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EVALUATION OF FUNCTIONAL ANKLE INSTABILITY AND BALANCE IN SHOTOKAN PLAYERS: A CROSS-SECTIONAL STUDY

Dr. Jyoti Parle[1] & Divya Irkar[2]

Affiliations:

1. Associate Professor, MGM College of Physiotherapy, Navi Mumbai, Maharashtra, India. e-mail id: ajparle@gmail.com.
2. Intern, MGM College of Physiotherapy, Navi Mumbai, Maharashtra, India. e-mail id: irkardivya@gmail.com* Corresponding author:

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ABSTRACT

Increasing participation in Karate has led to increasing rate of lower limb injuries-specially ankle sprains have major share. With the hypothesis that ankle sprains can cause instability and hinder balance, purpose of this study was to evaluate Functional Ankle Instability and Balance in Shotokan players. This cross-sectional study included 55 participants in age group 17-25 years. The participants were assessed for Functional Ankle Instability through IdFAI questionnaire, SLBT and mSEBT for static and dynamic balance respectively. Here, ankle range of motion was also taken in consideration. 33% participants reported functional ankle instability. Assessment of Static, Dynamic Balance and Ankle range of motion reported impairment with lower mean values. IdFAI had positive correlation with SLBT in eyes open domain whereas negative with eyes closed of SLBT and all three directions of mSEBT. The study concluded significant prevalence of FAI and had correlation with static and dynamic balance.

Keywords: Shotokan, Karate, Functional Ankle Instability, Balance.

1. INTRODUCTION

Karate is Japanese empty-handed Martial art of self-defense through which karate player masters all body movements such as bending, jumping, and balancing by learning to move limbs and body backward and forward, left and right, up and down, freely and uniformly.[1] Shotokan is one of the oldest styles which uses three basic techniques:-'Kihon', 'Kata' and 'Kumite'.[1]'Kihon' is performance of basic techniques in static posture.[2]'Kata' consists of basic techniques – blocking, punching, kicking in orderly and combined manner.[2] 'Kumite' is sparring or fighting against an opponent.[2]Athlete has to maintain various static postures; kicks from opponent, kicking the opponent in kihon, kata also experiences loss of balance while fighting in kumite. This leads athletes to bear total body weight on the outer edge of the foot. [3, 4] In Karate, inversion injury to lateral ankle ligament has increased the prevalence of ankle sprains. [3, 4] According to evidence out of 47% lower limb injuries; 85% account for ankle injuries which majority include ankle sprains.[3, 4]Recurrent episodes of ankle sprains if not rehabilitated lead to chronic ankle instability which is the most commonest problem encountered by Karate players.[4, 5]

Ankle instability can be classified as 'Mechanical' and 'Functional'. 'Mechanical' ankle instability involves ankle hypermobility and laxity. 'Functional' ankle instability (FAI) is characterized by subjective feeling of recurrent giving way of outer (lateral) side of the ankle which often develops after repeated ankle sprains.

Postural control is crucial in karate players during kata and kihon. Center of Mass (CoM) is not maintained at constant height throughout the execution of Shotokan karate techniques. According to fighting conditions; kumite model demands dynamic balance and postural regulations as it requires technical and physical abilities and lesser stability to be expressed at their best during unpredictable situations.[6] Static Balance is the ability to maintain the body in fixed posture whereas Dynamic balance is attaining stability while performing task along various directions. [6, 7, 8] Athletes or individuals with Functional Ankle Instability are prone to have balance deficits which may affect their performance. Balance strategies can be assessed in static and dynamic domains, three dimensional body kinematics of the athletes or even functional activities which are involved in sport.

Studies have been conducted on Sport-specific balance ability in Taekwondo practitioners where dynamic balance was assessed by functional tests required during practice. [9] There is no specific literature in India reporting on the evaluation of ankle instability and balance in Shotokan players. Therefore, the purpose of this study was to evaluate Functional Ankle Instability (FAI) and its effect on Static and Dynamic Balance amongst Shotokan Karate players.

1.1 Objectives:

- To evaluate Functional Ankle Instability and its prevalence using 'The Identification of Functional Ankle Instability (IdFAI)' questionnaire.
- To evaluate the Static balance by Single Leg Balance Test (SLBT) for domains of eyes open and eyes closed.
- To evaluate the direction of balance impairment using modified Star Excursion Balance Test (mSEBT).
- To find the correlation between Functional Ankle Instability (FAI) and BMI, Static and Dynamic Balance.

2. METHODOLOGY

Participants

55 shotokan players in age group of 17-25 years were included in this cross-sectional study using purposive sampling method. Participants were selected on the basis of inclusion criteria and exclusion criteria.

2.2 Tools and Equipments

The Identification of Functional Ankle Instability (IdFAI)' questionnaire. was adopted to evaluate FAI in this study. Single Leg Balance Test(SLBT) and modified Star Excursion Balance Test (mSEBT) were used for assessment of Static and Dynamic Balance respectively. The Ankle Range of Motion (ROM) assessment was done by goniometer.

2.3 Procedure

Permission from Karate institutes and informed consent was taken from the participants. Anthropometric measurements (weight, height), KYU (Belt), duration of practice were recorded. Each participant was asked to fill IdFAI questionnaire for evaluation of Functional Ankle Instability (FAI). Participants with score of 11 and above were suggestive of Functional Ankle Instability (FAI). These participants with FAI underwent Static Balance-Single Leg Balance Test (SLBT). SLBT was performed bilaterally with Eyes Open (EO) & Eyes Closed (EC). Time of three trials was recorded and average was calculated. A single eyes open trial was followed by eyes closed trial with rest interval of atleast 5 mins was taken between each trial set to avoid fatigue. Dynamic Balance was assessed using Modified Star Excursion Balance Test (mSEBT); three trials of reach distances in all three directions (Anterior, Posteromedial, and Posterolateral) were recorded. Reach distances were normalized by measuring limb length from anterior superior iliac spine (ASIS) to medial malleoli. Average of reach distance in each direction was calculated by obtaining the sum of Reach 1+ Reach 2+ Reach 3 then divided by 3. The Normalized Reach Distance (%) was calculated by dividing average reach distance with the respective measured limb length and calculation of its percentage by dividing by 100. The ankle Dorsiflexion and Plantarflexion range of motion was then assessed by universal goniometer.

2.4 Statistical Analysis

Data of Demographic information was evaluated by calculation of mean and standard deviation. Pearson's and Spearman's rho correlation of data was analyzed using SPSS (version 20.0).

3. RESULTS

Amongst 55 participants, 71% (n=39) Males and 29% (n=16) Females. Also, based on KYU (Belt); 53% (n=29) were Black belt followed by 4%- Brown 1, 7%- Brown 2, 11%- Brown 3, 4%- Purple, 7%- Blue, 9%- Green and 5% were Orange Belt.

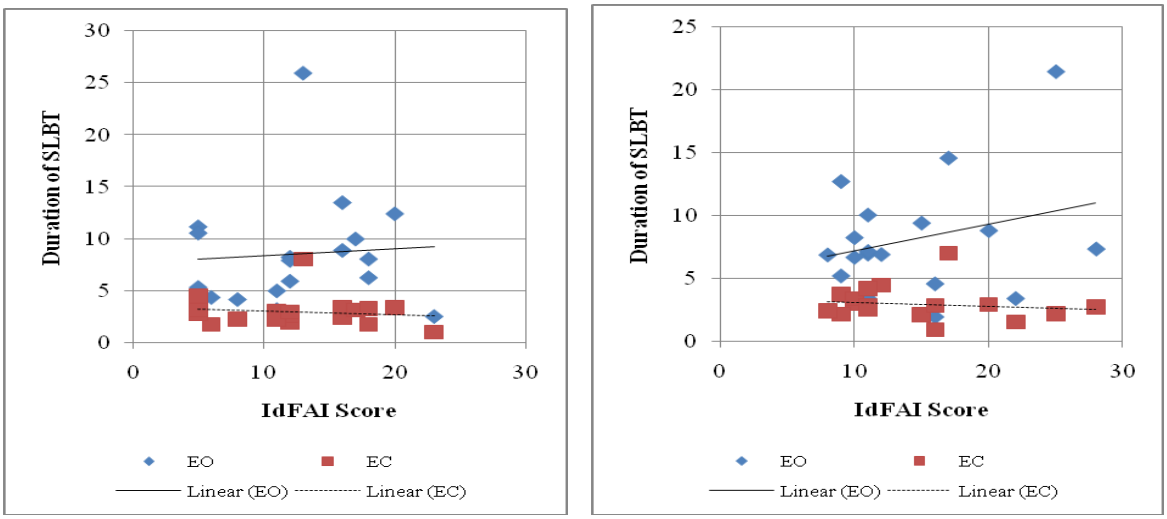
TABLE 1
MEAN AND STANDARD DEVIATIONS OF DEMOGRAPHIC INFORMATION.

	Mean± Standard Deviation
Age(years)	19.16±2.23
BMI(Kg/m^2)	21.84±4.21
Duration of practice(years)	5.18±2.91

Prevalence of FAI was found to be 33% (n=18) of which 12 were Males and 6 were Females. Majority of participants had unilateral FAI (n=10) and bilateral FAI (n=8). The Highest score of FAI obtained is 28 and lowest is 11.

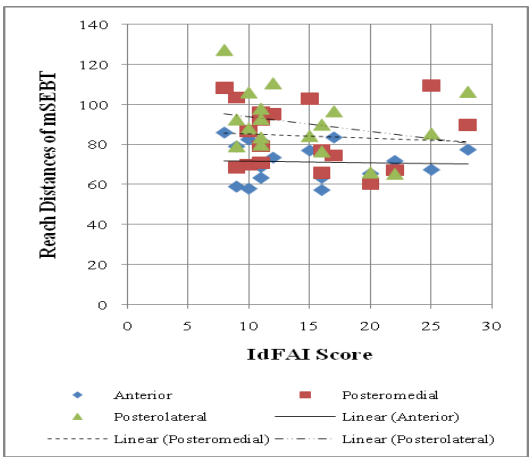
TABLE 2
MEAN± STANDARD DEVIATION OF THE OUTCOME MEASURES OF PARTICIPANTS WITH FAI.

	Mean± S D (Right)	**Mean± S D (Left)**
IdFAI Score	12.67± 5.47	14.50± 5.88
Static Balance(SLBT) (Secs.) EO	9.07±5.99	5.90±3.05
EC	2.99±1.67	3.05±1.09
Dynamic Balance (mSEBT) (%) A	71.41±9.20	72.29±10.12
PM	84.49±15.89	86.28±12.47
PL	90.65±15.57	91.87±15.46
Ankle Range of Motion(º) DF	18.84±5.82	20.5±7.44
PF	35.76±8.37	44.91±4.91

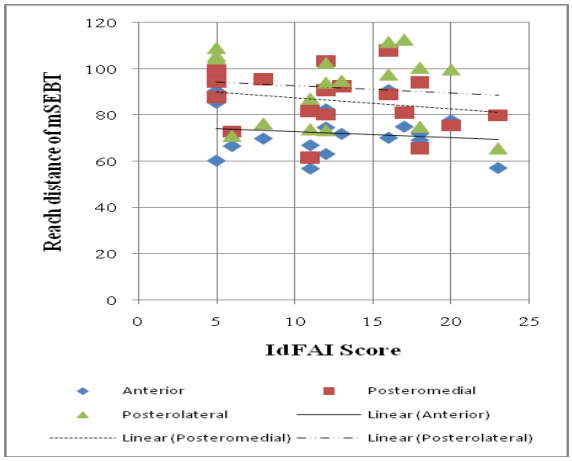


(a) Right SLBT. (b) Left SLBT.

Figure1. Correlation between FAI and SLBT (EO & EC).



(a) Right mSEBT.



(b) Left mSEBT.

Figure-2: Correlation between FAI and mSEBT.

TABLE 3

CORRELATION ANALYSIS OF FAI WITH BMI, SLBT (EO &EC), mSEBT (A, PM, PL).

	IdFAI Score(Right)		Correlation	IdFAI Score(Left)		Correlation
	'r' Value	'p' Value		'r' Value	'p' Value	
BMI	-.338	.170	Negative	-.302	.223	Negative
SLBT-EO	.159	.529	Positive	.147	.560	Positive
SLBT-EC	-.032	.899	Negative	-.152	.548	Negative
mSEBT-A	-.142	.575	Negative	-.026	.918	Negative
mSEBT-PM	-.209	.405	Negative	-.058	.818	Negative
mSEBT-PL	-.114	.654	Negative	-.279	.262	Negative

Abbreviations: IdFAI Score: Functional Ankle Instability score from the IdFAI questionnaire, BMI: Body Mass Index, EO: Eyes Open, EC: Eyes Closed, A: Anterior direction reach distance, PM: Posteromedial direction reach distance, PL: Posterolateral direction reaches distance.

Inference: Table 3. Shows positive correlation between FAI and SLBT in eyes open domain. Correlation of FAI is negative with BMI, SLBT (EC) and mSEBT in all three directions.

3 DISCUSSION

Shotokan players in age group of 17-25 years were included in this study, as age of bone ossification (closure of primary epiphysis) of maximum bones is approximately between 16-17 years in both males and females. [19] Majority of participants were in normal and below normal BMI range as per Asia criteria. [18] Although, participants in overweight and obese category were in lower grades of training. Correlation analysis of participants with Functional Ankle Instability (FAI) revealed that FAI and BMI had fair negative relation whereas studies reported BMI was highly correlated with FAI in their study. Underweight individuals have lower muscle masses which may lead to lower musculature strength; thus increasing prevalence of FAI. In present study, FAI was independent on higher BMI as the participants were in higher grades (belt) of training.

As the aim of study was evaluation of Functional Ankle Instability (FAI), prevalence rate of FAI in Shotokan players was found to be 33% (18 participants out of 55). Studies reported Shotokan Karate techniques and higher rates of ankle injuries caused by recurrent ankle sprains led to instability if not rehabilitated. [3, 4, 5]

Results of goniometric measurement of ankle Dorsiflexion and Plantarflexion ranges reported lower range of motion on right side compared with left. Studies also reported restriction in ankle range of motion in individual having FAI. [20] Few studies reported that restricted ankle ranges may cause ankle instability but is considered as a mechanical insufficiency. The restricted goniometric range of motion alone does not interpret functional ankle instability and assessment of anterior drawer test, talar tilt test may also be taken into consideration. [8]

Our results reported duration of SLBT in Eyes open domain of left lower limb was lower than the right side. Whereas, the right side reports lower duration values in Eyes closed domain than the left. Studies also reported sway in Single-Leg balance assessment. [8, 21] Although, higher static balance can be due to factors such as strength of the right lower limb, better proprioception than the left lower limb which is reported by previous investigations.[8] The SLBT duration values (eyes open) had little to no positive correlation with the FAI; although, FAI associates negatively with the eyes closed domain of SLBT. The positive correlation with the eyes open domain could be possibly due to the advantage of visual cues along with vestibular system.[21] Increased strength, proprioception and advantage of visual sensory system may be the factors for positive correlation of eyes open SLBT and FAI.

Modified Star Excursion Balance Test (mSEBT) results reported reach distances of left side in Anterior and Posteromedial directions were comparatively higher than right side. Posterolateral reach distances were equal bilaterally. Highest impairment in reach distances bilaterally were reported in Anterior direction than Posteromedial direction whereas Posterolateral reach direction show lower impairment. Better reach distances in posteromedial and posterolateral direction can be possibly due to good hip abductor musculature strength, hip abduction range of motion rather than the hip flexors revealing poor reach distances.[8, 21] Shift in the center of gravity occurring in medial direction causing tensile forces to be applied in lateral direction caused impairment in posteromedial direction in mSEBT reach distances and least impairment in Posterolateral direction .[23] Lower anterior reach distances may be dependant on knee range of motion and muscle activation of vastus medialis.[16] FAI had little to no negative correlation with contralateral limb reach distances in all three directions of mSEBT**.** The possible negative correlation may be suggestive of better lower limb musculature strength and proprioception and better CoM maitainence. [8, 23]

4 CONCLUSION

Significant prevalence of Functional Ankle Instability was found in Shotokan players. Though eyes open domain of static balance did not reveal greater impairment; eyes closed domain is largely affected. The anterior direction in Dynamic Balance shows greater impairment than the posteromedial and posterolateral directions. This study concluded that FAI was negatively correlated with static and dynamic balance.

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PROBLEMATIC SOCIAL BEHAVIOUR SKILLS IN EARLY ADOLESCENCE : WITH REFERENCE TO SPORTS PARTICIPATION

Anil Kumar[1] & Dr. Yuwraj Shrivastava [2]

Affiliations:

[1] Advanced Postgraduate Student, Department of Physical Education, Dr. CV Raman University, Kargi Road Kota Bilaspur C.G.

[2] Associate Professor, Department of Physical Education, Dr. CV Raman University, Kargi Road Kota Bilaspur C.G.

ABSTRACT

The main objective of this study was to compare problematic social behavioural skills among adolescent player and non player boys. The sample of this study was chosen to fulfil the major objective of this work. 50 player boys in their early adolescence were selected. The age range of these subjects in their early adolescence was 13 to 15 years. Those school-going boys in their early adolescence period with participation in district level sports participation were selected. Apart from this, 50 non-player boys in their early adolescence were also selected. The age range of these subjects in their early adolescence was 13 to 15 years. The chosen adolescent player boys average age was 14.11 years while the average age of adolescent non-players boys was 14.21 years. To select 100 school-going boys purposive sampling was used. Social skills problem behaviour checklist compiled and standardized by Madhu Mathur and Saroj Arora (2005) was thought suitable for this study. Results indicate about lower problematic social behavioural skills in adolescent player boys as compared to adolescent non player boys. It was concluded that problematic social behavivour skills in adolescent can be managed by ensuring their involvement in competitive sports.

Keywords : Problematic social behaviour skills, adolescence, competitive sports

1. INTRODUCTION

Early adolescence is a critical stage in human development. Early adolescence is one of the pivotal stages in life in which many psychological, social and physiological changes occur. In adolescence social skills play a very constructive role in terms of learning outcomes and social integration. Hence it is essential to develop proper social skills in this period so that the adolescent can cope up with social demands and interact well with society. Social skills are essential part of adolescence capacity to cope with day-to-day life situations. Social skills are hallmark of interacting well in the society. Due to lack of proper social skills some adolescent boys behave aggressively or exhibit socially unaccepted behaviour. This causes disruption in their social behaviour. To maintain harmonious social relationship it is essential to have good social skills without which the social relationship lost its meaning and create conflicting situation when interacting with peers and person of same age.

First description of social skills can be traced back to social learning theory of **Bandura (1971)** which was used in United States to define interactive skills of children and adolescents. **Riggo (1986)** opined that social skills can be learned or taught. Riggo believed that social skills can be learnt and is an integral element as far as interpersonal interactions are concerned. **Ford (1982)** wrote about pro social behaviour in which they lay emphasis of social skills in terms of relationship with peer, parents, fellow person and siblings. **Bakker et al. (2010)** emphasizes two different kind of social skills. One is assertiveness and other is self control. They further added that adolescents with necessary social skills are able to control and manage their feelings and longing with ease. It was also pointed by **Bakker et al. (2010)** that lack of social skills are responsible for conflict with authority figure. Another point in favour of social skills is floated by **Segrin and Flora (2000).** They noted a comprehensive relationship between social skills with social anxiety. **Cecconello and Koller (2000)** reported that good social skills increases resilience, reduces emotional susceptibility and added capacity to deal with adverse life situations.

Number of factor contributes to development of social skills in adolescence and it was opined that sports related physical activities are needed for development of these skills. Researchers like **Sheikhi et al. (2012), Singh et al. (2013), Mondal and Patar (2015)** gave contradictory results regarding this notion. Since this opinion has contradictory scientific results, this study was planned to assess problematic social behavioural skills in early adolescent period in boys life with emphasis on involvement in competitive sports.

The objective of the present study was to compare problematic social behavioural skills among adolescent player and non player boys. It was also hypothesized that pproblematic social behavioural skills will differ among adolescent boys on the basis of their involvement in competitive sports.

2. METHODOLOGY

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

2.1 Sample

The sample of this study was chosen to fulfil the major objective of this work. 50 player boys in their early adolescence were selected. The age range of these subjects in their early adolescence was 13 to 15 years. Those school-going boys in their early adolescence period with participation in district level sports participation were selected. Apart from this, 50 non-player boys in their early adolescence were selected. The age range of these subjects in their early adolescence was 13 to 15 years. The chosen adolescent player boys average age was 14.11 years

while the average age of adolescent non-players boys was 14.21 years. To select 100 school-going boys purposive sampling was used.

2.2 Description of Instrument

Social skills problem behaviour checklist compiled and standardized by **Mathur and Arora (2005)** was thought suitable for this study. The total statement in this checklist is 62 with marking system of 3, 2 and 1 for response . There are six dimensions in this checklist. They are - presentation, interaction and conversation skills, social integration, attitude towards other children and attitude towards adults respectively. The magnitude of problematic social behavioural skills can be understood by higher scores on this checklist i.e. higher raw score indicate greater degree of problematic social behavioural skills. The reliability and validity of this checklist is scientifically established.

2.3 Administration of Instrument

50 school-going player boys in their early adolescence i.e. between 13 to 15 years were selected. 50 school-going non-player boys in their early adolescence i.e. between 13 to 15 years were also selected. The social behaviour checklist was administered. The response on each statement for each subjects was scored off. Suitable statistics was used for analysis of acquired data. The analysis of data is shown in table 1.

3. RESULT

TABLE 1
COMPARISON OF PROBLEMATIC SOCIAL BEHAVIOURAL SKILLS BETWEEN ADOLESCENT PLAYER AND NON-PLAYER BOYS

Variable	Adolescent Player Boys (N=50)		Adolescent Non Player Boys (N=50)		Mean Diff.	't'
	Mean	S.D.	Mean	S.D.		
Problematic Social Behavioural Skils	76.54	10.11	82.18	9.20	5.64	2.91*

Significant at .05 level
t.05 (98) = 1.96

As given in table 1, the mean scores on problematic social behavioural skills for adolescent player boys was 76.54 with standard deviation of 10.11. The mean scores on problematic social behavioural skills for adolescent non player boys was 82.18 with standard deviation of 9.20. When mean difference was calculated it was 5.64 and showing significant difference in two groups because the t=2.91 is showing significance level of .01. It indicates about lower problematic social behavioural skills in adolescent player boys as compared to adolescent non player boys. The interpretation tells us that lower score means less problematic social skills behaviour.

4. DISCUSSION

Numerous studies have documented that augmentation of personality in children and adolescent can be achieved by introducing competitive sports in their lives. As earlier reported in sports psychology, active participation in competitive sports and games helps to increase team spirit, leadership behaviour, commitment and resilience apart from some other useful psychological qualities. Competitive sports boost physical, mental, spiritual and social wellbeing. Hence it can be said that involvement in sports boost social skills and behaviour to a significant extent.

5. CONCLUSION

It was concluded that problematic social behavivour skills in adolescent can be managed by ensuring their involvement in competitive sports.

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COMPARATIVE STUDY OF MENTAL TOUGHNESS STATUS AMONGST MALE PLAYERS OF TEAM GAMES

Rahul Kumar[1] & Dr. B. John [2]

Affiliation:

1. Advanced Postgraduate Student, Department of Physical Education, Dr. CV Raman University, Kargi Road Kota Bilaspur C.G.
2. Associate Professor, Department of Physical Education, Dr. CV Raman University, Kargi Road Kota Bilaspur C.G.

ABSTRACT

The main objective of this study was to compare mental toughness status amongst male players of team games. The sample for this study was 40 interuniversity male players from different team events namely basketball, handball, volleyball and cricket. From each team game 10 male players were chosen. The average age of male team game players was 24.11 years at the time of study. To measure dependent variable mental toughness, questionnaire standardized by Sandip Tiwari (2007) was deemed appropriate. One Way ANOVA clearly shows significant difference in mental toughness status amongst male players of team games although this difference was not found to be across all the groups consisting of basketball, handball, volleyball and cricket players. The authors conclude that just because of taking part in team games it can not assumed that mental toughness status amongst male players will remain the same.

Keywords : Mental Toughness, Team Game, Male, Players

1. INTRODUCTION

Influence of psychological factors on performance comes under sports psychology. It is a inter-disciplinary science with incorporates other allied fields. Sports psychology provides link between psychological variables and its impact on performance. It addresses the psychological factors that are of prime usage in optimal sports performance. It is also useful in connecting physical and psychological aspects of sports performance. It mainly involves the use of attention, focus, mental imagery, motivation, personality, self concept, self confidences and varied psychological factors for performance enhancement in sports. Sports psychologists are very common in modern sports and majority of the top teams in the world use them for optimum performance. The cognitive and behavioural aspects are major domains of sports psychology and these theories and principles are used by sports psychologists to chalk out psychological training plan for athletes.

Among prominent psychological variables in sports performance, mental toughness has earned special position. Psychological part of sports performance considers mental toughness as very important variable and techniques under mental toughness by elite athletes to achieve optimal results. Historical details gives details about the first use of mental toughness and the credit was given to Loehr. Some obstacles in achieving something in sports are doubt about certain factors. There are numerous situations faced by sportsperson which are not only problematic but creates hurdles in obtaining certain desired outcomes. Only those athletes who are mentally tough are able to cope with this adverse situation and succeed in achieving the desired goals in their sports career. **Jones et al. (2002)** described mental toughness in three different aspects- (1) According to this definition mental toughness is an in-built ability of some sportsperson by which they exert superiority over opponents. Sometimes mental toughness may also be considered as trainable ability. (2) The pressure of performance and coping mechanism of an athlete depends on his mental toughness. (3) Determination and self confidence with aided focus in athletes comes from mental toughness. These virtues of mental toughness are essential to give best performance under crucial juncture of a match or under extreme pressure be it from environmental or other. The 4C model was suggested by **Clough et al. (2002)** in defining mental toughness. This model consist of facing the odds or challenges, dedication towards some clear goals, sound emotional mechanism, ability to perceive confidence in own capacities and confidence while dealing with other person. Earlier **Mande (2012), Patil and Pasodi (2012), Dubey and Singh (2014), Vandervies and Paskevich (2015), Cowden (2016), Shrigiriwar (2019)** are prominent researchers who studied mental toughness in players on the basis of various parameters The area selected for this research although explored but not understood fully. Hence this study was accomplished.

The objective of the present study was to compare mental toughness of male players competing in team games namely basketball, handball, volleyball and cricket. It was also hythesized that there will be significant difference in mental toughness among male players of different team games i.e. basketball, handball, volleyball and cricket.

2. METHODOLOGY

2.1 Sample

The sample for this study was 40 interuniversity male players from different team events namely basketball, handball, volleyball and cricket. From each team game 10 male players were chosen. The average age of male team game players was 24.11 years at the time of study. Purposive sampling was used for selection of sample.

2.2 Instrumentation

To measure dependent variable mental toughness, questionnaire standardized by Sandip Tiwari (2007) was deemed appropriate. There are 48 statements in this mental toughness questionnaire and it is based on sub-scale such as (1) self confidence, (2) motivation, (3) attention control, (4) goal setting, (5) visual and imagery control and (6) attitude control respectively. A respondent can score marks from 48 to 240. Scores on higher side considered better mental toughness. The reliability and validity of this MTQ was established by author in an appropriate manner.

2.3 Administration of Instrument

10 male basketball players, 10 male volleyball players, 10 male handball players and 10 male cricket players were chosen from interuniversity tournaments purposively. The administration of mental toughness questionnaire was carried with the help of instruction manual. Response for each player was scored with the help of keyed answer. Data was specifically entered according to different team games. The statistical tools was used in accordance with distribution of data. The analysis of data is shown in table 1

3. RESULT

Table 1 is related with comparative analysis of mental toughness between male basketball, handball, volleyball and cricket players. Since the number of study groups are more than two, one way ANOVA was employed for analysis.

TABLE 1

BASIC STATISTICAL PROPERTIES FOR MENTAL TOUGHNESS IN MALE BASKETBALL, HANDBALL, VOLLEYBALL AND CRICKET PLAYERS

Groups	N	Mental Toughness		
		Mean	S.D.	Standard Error
Male Basketball Players	10	209.00	13.50	4.27
Male Handball Players	10	202.50	16.56	5.23
Male Volleyball Players	10	207.50	17.08	5.40
Male Cricket Players	10	226.30	8.19	2.59

ANOVA SUMMARY

Source of Variance	df	Sum of Squares	Mean Square	F-ratio
Between Groups	**03**	3221.675	1073.892	5.26*
Within Groups	**36**	7341.100	203.919	
Total	**39**			

*Significant at .05 level and.01 level, F (3,36) = 2.87

As given in table 1, the mean score on mental toughness for male basketball players group was 209.00, for male handball players group mean mental toughness score was 202.50, for male volleyball players group mean mental toughness score was 207.50 and lastly the mean score on mental toughness for male cricket players was 226.30.

To analyse the difference the Fisher's value F=5.26 was showing significance at .01 level. Hence difference between the groups was established.

TABLE 2
PAIRED COMPARISON AMONG MALE PLAYERS FROM TEAM GAMES BASKETBALL, HANDBALL, VOLLEYBALL AND CRICKET

Mean (I)	Mean (J)	Mean Difference (I-J)
Male Basketball Players	Male Handball Players	6.50
	Male Volleyball Players	1.50
	Male Cricket Players	17.30*
Male Handball Players	Male Volleyball Players	5.00
	Male Cricket Players	23.90*
Male Volleyball Players	Male Cricket Players	18.80*

* Significant at .05 level

According to statistical data in table 2, mental toughness in male handball and volleyball players was better than male basketball players but the mean difference of 6.50 and 1.50 did not meet the decisive statistical factor of significance. Similarly mental toughness in male volleyball players was better than male handball players but the mean difference of 5.00 did not meet the decisive statistical factor of significance. It was also observed that mental toughness in male cricket players was significantly better in comparison with male basketball, handball and volleyball players. This is proved by significant mean difference of 17.30, 23.90 and 18.80 at .01 criterion statistically.

4. DISCUSSION

Results reveal some difference in mental toughness of players from team games such as basketball, handball, volleyball and cricket respectively with mental toughness being highest in cricket players. This could be due to magnitude of individual brilliance being high in sport such as cricket and it is more competitive in India due to its popularity. Apart from this individual difference also plays a part in determining mental toughness of players irrespective of chosen type of sports.

5. CONCLUSION

On the basis of results, it may be concluded that mental toughness status amongst male players participating in team games such as basketball, handball, volleyball and cricket differ with each other. The authors recommend that is is essential to know the mental toughness status of male players for preparing specific psychological training plan for players participating in specific team game such as basketball, volleyball, handball, and cricket

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SELF CONFIDENCE PROFILE OF SOCCER PLAYERS OF JAMMU AND KASHMIR AND LADAKH

Loldan Tonyat [1] & Dr. B. John [2]

Affiliations:

[1] Advanced Postgraduate Student, Department of Physical Education, Dr. CV Raman University, Kargi Road Kota Bilaspur C.G.

[2] Assistant Professor, Department of Physical Education, Dr. CV Raman University, Kargi Road Kota Bilaspur C.G.

ABSTRACT

The main objective of this study was to prepare self confidence profile of inter collegiate soccer players of Jammu and Kashmir and Ladakh. To conduct the study 50 male soccer players with average age of 22.11 years were selected. All these players took part in intercollegiate tournament in Jammu and Kashmir and Ladakh. The choice of sample was made with the help of purposive sampling. The psychological instrument for collection of data in this work was self confidence inventory of Pandey (1983). It was found that majority of the selected male soccer players from Jammu and Kashmir and Ladakh enjoys moderate degree of self confidence in their own abilities followed by male soccer players with high and lastly low level of self confidence in their own abilities. It was concluded that self confidence in soccer players from Jammu and Kashmir and Ladakh need to be addressed with psychological training program.

Keywords : Self Confidence, Soccer, Male players, J & K , Ladakh, Inter-collegiate

1. INTRODUCTION

Apart from winter sports, adventure sports and golf, the other popular sport in Jammau and Kashmir and Ladakh are cricket and soccer. Biscoe in 1891-92 introduced soccer in Jammu and Kashmir and it became the most popular sport in this region. Participation of Jammu and Kashmir soccer team in Santosh trophy dates back to 1964. I-league in Jammu and Kashmir consists of division I and division II. One of the soccer players from Jammu and Kashmir namely Wadoo was part of Indian soccer team and also took part in Indian super league. So far Jammu and Kashmir produced 19 soccer players from junior to senior level who represented India internationally. Some of the players from Jammu and Kashmir league have also represented top soccer clubs like Mohan Bagan and East Bengal. Jammu and Kashmir boast an international level soccer stadium in TRC. To promote soccer in valley several efforts have been made by the government starting from the year 2017. Like any other soccer loving city Leh possesses the passion for this sport. At high altitude of 11483 feet with adverse playing conditions such as atmospheric pressure and oxygen level, soccer is extremely popular in Leh. The weather allows soccer for only six months in a year because the rest of the time this zone is covered in thick snow. There are as many as 32 soccer teams in this region with different age group. Bakula Rinpoche Memorial championship is major tournament in which Leh-Ladakh compete with each other. The major soccer clubs are Oasis and Mahabodhi respectively and these two clubs are represented by best available talent. In Leh-Ladakh, Jammu and Kashmir region a football tournament at highest altitude in world is organised every year by ITBP. The whole idea is to tap best available talent in this region and train them to be part of various top clubs of India. Since soccer players of Jammu and Kashmir and Ladakh possesses athletic ability and endurance to excel in sports like soccer it is necessary to evaluate their psychological potentiality also. One such psychological ability is self confidence. No one can deny the importance of self confidence in personal as well as professional career. The same is true in sport where self confidence is considered to be major psychological ability as far as performance is concerned. It is also necessary for players to use their abilities in best possible ways. The importance of self confidence in sports performance has been documented in sports psychology through studies conducted by **Soltani et al. (2013), Bajpai and Nagma (2015), Durge and Bhagwati Chandra (2017), Kang and Jang (2018), Warni and Purwono (2019).**

The objective of the present study was to prepare self confidence profile of inter collegiate soccer players of Jammu and Kashmir and Ladakh. It was hypothesized that the majority of the intercollegiate soccer players from Jammu and Kashmir and Ladakh will be fairly high on self confidence parameter.

2. METHODOLOGY

2.1 Sample

To conduct the study 50 male soccer players with average age of 22.11 years were selected. All these players took part in intercollegiate tournament in Jammu and Kashmir and Ladakh. The choice of sample was made with the help of purposive sampling.

2.2 Instrumentation

The psychological instrument for collection of data in this work was self confidence inventory of Pandey (1983). 60 questions in Hindi forms this inventory. There are positive as well as negative worded statements in this Hindi inventory to assess self confidence. The number of positive worded statements in this Hindi inventory to assess self confidence is 18 while 42 statements are framed negatively. This inventory enjoys very high face validity apart from being

satisfactorily reliable. The construction of this inventory was made in such a way that scores on higher side denotes lack of self confidence.

2.3 Administration of Instrument

Desired number (N=50) of male soccer players residing in Jammu and Kashmir and Ladakh were selected from intercollegiate tournaments. Self confidence inventory was given to each male soccer player. The fully filled questionnaire were then put to scoring by process mentioned in manual regarding each statement in the inventory. After scoring data was analysed with appropriate statistical formula. The analysis of data is shown in table 1

3. RESULTS

TABLE 1
FREQUENCY OF INTERCOLLEGIATE MALE SOCCER FROM JAMMU AND KASHMIR AND LADAKH IN VARIOUS SELF CONFIDENCE CATEGORIES

Categories of Self Confidence	Frequency (Number of Subjects)	%	$\chi 2$
High (Scores below 23)	13	26.0	$\chi 2 = 8.32$ ($p<.05$)
Moderate (Scores between 24-37)	25	50.0	
Low (Scores > 38)	12	24.0	
Total	**50**	**100.0**	

$\chi 2$ (df=2) = 6.28 at .05 level and 9.21 at .01 level

Table 1 reveals that 26% intercollegiate male soccer players from Jammu and Kashmir and Ladakh showed higher extent of self confidence. 50% intercollegiate male soccer players from Jammu and Kashmir and Ladakh showed average level of self confidence. 24% intercollegiate male soccer players from Jammu and Kashmir and Ladakh showed lower extent of self confidence. The $\chi 2 = 8.32$, $p<.05$ indicate statistically proves the significance of the results and it is clearly visible that majority of the selected male soccer players from Jammu and Kashmir and Ladakh enjoys moderate degree of self confidence in their own abilities followed by male soccer players with high and lastly low level of self confidence in their own abilities.

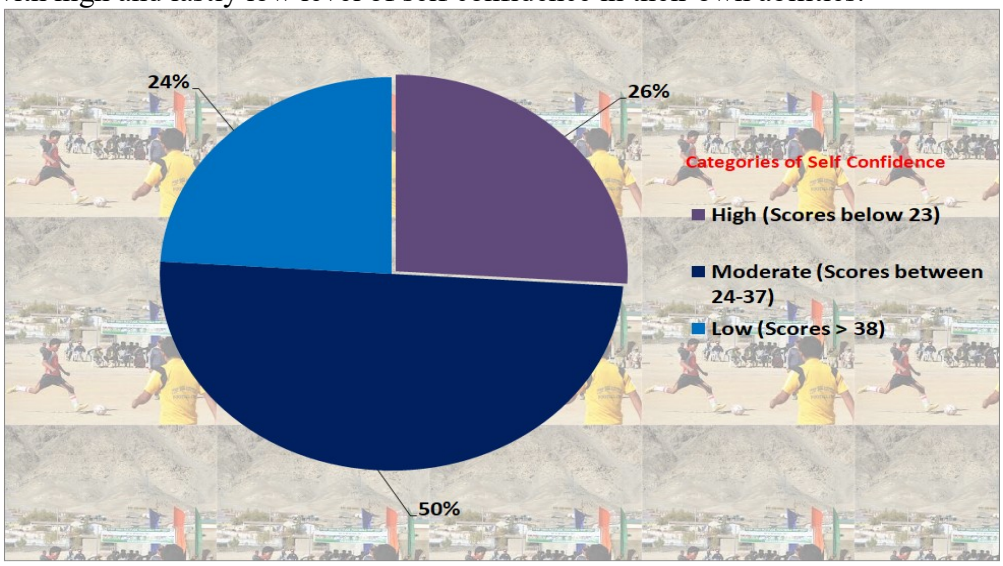

Figure 1 Percentage Contribution of Various Self Confidence Categories

4. DISCUSSION

The results substantiate the fact that majority among intercollegiate male soccer players of Jammu and Kashmir and Ladakh were moderately confident. This goes to show that these players need to work on their psychological aspect of performance. The moderate and low level of self confidence in these soccer players may be due to lack of exposure and playing conditions at high altitude. The other factor may be lack of resources to these soccer players in terms of psychological training. In a study on volleyball players, **Bajpai and Nagma (2015)** also reported that district level and state level players were low in self confidence as compared to national level players. So it is possible that intercollegiate soccer players are not skilled enough so that their belief in their own abilities is not certain. This may be the reason for moderate and low level of self confidence in soccer players of Jammu and Kashmir and Ladakh.

5. CONCLUSION

On the basis of results, it may be concluded that soccer players of Jammu and Kashmir and Ladakh need psychological training so that their level of self confidence can be enhanced.

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EFFECTOF TEMPERATUREON MOTOR FITNESS COMPONENT

Jatinder Kumar[1]

Affiliation:

1. Assistant Professor, S.G.G.S Khalsa College, Mahilpur (Punjab)

ABSTRACT

The purpose of the study is to investigate the "Effect of Temperature on Motor Fitness Component". Sample of 15 sports person of 12th class students of D.A.V Public Sr. Sec School, Parwanoo were selected. The collected data were analyzed by computing the 't' test The results of the study revealed that there is no significance difference between the cold and hot temperature on motor fitness component. And there is significant difference in 12 minute run and walk in cold and hot temperature was found.

Keywords: Motor Fitness, Student, Sportspersons, Schools, tenprature

1. INTRODUCTION

The term "motor fitness" is most often used synonymously with physical fitness by the physical educators, but it is very important for the physical education student s to know the basic difference between physical fitness and motor fitness. Physical fitness is used to denote only four basic fitness components (muscular strength, muscular endurance, cardiovascular endurance and flexibility), whereas motor fitness is a more comprehensive term which includes all the ten fitness components like four fitness, one of the health related fitness and five motor performance components, power, speed, agility, balance and reaction time, which is important for the success in sports. In other words, motor fitness refers to the efficiency of basic movements and also to the addition of physical fitness. Sports performance is indeed an aspect of complex human performance, which has several dimensions. Hence, several disciplines of sports sciences are required to work in a coordinated manner to explore the nature and the process of improving performance In the last few decades several disciplines of sports sciences have established e.g. sports medicine, sports physiology, sports training, sports bio-mechanics, sports psychology, sports pedagogy, sports nutrition and so on. These sports sciences work as one integrated unit to give super sports performance.**(Singh, 2017).**

Physical activity enhances mental development of person **(Cowell and France, 1963).** In physical education and sports, especially, in developing physical fitness there is a large collection of activities for experiencing success **(Chaudhary, 2014**). Many studies conducted outside India have advised for physical fitness has positive effect on sport performance capacity **(Harre, 1977)**

Regular, vigorous physical activity through out life significantly reduce that risk of disability premature death from smoke and heart disease. It can also effectively alter many of important risk factor for cardio vascular disease by lowering body weight and raising HDL Good, cholesterol and promoting the maintenance of normal blood pressure.

Physical fitness is the ability to function effectively throughout your workday, perform your usual other activities and still have enough energy left over to handle any extra stresses or emergencies which may arise.

Cardio respiratory (CR) endurance - the efficiency with which the body delivers oxygen and nutrients needed for muscular activity and transports waste products from the cells **(The U.S. Army Fitness Training Hand Book)**

Muscular strength - the greatest amount of force a muscle or muscle group can exert in a single effort.

Muscular endurance - the ability of a muscle or muscle group to perform repeated movements with a sub-maximal force for extended periods of times. **(https://www.toppr.com)**

Flexibility - the ability to move the joints or any group of joints through an entire, normal range of motion**. (https://www.familychiroplus.com)**

Body composition - the percentage of body fat a person has in comparison to his or her total body mass.

Improving the first three components of fitness listed above will have a positive impact on body composition and will result in less fat. Excessive body fat detracts from the other fitness components, reduces performance, detracts from appearance, and negatively affects your health.

Factors such as speed, agility, muscle power, eye-hand coordination, and eye-foot coordination are classified as components of "motor" fitness. These factors most affect your athletic ability. Appropriate training can improve these factors within the limits of your potential. A sensible weight loss and fitness program seeks to improve or maintain all the components of

physical and motor fitness through sound, progressive, mission specific physical training. **(https://www.healthmagazine.ae)**

The purpose of this study was to investigate the Comparative Effect of Temperature on Motor Fitness Component.

2. METHODOLOGY

2.1 Sample

The research scholar chose 15 male Sports students of D.A.V Public Sr. Sec School, Parwanoo of 12th class.

2.2 Criterion Measure

The performance of the subjects in 50-yard dash, shuttle run, standing broad jump, sit ups and 12 minute run/walk were taken as a criterion measure for the study. The following measures were: -

2.2.1 50 Yard Dash

The taken by the subject to run a distance of 50 meter was recorded to the nearest $1/10^{th}$ of a second by using synchronized and calibrated stop watch.

2.2.2 Sit-ups

The number of completed bent knee sit-ups in one minute more recorded to the nearest whole number.

2.2.3 Shuttle Run

Time taken by the subject to run a distance of 4 x 10 yard was recorded to the nearest tenth of a second.

2.2.4 Standing Broad Jump

Maximum distance covered by the subject was recorded to the nearest centimeter.

2.2.5 12 minute Run/Walk

Distance covered by the subjects in 12 minute run\walk.

3. RESULT

The data collected was statistically analyzed by 't' test and results of the various groups are presented in Table 1.

TABLE 1
DIFFERENCE OF MEANS BETWEEN COLD AND HOT TEMPERATURE OF MOTOR FITNESS COMPONENTS

S.No.	Variables	Mean		Mean Difference	Standard Deviation		DM	't' Ratio
		Cold	Hot		Cold	Hot		
1.	12 Minute Run-Walk	2861.63	2718.35	143.28	145.40	106.58	27.50	5.18*
2.	50 Yard Dash	7.40	7.58	0.24	0.23	0.59	0.16	1.65
3.	Shuttle Run	9.49	10.0	0.51	0.35	0.37	0.27	1.93
4.	Pull-ups	5.5	5.2	0.4	0.97	0.83	0.57	0.71
5.	Sit-ups	32.51	32.89	0.33	2.15	2.36	0.80	0.43
6.	Standing Broad Jump	2.40	2.53	0.09	0.25	0.56	0.06	1.5

*Significant at .05 level

t.05(14)= 2.145

It is evident from the Table 1 that there is significance difference between the cold and hot temperature on motor fitness components.

4. DISCUSSION

It is evident from Table 1 that there was insignificant difference between cold and hot temperature in 50 yard dash (1.65), shuttle run (1.93), pull-ups (.71), bent knee sit-ups (.43), standing broad jump (1.5), but there was a significant difference in 12 minute run-walk test between cold and hot temperature. It can be revealed that there is no difference between cold and hot temperature in all motor fitness components except 12 minute run-walk. Probably the reason could be that all the subjects taken for the study were the professional physical education students under going the same training programme which might have brought insignificant difference between the cold and hot temperature. The reason for the significance of difference of 12 minute run-walk could be due to only time duration of particular activity, because in "cold or cool environment, exercise can that be maintained for an hour or more in seldom limited by and excessive increased in internal or rectal temperature.

Environmental heat reduces the thermal gradient between the environment and skin surface, and between the skin surface and the body core, thus imposing an added resistance to body heat loss. Such a heat loss barrier causes an excessive increase in rectal temperature and surely limited the capacity for work".

5. CONCLUSION

On the basis of the analysis of data and the limitation of the present study the following conclusions may be drawn :

1. There is no significant difference in motor fitness components between cold and hot temperature.
2. There is significant difference in 12 minute run and walk in cold and hot temperature was found.

6. RECOMMENDATION

In the light of result obtained from the present study the following recommendation can be made :

1. Physical education teacher and coaches should keep in mind, the importance of specific motor fitness items required for a various temperature.
2. The same study can be taken up by choosing the non-professionals as subjects.
3. The study can be taken up by choosing subjects of different sex, age group etc.

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RELAXATION STRATEGY ON ARTERIAL PRESSURE OF COLLEGE STUDENTS: A STUDY

Dr. Ashish Kumar Nigam[1] & Dharmendra Narwaria[2]

Affiliations:

[1] Sports officer, Jawaharlal Nehru Krishi Viswavidalaya Jabalpur MP, dr.aknigam@gmail.com, Mob. 9826348748

[2] Sports officer, Jawaharlal Nehru Krishi Viswavidalaya, Jabalpur MP, Mob. 8817222229 narwarialnupe@gmail.com

ABSTRACT

The study was conducted on college going male students to observe theoutcome of different relaxation strategy on individual's arterial pressure. For this study randomly selected sixty male subjects (N=60). All the sixty students equally dived in two group's ie. Experimental and control groups namely A and B groups. Subject Age range between 18-24 years. In this study arterial pressure (systolic and diastolic) was opted as the dependent variables and four weeks different relaxation strategies as independent variables. Standard procedures were followed by the researcher during pre and post data collection. Data was acquired with the assistance of digitalSphygmomanometer. Paired‘t’ test was employed to analysis the data. The result of the study depicted that there was a significant difference between pre and post data of a group and insignificant found in B groups with the Level of significance at 0.05.

Keywords: systolic pressure and diastolic pressure, electric Sphygmomanometer, relaxation strategy

1. INTRODUCTION

In this computer and mechanical world people more engaged with their daily routine occupation. Due to the excessive use and dependency on digital gadgets they have least time for their health aspects. Due to this fact they have lot of stress and strains.

In this presence scenario due to lack hypokinetic works habit many disease capture the individual health. Similarly one of the known health issue is High Blood Pressure. It may Cause Toughening and Thick of The Arteries that leads Stroke or Other heart Problems. This situation is Life-Threatening for human **(https://www.heart.org).**

At what time heart beats, when heart pumps blood round the body it provide the energy and oxygen at required parts. As blood moves in the body, it drives against the sides of the vessels. The strength of this force is known as a blood pressure. If the pressure is too high, it put extra strain on arteries and it lead to heart attacks or strokes**.**

Although, the body requires oxygenated blood and carries all over the body. It creates pressure that pushes blood over a network of vessels, arteries, veins and capillaries. These results two forces: The first force (systolic pressure), when blood pumps out of the heart and into the arteries. This movement called as circulatory system and second force is known as diastolic pressure it makes as between heart beats or heart rests. After the longtime of this internal force and friction of high blood pressure, it causesharms the inside tissue of the arteries.

When individuals have numerous responsibility and works, this situation move the body towards illness, however the human is very less conscious about their health aspects. To overcome this problems people may indulge in the various yogic exercise fitness activities, short term relaxation technique. **(Catherine, 2011).**

Relaxation techniques are the stone mile for management of mental and physical stress of the body. It's not confine only peace of mind, enjoying a hobby also reduces the effects of stress on mind and body. It assists to manage daily stress and it's related various health problems. **(Mayo Clinic Staff 2020)**

In this present world to manage the stress and maintain the physical fitness, Individual must learn the basic relaxation and yogic, meditative exercise or techniques. As these activities people may get often free or low cost. People may get started on de-stressing the life and improving health and fitness aspects.

While practicing these relaxation activities or exercise individual have many benefits such as, control heart rate and blood pressure, improve breathing rate and digestion Maintain blood sugar levels, Reduce stress hormones, and delay the fatigue, Taming concentration and mood, control anger and frustration

In common, relaxation activities comprise refocusing kindness on something calming and rising awareness of the body. It hardly matters, which relaxation technique performing. A things matter is that people try to practice regularly to gain its benefits.

In general, these are the some relaxation technique namely, Autogenic relaxation, Progressive muscle relaxation and Visualization. If one relaxation technique doesn't work for you, try another technique. If none of effect feel on the body at stress reduction appears, you must consult to experts. To understand and examine the impact of relaxation activities such study was conducted by researcher.

2. METHODOLOGY

2.1 Selection of Subjects

A sixty subjects (N=60) age ranged from 22 to 30 years free from any disease and health issue. Subjects were divided randomly Thirty (n=30) in each experimental and control groups.

2.2 Selection of Variables

Arterial pressure (systolic and diastolic) variables were opted as dependent variables. Arterial pressure was recorded using digital Sphygmomanometer; standard procedure was followed while collection of data. Morning session was chosen to collect Pre data from both groups. After successfully completion of four weeks relaxation strategy program, post data was collected in the same conditions. After reviewed the in-depth literature, research paper, articles and studies, researcher came with conclusion that the effects The strategy of relaxation is given in the table below.

2.3 Protocol of Relaxation strategies

WEEK	DAY	Duration	RELAXATION STRATEGY
1st tweek	Monday, Saturday	90 minutes	Asanas, Meditation & visualization, Stretching activity,
	Tuesday, Wednesday		Asanas, Laughing & OM chanting, Stretching activity
	Thursday, Friday		Asanas, Scan body, Stretching activity
2nd week	Monday, Saturday	90 minutes	Asanas, Meditation & visualization, Stretching activity
	Tuesday, Wednesday		Asanas, Laughing & OM chanting, Stretching activity
	Thursday, Friday		Asanas, Scan body, Stretching activity
3rd week	Monday, Saturday	90 minutes	Asanas, Meditation & visualization, Stretching activity
	Tuesday, Wednesday		Asanas, Laughing & OM chanting, Stretching activity
	Thursday, Friday		Asanas, Scan body, Stretching activity
4th week	Monday, Saturday	90 minutes	Asanas, Meditation & visualization, Stretching activity
	Tuesday, Wednesday		Asanas, Laughing & OM chanting, Stretching activity
	Thursday, Friday		Asanas, Scan body, Stretching activity

2.4 Tool & Techniques

2.4.1 Sphygmomanometer

Arterial Pressure is known as an average arterial pressure during one cardiac cycle, systole, and diastole. Digital sphygmomanometer is automatic machine which provide the digital reading of systole and diastole.

2.4.2 Scan body

These technique combinations of breathe focus with progressive muscle relaxation. After a deep breathing of few minutes, concentration on one part body at a time and psychologically release any physical tension feel. It may benefit to enhance awareness.

2.4.3 Focused Breathe

This is a very easy and most prevailing technique, it needs to take long, slow, deep breaths with the help of abdominal. As we take breathe, gradually separate mind from diverting from various thoughts and feelings.

2.4.4 Chanting of OM

In this practice silently repeat a short chanting of om while practicing breath focus. Repeat this chant with several times, while exhalation of breath.

2.4.5 Laughing

This practice is not only help to alleviate the mental pressure. But control the cortisol, reduce stress hormones, and improve the endorphins.

2.4.6 Meditation and Visualization

Meditation and visualization may carry abrupt relief and added relaxed. It bring tremendous effect when we practicing habitually.

2.4.7Asanas

Sukhasana, Balasana, Paschimottanasana, AnandaBalasana, Uttanasana.

3. RESULTS

The study was conducted to examine the effects of four weeks of relaxation strategy on student's blood pressure. The data was collected by employing standard test and precise instruments for measure the experimental and control groups. To investigate the mean difference in arterial pressure (systolic and diastolic) scores between the pre and post data of both groups dependent 't' tests were computed and data pertaining to this has been presented in Table 1 -2 and depicted in figure 1-2.

TABLE 1
SIGNIFICANCE OF DIFFERENCE BETWEEN PER AND POST TEST MEAN SCORES OF SYSTOLIC BLOOD PRESSURE OF EXPERIMENTAL AND CONTROL GROUP

Groups	Test	Mean	MD	σ DM	t-ratio
Experimental group	Pre Post	125.83 124.33	1.50	0.37	4.065*
Control group	Pre Post	122.53 122.74	0.21	0.30	0.689

*Significant at .05 level
t.05 (58)=2.00.

Table 1 reveals that, there was a significant difference between the pre and post data on systolic blood pressure of experimental group, since the calculated't' value (4.065) was greater than tabulated value(2.045)with 29*df*. But insignificant difference was found in control group.

TABLE 2
SIGNIFICANCE OF DIFFERENCE BETWEEN PRE AND POST TEST MEAN SCORES OF DIASTOLIC BLOOD PRESSURE OF EXPERIMENTAL AND CONTROL GROUP

Groups	Test	Mean	MD	σ DM	t-ratio
Experimental group	Pre Post	69.72 68.69	1.03	0.22	4.68*
Control group	Pre Post	69.19 68.39	0.80	0.46	1.74

*Significant at .05 level
t.05 (58)=2.00

Table 2 indicates that there was a significant difference found between the pre and post data on Diastolic blood pressure of experimental group, subsequently the calculated t' value (4.68) was greater than tabulated value (2.045) with 29*df*. But insignificant difference was found in control group.

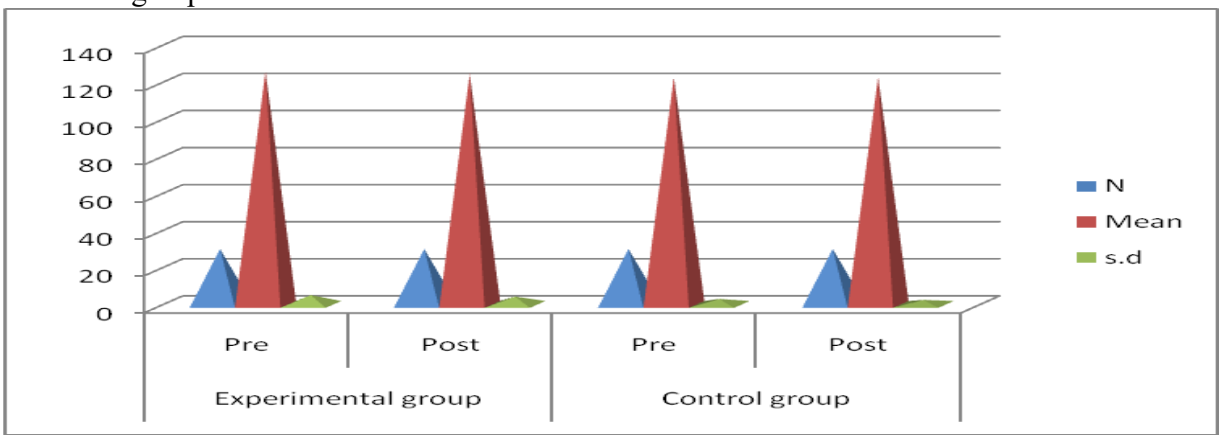

Figure- 1: Mean Scores of Pre and Post Test on Systolic Blood Pressure of Experimental and Control Group of Healthy Students

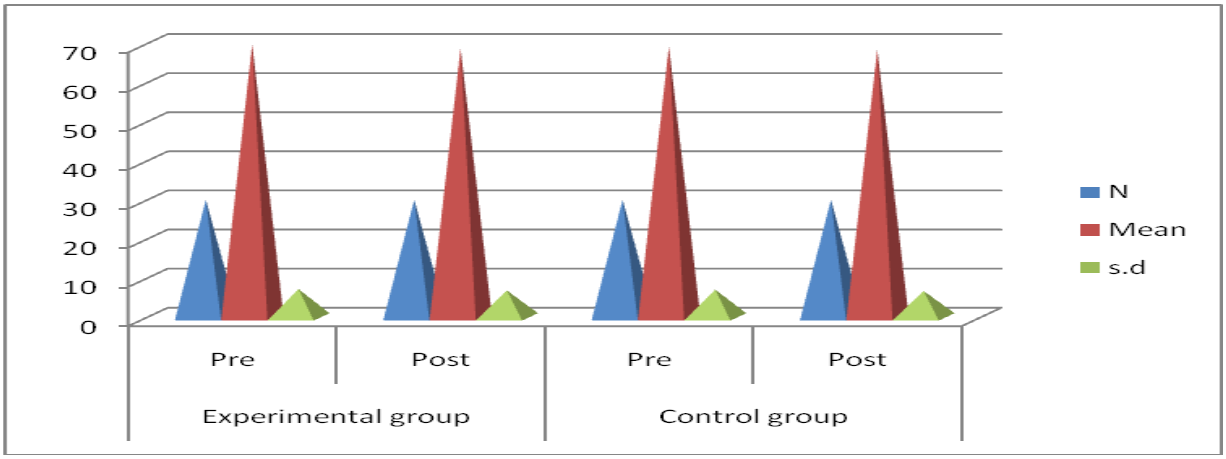

Figure- 2: Mean Scores of Pre and Post Test on Diastolic Blood Pressure of Experimental and Control Group of Healthy Students

4. DISCUSSION

Based on obtain results and limitation of study. It may be concluded that there was a significant difference found in the pre and post data of systolic and diastolic pressure between Experimental and control groups. However, insignificant difference was found in control group systolic and diastolic blood pressure. The findings of the study disclosed that relaxation strategy has a significant impact on arterial pressure (systolic and diastolic pressure).These relaxation strategies are adept for control the arterial pressure and it's also helpful in management of stress and physical fitness of the peoples. **Wolff, et al. (2013*)*** was also conducted by the similar study and found the same results. **Saensak, et.al. (2013)** found the similar results in the study). **Arora & Dubey, (2018)** was also conducted similar type of study, the independent variables was om chainting, researcher was to examine the its effect on heart beats. The result of the study also supported the presence study results. Further, **Marshall Hagins et. al. (2013)** was also conducted a Meta analysis study, to investigate the effect of yogic exercise on hypertension, Meta analysis study also support the result of the study. On the basis of the findings of the study yoga teacher, fitness and health expert in various may also use this programme. However, various similar study and literature also revealed that relaxation exercise also have a significant effect on blood pressure.

5. CONCLUSION

1. There was a significant difference found in the pre and post data of systolic and diastolic pressure between Experimental and control groups.
2. Insignificant difference was found in systolic and diastolic blood pressure. of control group
3. The findings of the study disclosed that relaxation strategy has a significant impact on arterial pressure (systolic and diastolic pressure).

\6. RECOMMENDATION

On the basis of conclusions drawn, the following recommendations are made- Similar may be conducted for school students also. Elite sportsmen can be picked as sample for the study. Study may be conducted on various psychological variables.

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IMPROVEMENT OF SKILL FOR SELECTION OF UNIVERSITY MEN HANDBALL PLAYERS

Dr. Sanjay K. Dabhi[1] & Dr. Munjal Rami[2]

Affiliations:

[1] Assistant Director, Department of Physical Education, Parul University, Limda, Vadodara, Vadodara, Gujarat 09726283482, Email ID: sanjay.dabhi143559@gmail.com

[2] Assistant Director, Department of Physical Education, Parul University, Limda, Vadodara, Vadodara, Gujarat Mob. No:- 09925980800 munjalrami80800@gmail.com

ABSTRACT

The study titled "Improvement of Skill for Selection of University Men Handball Players" was done on Parul University Men Handball players aged above 18 to 24 years. The objective of the study was to improve physical fitness and skill test norms for Inter College handball players and to design grading scale and to find out present physical fitness and skill status of the players. For the study the Inter College handball players gathered for Parul University, Limda, Vadodara, Handball players were considered as the subject for the study. A total of 980 subjects were tested for the study. For the data collection Morphological test (i.e. Standing Height, Body Weight, West Hip Ratio) Physical Fitness (i.e.12 Min run and walk, 50 meter dass , Shuttle Run, Vertical Jump, S.B.J., Sit and Rich, Sit Ups, Push Ups, Handgrip Strength Test) and Skill (Front Shoot, Accuracy Throw, Speed Pass, Agility Dribbling, Footwork) were used, for establishing the norms. The tests were conducted on 980 subjects and the analysis was done. Descriptive analysis was done by calculating the Mean, Median, Mode and Standard Deviation The normality of the scores was tested through skewness and kurtosis. The outliers from the scores were removed using the Box plot method. Percentile method was used to prepare norms. Norms of Physical Fitness Tests (12 Min run and walk, 50 meter dass, Shuttle Run, Vertical Jump, S.B.J., Sit and Rich, Sit Ups, Push Ups, Handgrip Strength Test) and Skill (Front Shoot, Accuracy Throw, Speed Pass, Agility Dribbling, Footwork) were prepared. The grading system for assessment and evaluation of the player was prepared. To find out the handball players status, they were categorized according to points obtained by players. This study is going to be help to the handball players of Parul University and to the handball clubs and mainly to the handball players and the beginner in this field. The beginner will have some knowledge about the physical fitness and Skill required for selection. It will guide line for the players to improve the performance level and compared to other players and reduce the amount of injuries due to decreased physical and mental fitness.

Keywords: Skill, Handball, Physical Fitness, College Players

1. INTRODUCTION

Handball is an Olympic sport played professionally in many countries. In spite of Professionalization, this game need to scientific information to increased Inter College handball players performance. This can be due to many reasons, one of them is that most of the research which has been conducted in this field has been published in Eastern European countries and is not readily accessible to the sport science community. Another reason can be attributed to the conservative approach of most coaches towards physical conditioning for handball players. Modern handball is a fast game, characterised by incredible athletic performances by athletes. In fact, modern handball players are able to perform many different moves like jumping, running, change of directions and technical movements in very short time and with an order determined by the tactical situation. Players run with and without the ball, in line and with different paths, jumping, throwing, passing and receiving in motion or during flight represent the technical characteristics of a modern top handball player. Then, to excel at the highest levels, it is important that training methodologies are developed on simple basis specificity. The closer to the demands of the performance, the better the training is. To obey to the law of specificity we have to know exactly what are the physiological demands of handball performance, in India, handball has become famous among other sports played at Schools, colleges, university, clubs and professionally. It is world second fastest game and always considered as a high fitness, perception, speed, timing, accuracy and agility. With its rules and regulation and playing set up is being popularly played in India. It is a devoting and challenging game. **(http://www.vedamsbooks.com)**

Indian athletes also represent national and International competitions in this game but lake of scientific Training, Knowledge, dirty politics, quota system research based information the results of handball players are very poor in international area. Handball entered India in early seventies with filed version outdoor game and Indian handball federation was formed in 1971, with 16 states as its units was played in its infant days in India, first senior national championship held at Haryana , Soon it spread all over the country but state like Gujarat, Punjab, Haryana, Jammu-Kashmir, A.P and Maharashtra have edge over other states as far as standards and popularity of handball in India, On date IHF 33 units States, Boards, Steel Plants and Railways Punjab Police, Services C.I.C.F, C.R.P.F Professional team which dominated handball Scene the country. (**http://www.handballindia.com)**

2. JUSTIFICATION OF STUDY

As compare to other games handball is most popular and fastest game in the world. It needs good physical structure, physical fitness and skill. For handball game it is quite difficult to evaluate the player because coach, selection committee, physical education teachers have to consider the above aspects. Evaluation of the players is the important process for teaching and coaching, through evaluation, a coach, selection committee members, physical educator and players know the draw backs of their games. At the time of evaluation coach advice players to improve the draw backs in their games. Hence, the coach, selection committee member and players must be aware of some evaluation techniques, which enable him to measure the fitness and skill objectively and classify them initially as well as by measuring the progress made by them. The test helps the players to evaluate their performance, predict future performance, indicate weakness, place the athlete in appropriate training programme or training group, motivate the athlete and to provide an incentive for improvement. The tests also help the trainers, coaches, selection committee to measure player's performance and to evaluate their own coaching procedure and programme. These tests should be used for the selection process, but unfortunately at the time of selection, selection committee only consider performance of the player on the basis of single game situation as a selection criterion. Unavailability of proper norms for selection of Inter College handball players in Parul University is one of the main the reason of it. So the researcher has decided to conduct the study entitled "Improvement of Skill for Selection of University Men Handball Players"

The objectives of the study were to identify the performance variables of University team handball; to measure selected Morphological, Physical Fitness components and handball skills; to develop the Norms for Parul University Handball players; to design grading scales for Parul University Handball

players. and to find out Physical Fitness and Skill status of Parul University handball players on the basis of developed Skill.

2. METHODOLOGY

The present study was undertaken with a sight of developing the norms for Parul University Inter College handball players. This is normative study; model methods were followed to conduct this research project. The researcher found out physical fitness, skill status of handball players and determined the players grading on the basis of the morphological, physical fitness and handball skill tests and establishing standard norms. The detailed procedure has been presented in this chapter **(Prakash, 2000).**

2.1 Selection of Sample

The population for the present study is the senior handball players participating in various tournaments conducted by different University Handball Players in Inter College Parul University Gujarat state.

Due to time constraint and for the convenience of research, the Purposive sampling method has been used for the selection of sample for the study. Sample for the study is Parul University handball players those who have been participated in Inter College Handball Tournament which were organised by Parul University Handball Inter College Tournament in 2019 -2020. The sample design and size of sample of the study has been framed as follows. **(Best & Kahn,2006).**

2.2 Procedure

The physical fitness and skill of Parul University Inter College handball players were measured on the basis of Kangane S.E, 3 team handball test battery which developed for the inter College The investigator discussed with handball Experts about the test included in the test battery and they suggested that all fitness and skill variables were covered in this test battery. The detailed procedure of study has been openly presented in table-1, **(Kangane, 2007).**

TABLE 1

S.No.	Dimension	Test Items	Measuring Variables	Scoring
1.	Morphological	Height,	Standing Height ,	Centimetre
		Weight	Weight	Kilograms
		Waist - Hip Ratio	Body fat	Kg
2.	Physical Fitness	1. 12Min Run/Walk	1. C.V. Endurance	Meters
		2. 50 Meter Dash	2. Speed	Seconds
		3. Shuttle Run	3. Agility	Seconds
		4. Vertical Jump	4. Explosive Strength	Centimetres
		5. Standing Broad Jump	5. Explosive Strength of Leg Muscle	Meters
		6. Sit & Reach	6. Flexibility of Back & Hamstring	Centimetres
		7. Sit Ups	7. Muscular Endurance of Abdominal Muscle	Number of Repetition
		8. Push Up	8. Muscular Endurance	Number of Repetition
		9. Handgrip Strength Test	9. Muscular Strength of Forearm	Kilograms
3.	Skill	Front Shoot	Shooting Ability	Points
		Accuracy Throw	Throwing Accuracy	Points
		Speed Pass	Passing Ability	Points
		Agility Dribbling	Dribbling Ability	Time
		Foot Work	Defensive Foot Work	Points

2.3 Testing schedule

It was decided to conduct the test on the selected sample when the subjects would come to take part in the inter College Handball Tournament which was organized by Parul University. Inter College Handball Tournament were held for a period of Three days. The format of the tournament was league cum knock out; the matches were conducted during the morning and early evening. The testing schedule prepared after discussion with coaches, experts in the field of physical education and sports. The researcher conducted the tests in four sessions and tried to provide the subjects with adequate rest. The researcher requested the Inter College Tournament Secretary, team managers and coaches for their cooperation for the testing on Inter College Handball players. The Inter College Secretary, team managers and coaches were accept the request and gave permission to conduct the test on their players which were participating in Inter College Handball Tournament Parul University. The details of the tests conducted in the three days (four sessions) are presented below. **(Kansal, 2008).**

TABLE 2

FILED SCHEDULE FOR PARUL UNIVERSITY INTER COLLEGE HANDBALL TOURNAMENT PLAYERS TEST

Time	Test
7:00am to9:00am	Body Height, Body Weight, West, Hip, Vertical Jump
9.30am to 1.30pm	12Min Run/Walk, Agility Dribbling , Footwork ,Front shoot
2.00pm to 4.00pm	Sit and Rich, Gripe Dynamiter, S.B.J., Speeds Pass.
4.30pm to 6.30pm	Push Ups, 50m Dash, Sit Ups, Shuttle Run, Accuracy Throw

The schedule mentioned above was followed for all the Tournament. The table shows the detailed testing schedule of the Inter College Handball Tournament, Parul University, from 18th October to 21st October 2019 the direction about the process of the test-administration, rules for participation in each skill and scoring Director were clearly determined.

2.4 Statistical Analysis

Descriptive statistics will be used for obtaining Mean, Median, Mode, S.D. the percentile method 18 was used to prepare the norms.

2.5 Data Analysis

Data collected was processed through a series of statistical analysis; the results of step wise data analysis have been presented in this chapter. Further the result where discussed and justified with sound reasoning. From the tests conducted on the subjects, the raw data collected was converted into the norms. The raw data was converted into standard scores for the combining or comparing scores**.** After the data was collected the statistical analysis of data was done in accordance with the purpose of the study. Data obtained from 980handball players participating in the Inter College Handball Tournament, conducted by Parul University was subjected to descriptive analysis. The percentile norms provided a basis for interpreting an individual's score in terms of the standing in group. Percentile scale was considered as appropriate scale. The Percentile method was used to create norms. The following statistical procedures were followed.

3. RESULTS

3.1 Reliability and Objectivity of the selected test

The reliability of the test items has been computed by calculating coefficient of correlation with test retest method. The objectivity of the test has been computed by calculating coefficient of correlation with the test score of first test scores of first recorder and second recorder in each test.

TABLE 3
RELIABILITY AND OBJECTIVITY OF THE TEST

S. No.	Test Item	Reliability Coefficient	Objectivity Coefficient
1	Height	1	1
2	Weight	1	1
3	12Min Run/Walk	0.97	0.98
4	50 meter dash	0.97	0.93 to 0.96
5	Shuttle run	0.93	0.97
6	Vertical Jump	0.97	0.97
7	Sit & Reach	0.96	0.97 to 0.99
8	Standing Broad Jump	0.98	0.95
9	Sit ups	0.92	0.95
10	Push ups	0.99	0.97 to 0.99
11	Right Handgrip Strength Test	0.97	0.96 to 0.99
12	Front shoot	0.92	0.91 to 0.93
13	Accuracy Throw	0.93	0.93 to 0.95
14	Speed Pass	0.96	0.94 to 0.96
15	Agility Dribbling	0.91	0.92 to 0.96
16	Foot Work	0.93	0.91 to 0.93

Validity: The above test-items were further established to be incorporated in the test, after going through various related research, taking opinions of various experts in the area of Physical Education and field of handball. This, in actuality, guaranteed the content validity of the tests.

Reliability of the testers: To have greater correctness in data collection the assistance that helped the researcher were tester who are professionally qualified and technically experts. They were given training for data collection and the tester reliability was checked. The reliability of the testers was calculated from ranging from0.77 to 0.96.

3.2 Norms of Handball Players

TABLE 4
CONSOLIDATED CHART OF NORMS FOR PHYSICAL FITNESS VARIABLES OF INTER COLLEGE HANDBALL PLAYERS

S. No	Percentiles	12 min Run & Walk	50 m Dash	Shuttle Run	Vertical Jump	Standing Broad Jump	Sit & Reach	Sit Ups	Push Ups	Grip Strength
1	4	1650	8.65	13.45	24	1.25	16	16	17	30
2	11	1700	8.17	12.98	28	1.34	20	20	21	32
3	14	1765	8.00	12.34	31	1.45	21	23	24	34
4	21	1836	7.87	12.13	33	1.54	23	24	25	36
5	25	1890	7.70	11.95	34	1.57	24	26	26	37
6	30	1940	7.63	11.77	36	1.65	26	28	28	38
7	35	1985	7.49	11.57	38	1.67	28	29	30	40
8	40	2060	7.40	11.45	40	1.69	29	31	32	41
9	45	2110	7.32	11.25	42	1.73	31	33	33	42
10	50	2165	7.22	11.09	43	1.76	33	34	34	43

Table 4 (Continued)

S. No	Percentiles	12 min Run & Walk	50 m Dash	Shuttle Run	Vertical Jump	Standing Broad Jump	Sit & Reach	Sit Ups	Push Ups	Grip Strength
11	55	2230	7.15	10.96	44	1.8	34	35	36	44
12	60	2280	7.05	10.83	45	1.85	35	37	37	45
13	65	2325	6.98	10.57	47	1.88	36	40	39	46
14	70	2358	6.89	10.44	48	1.92	37	42	40	47
15	75	2420	6.89	10.31	49	1.96	40	43	42	48
16	81	2450	6.70	10.06	52	2.03	42	44	43	51
17	86	2564	6.50	10.01	54	2.1	44	46	45	54
18	90	2694	6.37	9.83	56	2.177	45	49	46	56
19	95	2855	6.30	9.58	58	2.33	58	54	48	58
20	99	3000	6.2	9.45	61	2.45	48	57	51	67

TABLE 5
CONSOLIDATED CHART OF NORMS FOR SKILL VARIABLES OF INTER COLLEGE HANDBALL PLAYERS

Sr. No	Percentiles	Front Shoot	Accuracy Throw	Speed Pass	Agility Dribbling	Footwork
1	4	9	9	21	6.80	13
2	11	11	11	22	6.25	13
3	15	12	12	23	5.89	14
4	21	13	12	24	5.71	14
5	26	13	13	25	5.44	15
6	30	14	13	26	5.34	15
7	35	14	14	26	5.23	15
8	40	15	15	27	5.10	16
9	45	15	15	28	5.00	16
10	50	16	16	29	4.89	17
11	55	16	16	30	4.85	17
12	60	17	17	31	4.76	17
13	65	18	17	32	4.67	18
14	71	18	17.1	32	4.56	18
15	76	19	18	33	4.43	18
16	80	20	19	34	4.34	19
17	85	21	19	35	4.28	19
18	90	23	21	36	4.22	19
19	95	24	22	38	4.15	20
20	99	28	23	46	4.10	21

TABLE 6
GRADING SCALE ON ITEM-WISE PERFORMANCE FOR SELECTION OF INTER COLLEGE HANDBALL PLAYERS

Variables	Test-Items	Poor	Fair	Average	Good	Excellent
Physical Fitness	12min R/W	1835 below	1838 to 2066	2060 to 2282	2281 to 2450	2450 above
	50 meter Dash	7.86 above	7.86 to 7.40	7.39 to 7.05	7.04 to 6.70	6.68 below
	Shuttle Run	12.11 above	12.12 to 1.45	11.44 to10.83	10.82 to 10.06	10.4 below
	Vertical Jump	34 below	34 to 40	41 to 45	46 to 52	53 above
	S.B.J	1.56 below	1.55 to 1.69	1.70 to 1.85	1.86 to 2.03	2.02 above
	Sit and Rich	20 below	22to 27	28 to 34	35 to 40	41 above
	Sit Ups	22 below	24 to 29	30 to 35	36 to 44	45 above
	Push Ups	25 below	26 to 32	33 to 37	38 to 43	43 above
	Grip Strength	36 below	36 to 41	42 to 45	46 to 51	52 above
Skill Test	Front shoot	12 below	13 to 15	16 to 17	18 to 20	20 above
	Accuracy throw	12 below	13 to 15	16 to 17	18 to 19	21 above
	Speed Pass	24 below	25 to 27	28 to 31	32 to 34	35 above
	Agility Dribbling	5.71 above	5.70 to 5.10	5.09 to 4.76	4.75 to 4.34	4.31 above
	Foot work	14 below	15 to 16	17 to 18	19	20.01 above

The percentile norms, presented above, were further substantiated to find out the performance in the tests in favour of selection of Handball players. In fact, a percentile score indicates the percent of individuals who fall below a specific score, whereas the grading signifies the performance ability within a range of score. In fact, the grading followed by percentile method was derived for the subjects in each item using Criterion-Referenced Grading, percentage correct method the derivation of grade in the test-item has been presented in table- V (5) In the grading table the performance of the players was graded into 5 groups (excellent, very good, good, average and poor) using the five point scale.

4. DISCUSSION

4.1 Norms

Percentile scales for all the test items for male senior handball players constructed. Percentile scale seems to be appropriate because the heights performance in skill test receives the maximum scores whereas the lowest performance in the test items receives a score of 0 this type of scale is only suitable for the sample selected as in

Future as excellent player may exhibit better performance than the maximum performance of the scale in comparison to the given sample. In that case, still the performance will be given the maximum score. This seems to be the drawback in the percentile scale as this is only suitable for given group and it does not take any consideration for any performance i.e. either good or bad in feature.

4.2 Grading

Keeping the drawbacks of percentile scale in mind, it was thought appropriate to construct grading scales. This scale was appropriate for all the test items as a specific

performance got a specific grade. It was thought appropriate to categories players into five categories i.e. excellent, very good, good, average and poor. Keeping the educational reforms in mind, there is a tend to award grades rather than the score in order to reduce stress and anxiety among the Players Thus, grading under normal distribution yielded a suitable scale.

4.3 Status

The status of the player clearly indicates the lack of player's fitness and their skill level being nominal even when the players are playing at state level. Only 20 to 30 percent of players are found to be in the excellent category which is appalling aspect of the players and should be taken into consideration while planning training schedules for players. The percentage of players in the poor and average category is a reason to worry as they form a large chunk of the total population of players and this is one major reason for teams not being successful. Status indicates that there is a need for using the norms for evaluation and assessing process which could bring in improvement in the players and the team.

5. CONCLUSIONS

1. The performance variables for inter College handball players are morphological, physical Fitness and skill. Performance variables of handball player
2. The morphological performance variables are standing height, body weight, and Waist hip ratio performance variables of handball player.
3. The physical fitness performance variables are 12 min run/walk, 50 meters run, shuttle run, standing broad jump sit and reach , vertical jump, sit ups, push ups and hand grip strength Morphological performance variables of handball player.
4. The skill performance variables are front shoot, accuracy throw, speed pass, agility dribbling, and footwork. Skill physical fitness performance variables of handball player
5. The Norms are developed for the selected performance variable (i.e. Physical Fitness and Skill only). Norms for the Inter College handball players, Parul University
6. The norms can be used as criteria for selection of Inter College Handball Players from Parul university team.
7. The handball players graded as poor, fair, average, good and excellent.
8. Shows grading for the Inter College handball players.
9. The status of handball players has been found using develops norms and status has been contagious in to five groups. The physical fitness and skill status of inter college Handball player Parul University

6. RECOMMENDATIONS

1. Handball coaches and P.E teacher's can use the criterion available from the norms developed for assessment and appraise the players.
2. Training of the players can be evaluated and their improvement can be checked time to time.
3. Pointer from testing and evaluation can help coaches to know the status of the Player which will help to plan training accordingly.
4. The norms can be used as measurement means to know the efficiency of Players.
5. The selection process could become plainer and clear as crystal.

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EFFECT OF FUNCTIONAL TRAINING ON PERFORMANCE OF FEMALE GYMNASTS ON UNEVEN BARS

Dr.Shonan Padte[1] & Prof.Vasanthi Kadhiravan[2]

AFFILIATIONS

1. Assistant Professor, Department of Physical Education, University of Mumbai, Mumbai-98, 7710990760
2. Professor, Department of Physical Education, University of Mumbai, Mumbai-98, 9869441123

ABSTRACT

The study was conducted in order to find out the effect of functional training on performance of female gymnasts on uneven bars, 15 sub –elite and elite gymnasts were randomly selected for the study. In place of their regular conditioning exercises the gymnasts were asked to replace it with functional training exercises prepared by the researcher for a period of 16 week, 5 days a week, during the evening sessions for 90 minutes. A pre and post-test were conducted using the standard evaluation of routines prescribed by the federation international gymnastics. The data of the pre and post-test were statistically analysed using the paired 't' test and the study showed a significant difference at a level of 0.05. It can thus be concluded that functional training improves the performance of female gymnasts on uneven bars. It can also be applied for improving performance of gymnasts on other apparatus and can have an extended application to training sportsmen for other sports and games as well.

Keyword: Training, Female Gymnasts, Uneven Bars, Performance, Elite, Sub-elite

1. INTRODUCTION

Gymnastics is said to be the mother of all sports, as it involves the big muscle activity as well as the gross and fine motor skills **(Padte and Vasanthi, 2016).** It is a complete package of health and skill related physical fitness components. It is also a sport that has an ancient origin tracing back to the Greek and Roman civilization, where the sports was used to showcase strength and later used to train the military for battle. Since then the game has been developing and finally paving its way into the Olympic Games. Initially there was just one discipline namely Artistic Gymnastics that was introduced to the sport. Gradually it has developed into an umbrella sheltering as many as 6 disciplines both for men and women. With the development of technology there have also been amendments in the designing of the apparatus on which the gymnasts perform, also the world witness tremendous developments with regards to skill difficulty performed by gymnasts all over the world. In the present day a number of training methods and patterns are being developed in order to ensure maximum performance of a gymnast. All the trainings have been combined or mixed in order to get the required benefits. All trainings are a combination of various exercises and no pure form of training has been successful in training gymnasts to their full potential. Coaches all over the world have been developing and trying various forms of training methods and programmes to develop long lasting and efficient gymnasts for a world standard. In India too, there are many ongoing efforts to develop world class gymnasts by modifying and adapting various ready programs of training or by hiring international experts to train Indian gymnasts. Currently the fitness industry is flooded with a humongous variety of training the more closely related training as the functional and the mobility training came into limelight(**Padte and Vasanthi (2020).** Uneven bars is an event for women in the artistic gymnastics discipline. This event comprises of two bars of varying heights from the surface with a distance not exceeding 180 centimetres as mentioned in the Code of Points (2017-2020). This event is overshadowed by lots of swing, flight and circular movements with only the hands of the gymnasts in contact with the apparatus. This demanding momentum, precision, arm strength, judgement and speed control. As gymnastics is a sport that has high amount of skill involvement in a variety of planes and axis's thus, comprising of a large variety of functions such as hinge, push, and pull. The researcher induced functional training with regards to uneven bar event to maintain and enhance the movements of the gymnasts with regards to the particular event. The study was conducted to find out the effect of functional training on performance of female gymnasts on uneven bars.

Purpose of the study was to investigate the effect of functional training on performance of female gymnasts on uneven bars. It was also hypothesized that there will be a significant improvement in the performance of female gymnasts on uneven bars due to functional training.

2. METHODOLOGY

2.1 Selection of Subjects

Fifteen female gymnasts were randomly selected as subjects from the age group 11 to 16 years from ShahjiRaje Krida Sankul, Andheri Sports Complex, Mumbai Suburban. The selected fifteen subjects formed a single experimental group**. (Padte and Vasanthi , 2019)** A pre and post-test on performance of uneven bars routine was conducted using the standardized scoring used by the federation international gymnastics (FIG) on the subjects mentioned in the code of points.

2.2 Training Programme

By the application of the scoring norms the pre and post-test data was collected. The skill selected for evaluation was uneven bars routine. The routine comprised the following skills taken

from the Women Artistic Code of Points (2017-2020) Glide Kip, Cast to handstand, Clear hip circle, Underswing on low bar with counter movement forward in flight to hang on High Bar, Glide kip on High bar Giant circle backward in regular grip and swing forward to salto backward stretched (Dismount) **(Code of Points, 2017-2020).** After the pre-test was conducted the treatment of functional training was applied for a period of 16 weeks, 5 days a week in the evening training session. The duration of the training was 90 minutes. The session involved the warm up, stretching and treatment exercises and cool down **(Padte and Vasanthi, 2020).** The variable that was trained during this session was performance of routine on uneven bars.

2.3 Research Design

Single group experimental design was designed for this study. The routine for evaluation was designed by the researcher keeping in mind the safety of the subjects.

2.4 Statistical analysis

To fin out the effect **of** functional training on performance of female gymnasts on uneven bars, mean, SD, and t- test was applied.

3. RESULTS

The data obtained during the pre and post-test was analysed by using statistical procedure of paired 't' test and data pertaining to this, has been presented in Table 1 and depicted in figure 1.

TABLE 1

SIGNIFICANCE OF DIFFERENCE BETWEEN PRE TEST AND POST TEST MEAN ON UNEVEN BARS PERFORMANCE OF FEMALE GYMNASTS DUE TO FUNCTIONAL TRAINING

Group	N	Mean	MD	σ DM	t-rato
Pre Test	15	3.30	4.11	0.622	6.21
Post Test	15	7.41			

* Significant at .05 level

t .05 (28)=2.05

It is quite obvious from the Table 1, that performance of female gymnasts differ significantly between pre and post-test mean scores on uneven bars, as the obtained t-value of 6.21 was higher than the required t .05 (28) = 2.05.

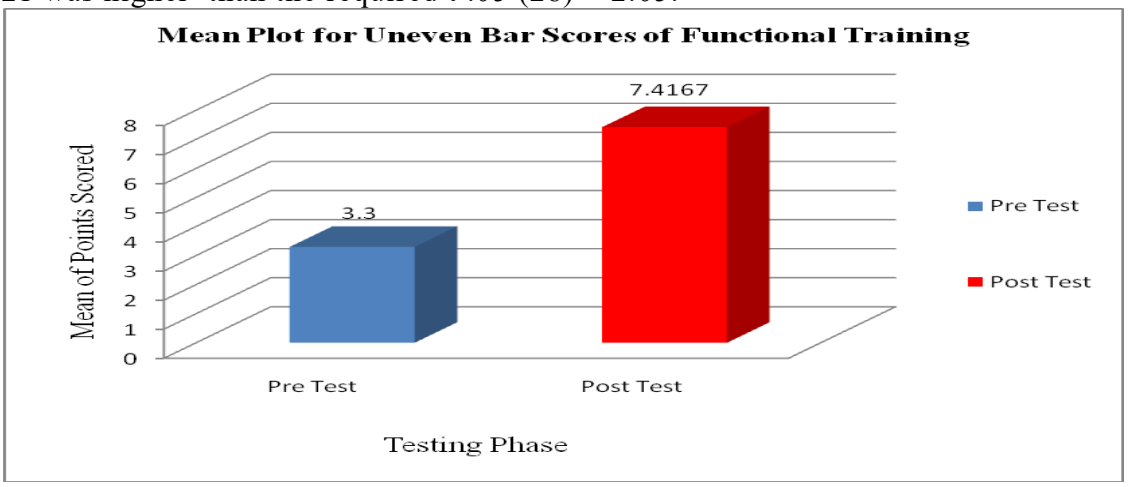

Figure-1: Performance Mean Scores between Pre and Post-test **on Uneven Bar of Female Gymnast as a Result of Functional Training**

From the above graphical presentation it is interpreted that the gymnasts have shown a significant improvement in their performance on uneven bars due to functional training. Hence, H_1 – There will be a significant improvement in the performance of female gymnasts on uneven bars is accepted. It indicates that the selected subjects have benefited from the functional training programme.

4. DISCUSSION

From the above analysis and interpretation of the data, the following findings may be drawn-Functional training programme contributes significantly towards uneven bars performance. As seen in the pre-test scores obtained by the application of evaluation procedure is score is lower than that of the post-test. Thus showing significant improvement in the performance of female gymnasts on uneven bars due to functional training by increasing the total score.

5. CONCLUSION

From the statistical analysis it has been concluded that there has been a significant improvement in the performance of female gymnasts on uneven bars due to functional training.

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EFFICACY OF CUSTOMIZED FOOT INSOLES IN ATHLETES WITH PATELLOFEMORAL PAIN SYNDROME AND PRONATED FEET

Surbhi Nandal[1] and Yashika Kumar[2]

AFFILIATIONS

[1] Student, Master of Prosthetics and Orthotics, ISIC – Institute of Rehabilitation Sciences, VasantKunj, New Delhi 110070 Mobile Number: 9034766462 surbhinandal88@gmail.com

[2] Assistant Professor (P&O), Master of Prosthetics and Orthotics, ISIC–Institute of Rehabilitation Sciences,VasantKunj, New Delhi 110070 yashikakumar28@gmail.com

Corresponding Author: Surbhi Nandal Email Address: surbhinandal88@gmail.com

ABSTRACT

PFPS is one of the most common musculoskeletal conditions and usually higher prevalent in active adolescents or subjects with intense sports activity and the literature reflects excessive pronation of the foot is linked to knee pain. Foot orthoses are designed to allow the foot to move through the usual pronation range and to prevent excessive pronation, as well as to minimize excessive tibial and femoral internal rotation which can lead to unusual patellofemoral tracking.45 athletes of age 20-30 years with anterior knee pain and proanted feet participated in the study which was a pre-test post-test experimental study design, knee pain was evaluated by a visual analog scale. Both static and dynamic balance was evaluated using MINIBest test and energy consumption was evaluated by using PCI test. Paired t-test was used to compare the difference in VAS, static and dynamic balance with MINIBest and energy consumption with PCI for pre-test and post-test. There was a significant difference in pain with ($p<0.000$), improvement in both static and dynamic balance with ($p<0.000$) and improvement in energy consumption with ($p>0.000$). This study provides evidence that customized foot insoles reduce pain and improve balance and energy consumption among athletes with knee pain and proanted feet.

Keywords: Patellofemoral Pain Syndrome, Pronated foot, Balance, Energy consumption and Foot Orthoses

1. INTRODUCTION

Patellofemoral pain (PFP) arising from the anterior knee, is one of the most common musculoskeletal condition.**(Negahban et al., 2013)** It usually represents a major problem especially in active adolescents or young adults or subjects with intense sports activity **(Munuera and Mazoteras-Pardo, 2011).** Prospective longitudinal studies have shown the presence of chronic PFP in active populations **(Collins, Crossley and Darnell, 2010).** It accounts for 25% of all knee injuries treated in sports activity **(Roush and Bay, 2012).** It is caused by imbalances in the forces regulating patellar tracking during knee flexion and extension, particularly with joint overloading **(Dixit et al., 2007) .**The precise pathogenesis of PFPS remains poorly understood, there are several factors may create a predisposition such as soft- tissue tightness, muscle weakness, excessive exercise and the lower extremity malalignment as excessive pronation that lead to increased cartilage and subchondral bone stress **(Fredericson and Yoon, 2006).** According to the existing evidences, it has been shown that PFPS has a higher correlation with excessive pronation of foot **(Eng and Pierrynowski, 1994).** The association between excessive pronation of the foot and patellofemoral pain is based on critical link- rotation of tibia **(Cheung, Ng and Chen, 2006).** Pronated feet are excessive compensatory pronation of the subtalar joint during weight-bearing activities, impair foot stability and thus affect patellofemoral pain **(Ashford RL, 2009).** Prevalence of pes planus and anterior knee pain in general recruits population is 4%, but it is more significant in moderate and severe pes planus, that is, 7% **(Kosashvili et al., 2008).**

There is no single diagnostic test for PFPS, so it is based on the cluster of objective findings from several physical examinations. One of them is Patellar compression test which is performed when the patient is supine with knees extended. If pain results, the test is considered positive **(Fredericson and Yoon, 2006).** Individuals with clinically diagnosed patellofemoral knee pain with pes planus experience impaired balance, increased oxygen consumption and pain during their physical activities **(Negahban et al., 2013), (Shih, Wen and Chen, 2011),(Pandey and Tyagi, 2011).**

Repetitive overloading of patellofemoral contact points lead to irritation, inflammation or impingement of peripatellar soft tissues (the infrapatellar pad, patellar retinacula, and peripatellar plica) that contribute to pain. One of the main symptoms of patients with various musculoskeletal conditions is increased fatigability accompanied by muscle weakness. Knee extensor (quadriceps) weakness has been considered as a major component factor in the development of PFPS. VAS scale, Physiological cost index, Mini- BESTest and Patellar compression test will be used as they are found to be valid and more reliable**.(Fredericson and Yoon, 2006), (Chesworth et al., 1989), (Sakunkaruna, Sakunkaruna and Sakulsriprasert, 2015)**

Different treatment modalities are used to treat the anterior knee pain as physical rehabilitation, taping, foot orthotics and patellar braces **(Gaitonde, Ericksen and Robbins, 2019).** Some studies have shown that foot orthotics are about 70%-80% effective in controlling the symptoms and recurrence of problems in runners **(Eng, 1993).** Foot orthoses are designed to allow the foot to move through the normal range of pronation and limit excessive pronation, as well as reduce the excessive tibial and femoral internal rotation that may lead to abnormal patellofemoral tracking **(Johnston and Gross, 2004).**

Foot orthoses have been also reported to enhance balance or stabilization in knee pain with, pronated foot **(Fredericson and Yoon, 2006)**. By using of appropriate foot orthotic, it can decrease the volume of oxygen consumption during running **(Pandey and Tyagi, 2011).**

An arch support is described which is intended to relieve the discomfort resulting from the condition commonly referred to as flat feet caused essentially by the inward rotation of certain foot bones principally, the calcaneus, the talus and the navicular accompanied by the "flattening" of the longitudinal arch of the foot **(Folson, 1960).**

As we found in different studies that foot insoles with medial heel post and wedges are effective in controlling the foot pronation and help in relieving in pain with PFPS, but lack of evidence with balance and energy consumption enhancement and also there is need for research with medial arch support customized foot insoles in athletes. This study will help to improve the design and enhance the performance in athletes as use of customized foot insoles with closed cell foam rubber (MCR) as it is more shock

absorbing and prescription for improving balance, decreased energy consumption and reducing pain in PFPS individuals.

2. MATERIALS AND METHODS

2.1 Selection of Subjects

A sample size of 45 athletes was chosen for the study to detect a difference of 10.2 point (Ref) on pain VAS scale in knee pain with 5% significance level, 5% precision & 16 point standard deviation. Sample size includes 10% drop out rate. Athletes between 20 to 30 years of age were selected for the study.

2.2 Inclusion and Exclusion Criteria

Subjects with knee pain from at least 2 months, Subject having bilateral pronated feet, Navicular foot drop index is greater than 10 mm, Patellar compression test should be positive, VAS score- 3 to 7(mild to moderate). Subject having no history for the use of foot orthotic, Subjects who are not visually and hearing deficit, BMI range between 18– 25.

2.3 Procedure

This was an experimental study using the pre test post-test study design. It was conducted at Indian spinal Injuries Centre, New Delhi after getting the approval from institutional Ethical Committee. The subjects were chosen through convenient sampling technique. The subjects in the experimental group were instructed to wear the foot orthoses while standing and walking during the intervention period. Pre intervention data of the experimental group collected for pain, balance, and energy consumption using VAS scale, MINIBest, PCI respectively. Similarly, post-intervention data were collected after a two-week intervention period.

2.4 Statistical Technique

Data was analyzed with the help of statistical package for social sciences (SPSS) 21 version. Paired t- test was applied to check the difference between pre and post readings of pain, balance and energy consumption. A significant level of $P < 0.05$ was fixed.

3. RESULT

A total of 45 athletes with patellofemoral pain syndrome and pronated feet as per the eligibility criteria participated in this study. The descriptive statistics of the demographic data has been given in the table 1. It shows the descriptive data of mean age, Height, Weight and BMI. The mean and S.D value age of the entire population was 24.16 ± 2.58, mean and S.D values of Height 167.73±7.56, mean and S.D values of weight 62.80±7.26, mean and S.D value of BMI 22.25±1.15.

TABLE – 1
DESCRIPTIVE DATA OF MEAN AGE, HEIGHT, WEIGHT AND BMI

Subject Characteristics	Subject	t- value	p- value
	Mean± S.D		
Age	24.16±2.58	62.69*	0.00
Height	167.73±7.56	146.97*	0.00
Weight	62.80±7.26	58.02*	0.00
BMI	22.25±1.15	129.61*	0.00

*Significant at 0.05 level

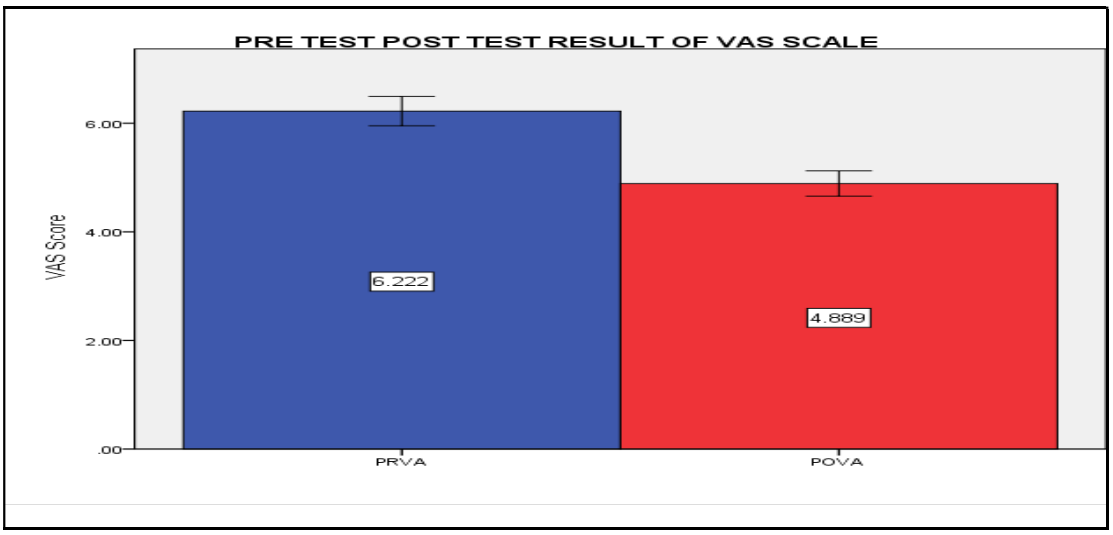
TABLE 2
PRE TEST & POST TEST VALUES OF VAS, MINIBEST, PCI

	Pre-Mean±S.D	Post-Mean±S.D	t-value	p-value
VAS	6.25±0.89	4.91±0.77	13.079*	0.00
MINIBEST	21.93±1.81	24.11±2.08	7.310*	0.00
PCI	0.08±0.02	0.06±0.02	10.148*	0.00

VAS Visual Analog Scale, PCI Physiological Cost Index* Significant at 0.05 level

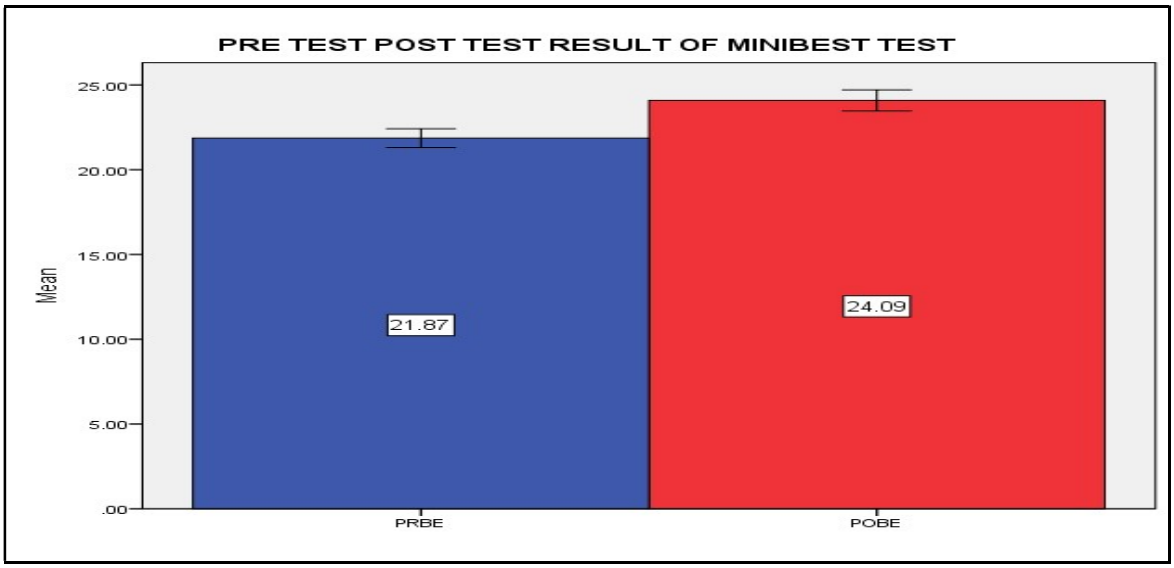
It shows the comparison of pre and post values of mean and S.D with their respective t-value and p-value. (Table2). A significant improvement in post- intervention pain score mean=4.91±0.77 as compared to pre- intervention score 6.25±0.89 which indicates significant reduction in pain. (Figure 1)

FIGURE 1



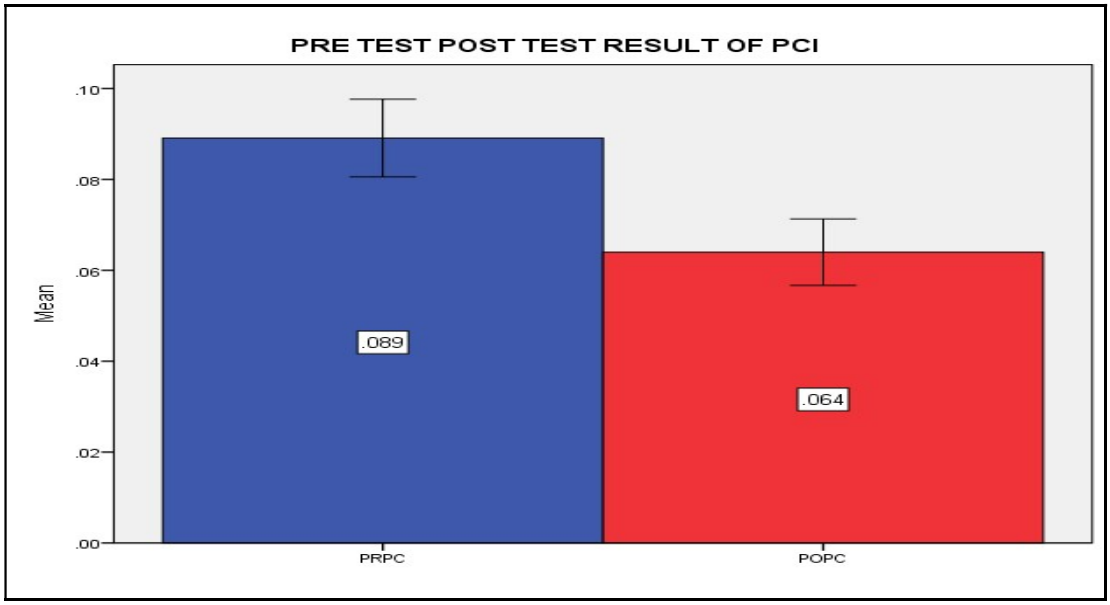
Significant improvement in post- intervention static and dynamic balance score mean = 24.11±2.08, as compared to pre intervention score= 21.93±1.81 which indicates significant improvement in balance (Figure 2)

FIGURE 2



Significant reduction in post- intervention energy consumption mean score= 0.06±0.02, as compared to pre intervention score mean= 0.08±0.02 which indicates significant reduction in energy consumption in athletes. (Figure 3)

FIGURE 3



4. DISCUSSION

On the basis of obtained results, it has been revealed that subjects with knee pain and pronated foot were benefited from orthotic intervention of customized foot insoles with a significant improvement in post- intervention score of pain, balance and energy consumption. This research integrated multiple orthotic interventions, that have well established beneficial effects as shown by previous literature evidence and it further assessed the efficacy of these custom-molded orthoses on their impact on PFPS athletes. These findings have been consistent with that M. Akbari et al on the impact of soft and rigid foot orthoses on dynamic balance in flatfoot females (Akbari, Mohammadi, and Saeedi, 2007) and Y. Shih et al stated that the medium-wedged rearfoot insole was a useful intervention to avoid or minimize painful knee or foot symptoms when running in pronounced runners **(Shih, Wen and Chen, 2011)**. Similar study done by F. Farmani showed the effect of foot orthoses on energy consumption in runners with flat foot **(Collins *et al.*, 2009).** This study aimed at assessing the effects of Foot orthosis on Energy consumption The findings of the study suggest that customized foot insoles is effecting in reducing pain thereby functional disability and improving static as well as dynamic balance and also reducing energy consumption in subjects with anterior knee pain and pronated foot. In addition, the use of foam materials increased the ability to withstand shock and further reduced pain and discomfort.

5. CONCLUSION

The significant improvement in parameters leads to an increase in the overall efficiency of athletes in terms of their performance and quality of life, and makes it easy for them to perform their sports activities. This study provides preliminary evidence that customized foot insoles reduce pain and improves balance and energy consumption among athletes and it can be concluded foot insoles can be prescribed for patients with anterior knee pain and pronated foot.

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EFFECT OF FIFA 11+ AND FIFA 11 INJURY PREVENTION PROGRAM VS GENERAL WARM-UP ON PHYSICAL PERFORMANCE AND INJURY RATE IN ATHLETIC POPULATION: A SYSTEMATIC REVIEW AND META- ANALYSIS

O. Banduni [1], G. Vishwakarma [2] *, S. Sharma [3], P. Singh[4] and H.S. Chabbra[5]

Affiliations:

1. Physiotherapist, Indian Spinal Injuries Centre Institute of Rehabilitation Sciences, New Delhi, India.
2. Head-Biostatistics, Indian Spinal Injuries Centre, Sector-C, Vasant Kunj, New Delhi- 110070, India Email: hod.biostatistics@isiconline.org Ph. No: (+91) 011-42255441
3. Dean, Indian Spinal Injuries Centre Institute of Rehabilitation Sciences, New Delhi, India.
4. Assistant Professor, Indian Spinal Injuries Centre Institute of Rehabilitation Sciences, New Delhi, India
5. Chief of Spine Services & Medical Director, Indian Spinal Injuries Centre, New Delhi, India.

***Corresponding Author**

ABSTRACT

Background: The definition of specificity of exercise components alter significantly in the literature. Therefore, aim of this systematic review with meta-analysis is to investigate the potency of sports specific and general warm-up program in preventing injury and enhancing physical performance in athletes. Method: A computerized search was conducted for eligible studies using the following databases: Cochrane Central Register of Controlled Trials, PubMed Central, Google Scholar and Science Direct from Dec 2008- Jan 2019. A protocol in accordance with PRISMA was registered in PROSPERO (CRD42019119030). Results: The pooled results were based on total injuries per 1000h of exposure involve the FIFA 11+ and FIFA 11. Statistically significant reduction in overall injury risk ratio [IRR] of 0.59 (95% CI: 0.39 to 0.88; P=0.01) found if FIFA11+ and FIFA 11 is used as warm up exercise. Physical performance parameters such as agility (MD = −0.60; 95% CI: (-1.17) – (-0.03); p=0.04) and 20m sprint (MD = −0.27; 95% CI: –0.47 to –0.07; P=0.007) also showed significant improvement. There was statistically significant reduction found in region specific lower extremity for knee (IRR=0.47), for ankle (IRR=0.62), and for hip/groin (IRR=0.57) for FIFA 11+ and FIFA 11. Conclusion: This systematic review & meta-analysis demonstrates that FIFA 11+ and FIFA 11 injury prevention program decreases the overall risk of injury and improve athlete performance parameters such as agility and 20m sprint.

Keywords: FIFA, FIFA, Warm-up, Performance, Injury, Athletes, Injury Prevention Training.

1. INTRODUCTION

Warm-up is mentioned as the muscles action which is carried out before a higher muscular demand and any high-intensity competition or recreational events. It traditionally requires general and specific warm-up (WU) exercises. One of the important focuses of WU is to improve performance with increase in muscle temperature, by decreasing the muscle's viscous resistance (i.e. smoother contraction), and improving the speed of nerve transmission **(Andrade, et. al., 2015).** Therefore, the ideal warm-up restrict fatigue as far as possible while increasing performance and should permit the athlete to accomplish an optimum muscle temperature range **(Racinais & Oksa, 2010).**

Traditionally there are two types of warm-up exercises, general WU – comprises a low-intensity aerobic component (e.g. sub maximal running) with some stretching exercises and comprehensive warm-up programmes – enhances the strength, awareness and neuromuscular control throughout the time of static and dynamic movements. These exercises have been shown in literature to reduce the likelihood of lower extremity injury **(Soligard, et.al., 2008).**

Since 2004, FIFA has concentrated on injury prevention by commencing FIFA Medical Assessment and Research Centre (F-MARC) prevention programmes, known as the FIFA injury prevention programmes, and evaluated their effects on football injury rates. F-MARC in collaboration with the Oslo Sports Trauma and Research Centre and the Santa Monica Orthopaedics and Sports Medicine Centre, developed, FIFA 11+ injury prevention programme for soccer players in 2006 **(Daneshjoo, et.al., 2013).**

The 'FIFA11+' programme is split up into three parts which consists of total of 15 exercises. These exercises should be performed in a specified sequence at the beginning of each training session. The key to the programme is proper technique which consist sequence of three parts **(Daneshjoo, et.al., 2013).**

FIFA has developed two different form of such programmes FIFA 11 and FIFA 11+ injury prevention programme. The FIFA 11+ is an updated form of the original FIFA 11 prevention programme. The goal of the programmes is to enhance strength, balance and jumping/landing ability that can lead to injury reduction **(Bizzini and Devork, 2015) .**

Some studies **(Bizzini et al, 2013; Daneshjoo, Mokhtar, Rahnama, and Yusof, 2013)** have showed that the use of FIFA 11+ programme can ameliorate the physical performance (e.g., vertical jump height), suggesting that performance enhancement might be feasible with this programme. Although, these outcomes have not been observed by other authors **(Impellizzeri et al, 2013; Steffen et al, 2013).**

The definition of specificity of exercise components alter significantly in the literature. Majority of the studies defined their injury prevention program as sports specific when they actually involve the components that develop the general physical abilities e.g. balance, core stability, and power.

Regardless of knowing about the advantage of sports specific injury prevention program, coaches and athletes favour more specialized instead of generalized exercise programs. It is difficult to mention this if available evidence justifies the common athlete and coach's consensus on sports specific injury prevention program being more effective in reducing injury rates while enhancing the performance.

In addition, to the best of our knowledge, no meta-analysis on the effects of FIFA 11 and FIFA 11+ vs general warm-up on performance among athletic population has been published to date. Therefore aim of this systematic review with meta-analysis is to investigate the potency of

sports specific and general warm-up program in preventing injury and enhancing physical performance in athletes.

2. METHODOLOGY

This systematic review is based on the guidelines of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA). A protocol was registered in the International Prospective Register of Systematic Reviews, PROSPERO (CRD42019119030).

2.1 Search Strategy

A methodical literature search covering the period from December 2008 to January 2019 was performed using various electronic databases: Cochrane Central Register of Controlled Trials, PubMed Central, Google Scholar and Science Direct. Three expert investigators reviewed the searched articles for eligibility. The following keywords in combination with one another: FIFA 11+ AND FIFA 11 AND different warm-up AND physical performance AND athletes were used for searching the appropriate articles based on inclusion and exclusion criteria given below:

2.1.1 Inclusion Criteria

Studies that were done on athletes (soccer, rugby, basketball players) as an intervention (FIFA 11 and FIFA11+) with age more than or equal to 13 years. Studies containing comparison group/control group with general warm-up or other than FIFA 11 and FIFA11+ and contains at least one of the outcomes (agility, sprint, vertical jump, core, balance and overall injury rate). Studies that are intervention-based (cluster) RCTs, prospective cohort studies, or observational and are published in English language only.

2.1.2 Exclusion Criteria

Studies conducted on children below the age of 12 years and does not have any comparative group. Studies which involve FIFA 11+ kids warm-up program as an intervention. Systematic reviews were excluded if comparative group is not a general warm-up. Studies which include only stretching as a warm-up routine and was published in languages other than English.

2.2 Research question

Does administration of "FIFA 11 and FIFA 11+ Injury prevention program" in athletic population result in improved physical performance and injury rate as compared to general warm-up?

Population (P)	Does Athletic population improve their
Intervention (I)	FIFA 11 and FIFA 11+ Injury prevention program
Comparison (C)	General warm-up
Outcome (O)	physical performance and injury rate

2.3 Data Extraction and Outcome Parameters

Data extraction was done by two investigators. In case of disparity a third researcher was consulted. Relevant study information regarding author, year, number of participants, intervention (weeks, frequency, duration per session) and passive control condition were extracted and transferred to an excel spread sheet.

Key outcome variables for this research were measured for physical performance, which was either related with injury risk and/or have been suppose to be similar with sport-specific performance. The parameters indicating balance (sub-groups static and dynamic balance as well as dynamic stability), sprint ability (basic straight sprint performance, acceleration, and change-in-direction speed), vertical jump (sub categories a) squat jump i.e. defined as a jump that is performed from a squatting position using b) countermovement jump (a jump where the athlete starts in a standing position crouch down to a pre-set height and straight away jumps up from

that position) and Core muscle strength (the control and endurance of the back/core stabilizing muscle were analyzed. In addition, lower extremity injury rates (Region specific-hip/groin, knee and ankle) was also analyzed.

2.4 Risk of bias assessment in individual studies

The methodological quality of the included RCTs was rated using the PEDro scale. This scale comprises 11 dichotomous items (yes/no). Studies were rated by three reviewers independently. After completing the evaluation, reviewers came to a consensus on every item. The reviewers were not blinded to study authors, place of publication, and results.

In order to examine a potential publication bias, we performed a risk-of-bias related sensitivity analysis between "weak" (score 0 and 4 on PEDro scale) and "strong" (score 8 on PEDro scale) studies for all main outcome parameters.

2.5 Synthesis of Results

The summary measures used for the present study is presented in Table 1. We used pooled RR for dichotomous variables and pooled Mean Standard Difference (MSD) for continuous variable for summarizing the results. The Mantel-Haenszel random-effects model was selected for all analyse. For the primary and secondary analyses including all randomised studies using FIFA injury prevention programmes, the overall injury risk ration (IRR) and MSD for continuous variables with 95% Confidence Interval (CI) were evaluated as the relative effect size. In the secondary analyses on body region-specific injury rates, we only incorporated studies using the FIFA 11+ and FIFA 11 prevention programme. RR and 95% CI were estimated as the relative effect size using extracted and pooled injury data for the body regions (lower extremity): hip/groin, knee, and ankle and analysed in three separate analyses, one for each body region.

Rev Man 5.0 software was used to perform meta-analysis. A forest plot is presented to allow for visual comparisons among studies. The level of statistical heterogeneity for pooled data was established using the chi-square and I^2 statistics with $p<0.05$ indicating a significant heterogeneity.

3. RESULTS

The Four databases (Cochrane Central Register of Controlled Trials, Google Scholar, PubMed Central, and ScienceDirect) were searched, yielded 938 articles. After removal of duplicates, 878 articles were screened on the basis of the title and abstract and finally 21 studies included for this systematic review. Figure 1 provides a schematic representation of the systematic steps involved in screening articles using the PRISMA flow diagram method.

3.1 Study characteristics

Of the total 21 included articles, 19 investigated exercise performance in FIFA 11+ vs control groups, whereas the other two studies investigated injury prevention in FIFA 11 vs controls. Out of 21 studies 13 were randomized control trial (RCTs).

3.2 Risk of bias within studies

Publication bias is assessed using standard funnel plots. Table 2 shows the study quality and risk of bias assessment using PEDro. Total 13 RCT were rated for the current study.

3.3 Results of individual studies

Table 3 demonstrates the characteristics of the included studies such as sample size, study design, level of play, outcomes, and results. 21 studies included 3,707 participants out of which 2,000 in experimental group and 1,707 in control group. Figure 2 reveals the results of meta-analysis for injury incidence between FIPP vs GWP. The total number of subjects in FIPP group was 2435, whereas 2314 subjects were included in the general warm-up group. The RR was 0.59 (95% CI: 0.39 to 0.88), indicating a significant reduction of overall injury incidence in the FIPP group (P=0.01).

Figure 3 shows the meta-analysis of dynamic balance between the FIPP vs GWP groups. For this meta-analysis, six studies were included. The total number of subjects in the FIPP group was 100, whereas 99 subjects were included in GWP group. This analysis indicated a significant improvement in dynamic balance for general warm-up group (MD = 2.77; 95% CI: 1.11 to 4.43; P= 0.01).

Figure 4 depicts the meta-analysis of Static balance between the FIPP and GWP groups. For this meta-analysis, two studies were included. The total number of subjects in the FIPP group was 24, whereas 24 subjects were included in GWP group. This analysis indicated significant improvement in static balance for general warm-up group (MD = 9.68; 95% CI: 6.99 to 12.36; P < 0.001).

Figure 5 demonstrates the meta-analysis of agility between the FIPP and GWP groups. For this meta-analysis, seven studies were included. The total number of subjects in the FIPP group was 162, whereas 159 subjects were included in GWP group. Analysis of agility showed significant improvements with FIPP (MD = −0.60; 95% CI: -1.17 to -0.03; P = 0.04) over general warm-up group.

Figure 6 represents the forest plot of vertical jump height between the FIPP and GWP groups. For this meta-analysis, six studies were included. The total number of subjects in the FIPP group was 146, whereas 142 subjects were included in GWP group. This analysis indicated inconclusive results in vertical jump height for (MD = 1.02; 95% CI: -2.73 to 4.77; P = 0.59) comparing both the groups.

Figure 7 shows the meta-analysis of squat jump height between the FIPP and GWP groups. For this meta-analysis, four studies were included. The total number of subjects in FIPP group was 51, whereas 50 subjects were included in the general warm-up group. This analysis indicated inconclusive results in squat jump for (MD = 2.82; 95% CI: -1.62 to 7.27; P = 0.21) comparing both the groups.

Figure 8 shows the forest plot for the 10m running sprint between the FIPP and GWP groups. For this meta-analysis, three studies were included. The total number of subjects in the FIPP group was 30, whereas 32 subjects were included in GWP group. This analysis indicated inconclusive results in 10 m running sprint for (MD= −0.03; 95% CI: -0.20 to 0.14; P = 0.73).

Figure 9 is the meta-analysis of 20m running sprint between the FIPP and GWP groups. For this meta-analysis, five studies were included. The total number of subjects in the FIPP group was 71, whereas 72 subjects were included in GWP group. Analysis of 20m running sprint showed significant improvements with FIPP group (MD = −0.27; 95% CI: –0.47 to –0.07; P = 0.007) as compared to GWP group.

The total number of subjects in the FIPP group was 2022, whereas 1932 subjects were included in the GWP group (Figure 10(A)). The RR for lower extremity injury prevention (Knee) was observed 0.47 (95% CI: 0.37 to 0.61), indicating a significant reduction of risk of knee injury in FIPP group (P < 0.00001). The total number of subjects in the FIPP group was 2022, whereas 1932 subjects were included in GWP group (Figure 10 (B)). The RR for lower extremity injury prevention (Ankle) found to be was 0.62 (95% CI: 0.44 to 0.86), indicating a significant reduction of risk of ankle injury in FIPP group (P = 0.004). Figure 10(C) shows the meta-analysis of Lower extremity injury prevention (Hip/Groin) between FIPP and GWP groups. The total number of subjects in the FIPP group was 1810, whereas 1728 subjects were included in the general warm-up group. The RR was 0.57 (95% CI: 0.37 to 0.88), indicating a significant reduction of risk of hip/groin injury in FIPP group (P = 0.01) in comparison to GWP group.

Funnel plot based on study standard error (Figure 11A) and log risk ratio (Figure 11B) in assessing publication bias. Circles indicate study point estimates. There was no clear asymmetry was found and hence, this funnel plot demonstrates no significant publication bias.

4. DISCUSSION

In this systematic review and meta-analysis we found a statistically significant increase in agility and 20m sprint along with reduction in overall injury incidence among athletes in favour of FIPP compared with GWP group.

4.1 FIFA 11+ and FIFA11 effect on physical performance

Our study confirms that the intervention (FIFA 11+ and FIFA11) increased the performance for agility and 20 m running sprint. **Zein, et al. (2014)** determined the effectiveness for brief duration of FIFA 11+ training in improving physical fitness components influencing injury risks among youth futsal players and showed that there is significant increase in agility in EXP group in contrast to CON group. Along with increased core strength experienced by the EXP group (+36.18 seconds) which was clinically significant. Improvement in agility is important in reducing injury incidence as researches shows that repeated sprint with turn is accounted for 37% of the incidence of non-contact injuries in futsal sports. **Nawed, et. al. (2018)** investigated the effects of FIFA 11+ program on functional performance in soccer players and results indicated an improvement in vertical jump performance and sprint ability in amateur soccer players with p-values of 0.04 and 0.01 respectively following 12 weeks of engagement in the program. FIFA 11+ program exercises, such as vertical jump, box jump, one leg squat, bounding, and cutting, may be important contributors to enhancements in leg power, speed, and agility since such exercises can increase the strength, neuromuscular recruitment, and muscle coordination.

Daneshjoo, et. al, (2013) reported benefits (compared to traditional warm-up) in jumping height, 20m sprint time, and agility after practicing FIFA11+ in young adults. There was no significant differences was observed between the groups. **Impellizzeri, et. al. (2013)** did not find meaningful improvements in the sprint time (10 and 20 m), jumping height (countermovement jump), agility in adult players and the effects for jumps, sprint and agility were not statistically significant. A study by **Kilding, et. al. (2008)** also reported benefit in jumping height (3 step jump and CMJ) which increased significantly and 20m sprint time by 2% ($p < 0.01$) in preadolescent football players using FIPP.

Perhaps the population differences could be an explanation for this variation among the reported results. Conventional warm-ups may have similar characteristics to FIFA 11+. Therefore, despite incorporating the FIFA11+ into their regular training, FIFA 11+ was not stringent enough for adult soccer players to achieve a training impact and improve physical performance.

Study by **Palazon, et. al. (2016)** examined the acute and chronic effects of the FIFA 11+ on several physical performance measures and the results of sub-studies 1 reported no statistically significant differences ($p > 0.05$) between paired-comparisons (FIFA 11+ vs regular warm-up) for any physical performance measure. Whereas, for any physical performance measure in sub-study2, neither statistically significant differences ($p > 0.05$) nor clear standardized differences exist between interventions. **Ayala, et, al, (2017)** conducted a randomized crossover counterbalanced study to examine the acute (post-exercise) effects of the FIFA 11+, Harmoknee and dynamic warm-up routines on a number of physical performance measures in amateur football players reported remarkable main effects (likely effects with a probability of >75–99%) for 10(1.7%) and 20(2.4%) meter sprint times. These findings are not in

accordance with the results reported by **Bizzini, et. al. (2013)** found that the magnitude of the effects obtained by the FIFA 11+ on sprint times (2.2%) were parallel with those published in the literature for dynamic warm-up routines (1.8%). A potential reason for this variation may be allocated to the different research design used in each study. Bizzini et al carried out a meta-analysis in contrast to the effects elicited by the FIFA 11+ with other warm-up routines earlier published regarding football players, while Ayala et al directly compared the effects prompted by the FIFA 11+ with a football-related standard dynamic warm-up routine.

Silva, et. al. (2015) found that FIFA 11+ program carried out three times per week significantly enhanced the vertical jump variables in the intervention group (G11+ versus CG: CMJ = 11.39% versus 2.53% and SJ = 12.92% versus 1.27%) compared to CG, which continued the normal training routine. **Faude, et al. (2012)** evaluated the actions preceding a goal over half a season, observed that 58% of the goals converted by defenders occurred after a jump. In this respect, jumps, sprint ability and change in direction are extremely important in defensive situations when the athletes should react to an action of the opponent. Majority of the study mentioning the effect of FIFA 11 and FIFA 11+ on physical performance are of level II and level III evidence as per the NHMRC guidelines. These studies shows no significant improvement in physical parameters for FIFA 11 and FIFA 11+ group except in 20m sprint and agility which is similar to our findings for agility (p= 0.04) and 20 m sprint (p=0.07). In study by **Akbari, et. al. (2018)** and **Palazon, et. al. (2016)** no long term effects were reported after one month of conclusion of FIFA 11+ programme. This might be due to small sample size, sample frame, age distribution and their physical skill levels limit the generalizability of the results. Based on our results it is shown that FIFA 11 and FIFA 11+ programme can improve agility and 20m running sprint whereas for improving static balance and dynamic balance general warm-up has shown better results but not significant. However, some of the level IV evidence studies reported significant improvement in all the physical performance parameters. Results of these studies can be cautiously used by coaches and trainer in future for training purpose but more number of good quality evidence researches is required for implementation of FIFA11 and FIFA 11+ among athletic population.

4.2 FIFA11+ And FIFA 11 Effect On Injury Prevention

The effectiveness of the majority of the FIFA 11+ studies has shown that exercise-based warm-up program can reduce the prevalence of injuries in both male and female amateur football players. Our study also supports the findings and FIFA 11+ and FIFA11 can reduce 41% of risk of injury as compared to general warm-up. Generally, teams that executed the FIFA 11+ had 30% to 70% fewer injured players **(Soligard, et.al., 2008 & 2010; Stephen, et. al., 2013)**. Furthermore, high compliance to the FIFA 11+ program was related with an approximated risk reduction of all injuries by 35% and significant enhancements in a number of characteristics of motor and neuromuscular performance (**Soligard, et.al., 2010; Stephen, et. al., 2013)**. **Steffen. et. al. (2008)** reported that a 20-min of NIPP improved dynamic and functional balance and lowered 72% risk of injury among players that strictly stick to the intervention during the season. Improvement on neuromuscular control seems to be key component of FIFA 11, which is related with improvement on technical and tactical performance of football players.

In a study conducted by **Beijsterveldt, et. al. (2011)** showed that the incidence of injury and its severity are lower in the group of athletes who performed the FIFA 11 warm-up programme. Moreover, the costs of injury treatment are lower when compared to the control group. According to the **Steffen. et. al., 2008 & Daneshjoo, et. al., 2013-** Women may be at

higher risk of serious injury than men. The rate of cruciate ligaments injuries is three to five times higher among girls than boys, which shows it is important to pay attention to the training of women athletes.

Longo, et. al. (2012) conducted a first randomized controlled trial to assess the effectiveness of FIFA 11 + program to prevent injuries in basketball players. They found that the FIFA 11+ warm-up program is effective in reducing the injury rate in elite male basketball players. In the intervention group, injury rates (per 1000 athlete-exposures) was statistically significantly lower when compared with those in the control group for overall injuries (0.95 vs 2.16) and lower extremity injuries (0.68 vs 1.4). The intervention group had also a statistically significantly lower risk of trunk, leg, and hip and groin injuries as compared with the control group. The comparison of ankle and knee injury rates of the two groups did not show a statistically significant difference.

Owoeye, et. al. (2014) studied Nigerian players aged 14 – 19 years (n = 416, IG: 212, CG: 204) over a period of 6 months and found that the FIFA 11+ program was efficacious, with a global injury reduction rate of 41% throughout the evaluation period. **Soligard, et, al. (2008)** who has been the first to examine the FIFA 11+ program, carried out a randomized clinical trial with 1,892 female Norwegian players aged 13 – 17 years (IG: 1,055,CG: 837). The FIFA 11+ program was applied for 8 months, and observed a 32% reduction in injury incidence.

However, majority of the RCT reported that CON group did not complete a standardized warm-up programme corresponding to those of INT group in the course of study period. So, the potential bias introduced by such contamination of the CON group might lead to underrate the preventive effect found in results. Our findings revealed that FIFA 11 and FIFA 11+ can significantly decrease the overall injury incidence. Therefore, we recommend incorporating the FIFA warm-up programmes into regular training and practice sessions.

4.3 Effect of FIFA 11+ And FIFA 11 on Injury Rate

In a study by **Longo, et. al. (2012),** INT group had statistically significant variation in lower extremity injuries (0.68 vs 1.4; P =0.022), acute injuries (0.61 vs 1.91; P<0.001), and severe injuries (0 vs 0.51; P =0.004) compared to CON group. There was no statistically significant difference in match, knee, ankle and overuse injuries between two groups. However, because females are at higher baseline risk of knee injury (such as anterior cruciate ligament rupture), baseline injury rates in this study using male athletes may be very low to determine statistically significant differences between the 2 groups when considering relatively rare injuries.

Owoeye, et. al. (2014) reported that FIFA 11+ NM warm-up programme in male youth football players significantly diminished the overall rate of injuries by 41% and LE injuries by 48%. The rate of reducing specific LE injuries by body location such as thigh and ankle injuries did not extended to the level of statistical significance (p= 0.052 and p=0.080 respectively). Although the compliance rate reported among teams (60%) in the INT was lower but the player compliance is higher (74%) that might have compensated for lower team compliance and explain why FIFA 11+ was effective in reducing injuries.

Soligard, et, al. (2008) also reported overall significant reduction in injury rate in 11+ intervention group by 32%. 215 injuries were recorded in CON group and 161 injuries in INT group. The author found a significant reduction in number of knee injuries (p=0.072) along with reduced risk of injury during match and training among female football players.

These studies show significant reduction in overall risk of lower limb injury. Greater the team compliance to the program, the lower the injury rate. Based on our findings there is significant reduction in knee, ankle and hip/groin injury rate.

5. CONCLUSION:

Evidence available from this research can be effectively used to reduce injury risk and incidence in soccer and other similar kind of sports. The inclusion of sports specific exercises in daily training activities can be carried out in a relatively simple way and requires little time, and their benefits are of great importance for preserving the physical integrity of soccer players. This systematic review & meta-analysis demonstrates that FIFA 11+ and FIFA 11 injury prevention program decreases the overall risk of injury and improve athlete performance parameters such as agility and 20m sprint. Future researches should focus on using injury prevention program in sports other than soccer.

6. CONFLICTS OF INTEREST

The authors certify that there is no conflict of interest with any financial organization regarding the material discussed in the manuscript.

7. AUTHORS' CONTRIBUTIONS

All authors were responsible for drafting the manuscript and revising it critically for valuable intellectual content. All authors approved the version to be published.

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Zein, Muhammad., Kurniarobbi, J., Prastowo, N. A. & Mukti I. L. (2014), The effect of fifa 11+ as an injury prevention program in youth futsal players.. Br J Sports Med. 48. 673-4

TABLE 1
LIST OF SUMMARY MEASURES

Outcome	Summary Measures
20 m Sprint	MSD with 95% CI
10 m sprint	MSD with 95% CI
Vertical Jump	MSD with 95% CI
Countermovement jump	MSD with 95% CI
Squat jump	MSD with 95% CI
Agility	MSD with 95% CI
Dynamic Balance	MSD with 95% CI
Static balance	MSD with 95% CI
Injury Rate	RR with 95% CI
Lower Extremity Injury Rate	

TABLE 2
STUDY QUALITY (PEDRO) AND RISK OF BIAS ASSESSMENT.

First Author & Year	Eligibility Criteria Specified	Randomization	Concealed	Baseline comparability	Patients	Care Provider Blinded	Assessor Blinded	Adequate Follow up	Intention to treat	Between group Comparison	Point Estimates and Variability	Score
Impellizzeri et.al; 2013	√	√	-	√	-	√	-	√	-	√	√	7
Steffen et.al; 2008	√	√	√	-	-	-	√	√	√	√	√	8
Beijsterveldt et.a l; 2011	√	√		√	-	-	-	√	√	√	√	7
Soligard et.al; 2008	√	√	√	√	-	-	-	-	√	√	√	7
Longo et.al; 2012	√	√	√		-	-	√	√	√	√	√	8
Palazon et.al; 2016	√	√	-	√	-	-	√	√	√	√	√	8
Akhbari et.al; 2017	√	√	--	√	-	-	-	√	-	√	√	6
Ayala et.al; 2017	√	√	-	√	-	-	√	√	√	√	√	8
Hammes et.al; 2014	√	√	-	√	-	-	-	√	√	√	√	7
Owoeye et.al; 2014	-	√	√	√	-	-	-	√	√	√	√	7
Zarei et.al; 2018	√	√	-	√	-	-	-	√	√	√	√	7
Ayala et.al; 2017	√	√	-	√	-	-	-	√	√	√	√	7
Silver Granelli et.al; s2015	√	√	√	√	√	√	√	√	√	√	√	11

Figure 1: PRISMA flowchart for review and triage of articles

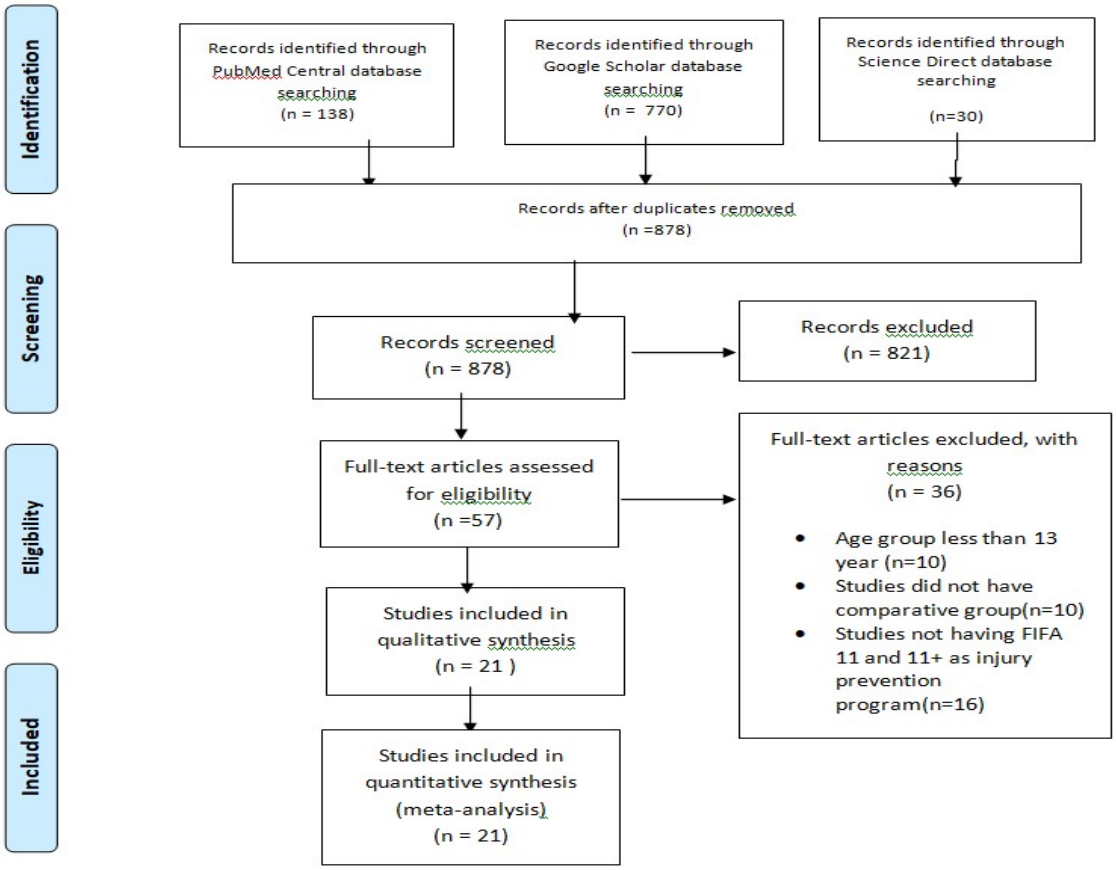


FIGURE 2: FOREST PLOT OF INJURY INCIDENCE

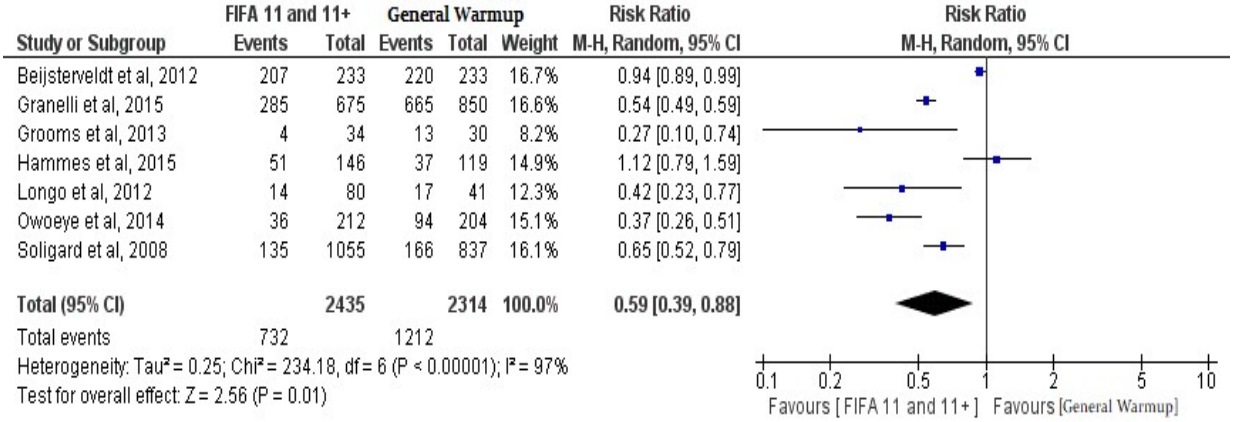


FIGURE 3: FOREST PLOT OF DYNAMIC BALANCE

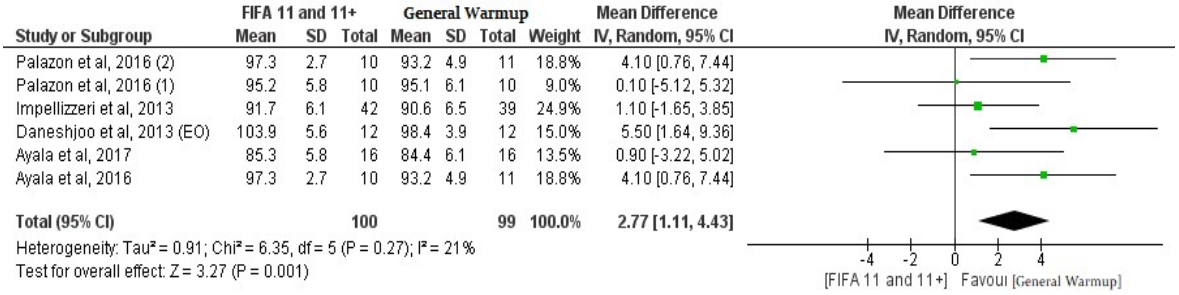


FIGURE 4: FOREST PLOT OF STATIC BALANCE

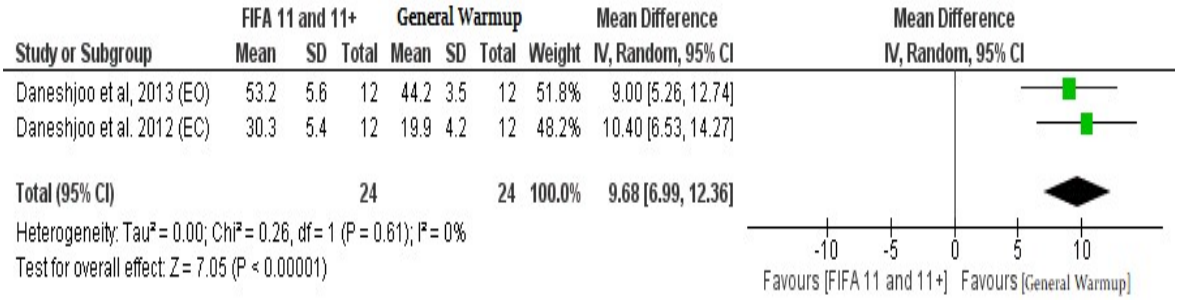


FIGURE 5: FOREST PLOT OF AGILITY

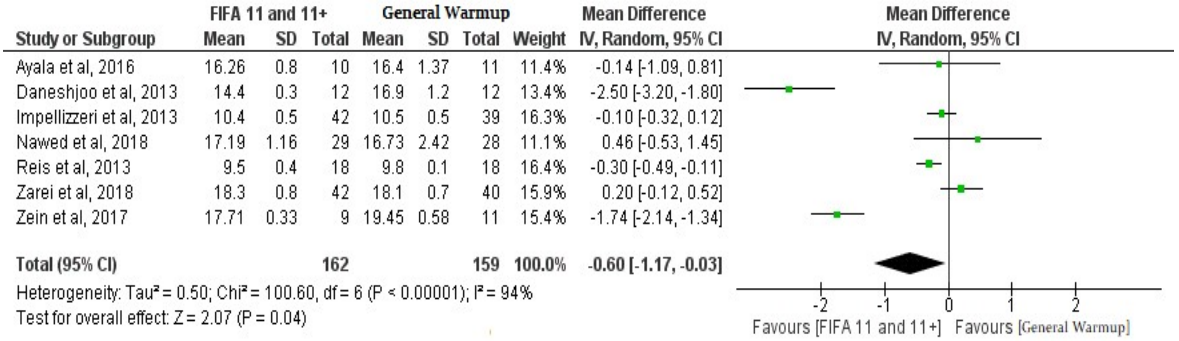


FIGURE 6: FOREST PLOT OF VERTICAL JUMP

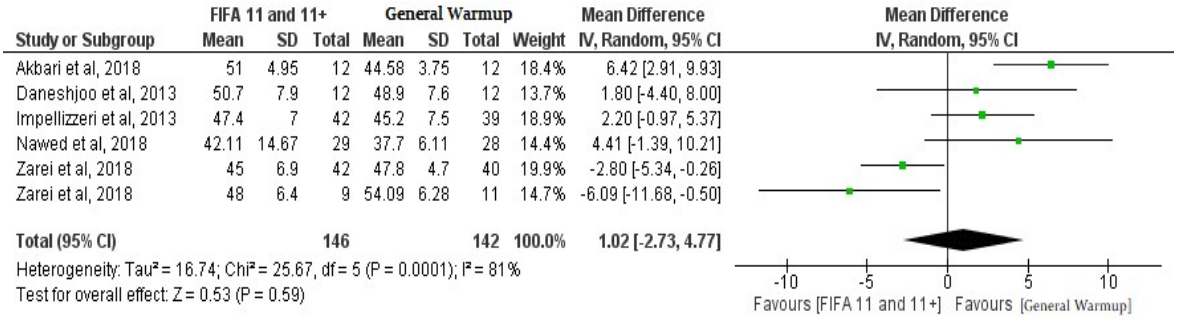


FIGURE 7: FOREST PLOT OF SQUAT JUMP

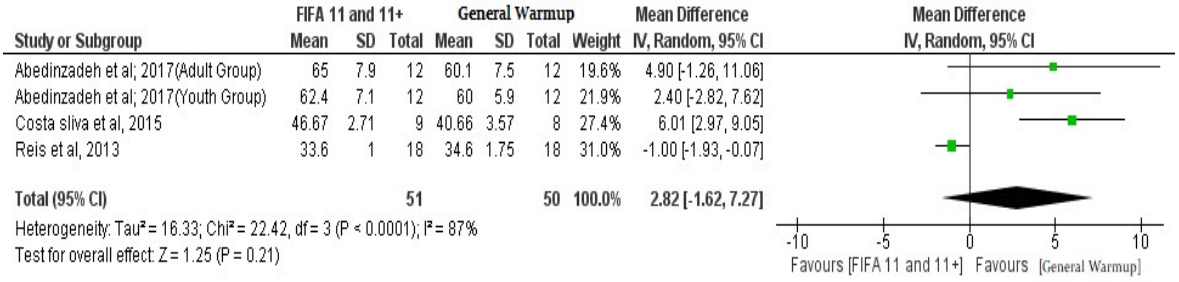


FIGURE 8: FOREST PLOT OF 10M RUNNING SPRINT

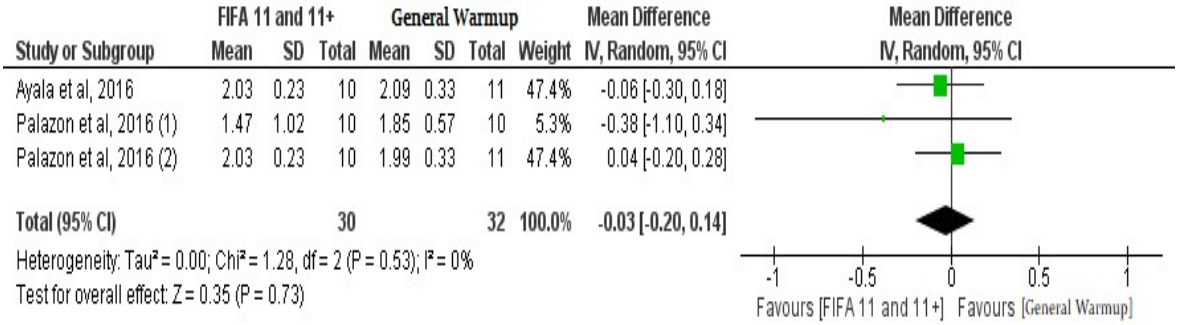


FIGURE 9: FOREST PLOT OF 20 M RUNNING SPRINT

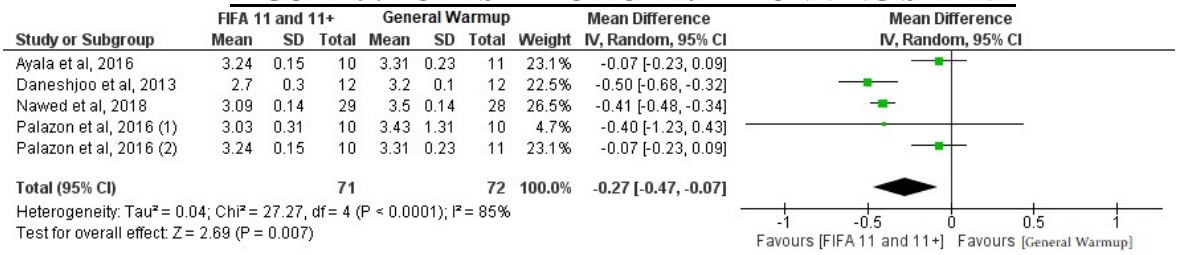


FIGURE 10(A): FOREST PLOT OF LOWER EXTREMITY INJURY PREVENTION (KNEE)

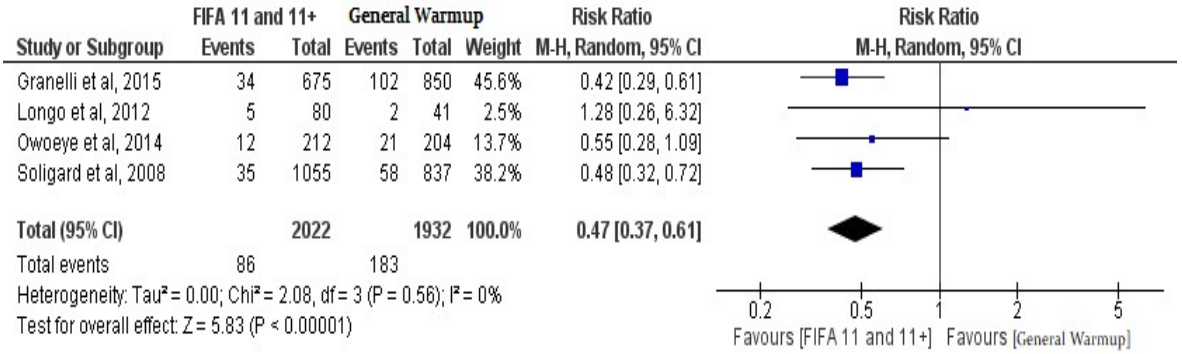


FIGURE 10(B): FOREST PLOT OF LOWER EXTREMITY INJURY PREVENTION(ANKLE)

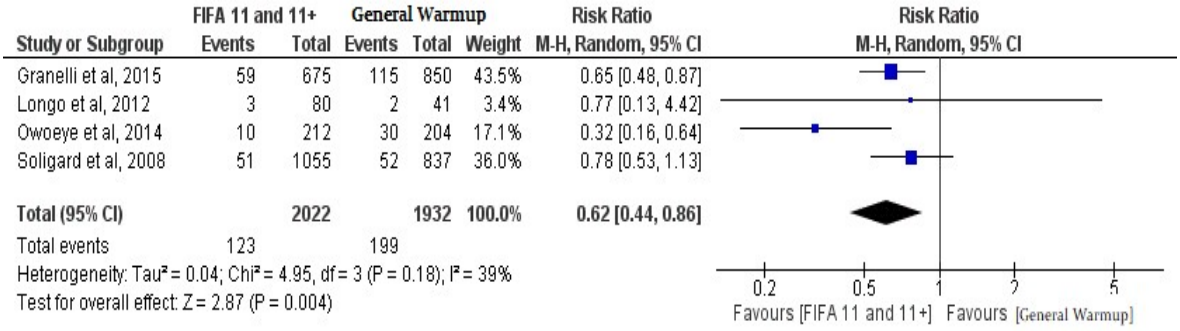


FIGURE 10(C): FOREST PLOT OF LOWER EXTREMITY INJURY PREVENTION(HIP/GROIN)

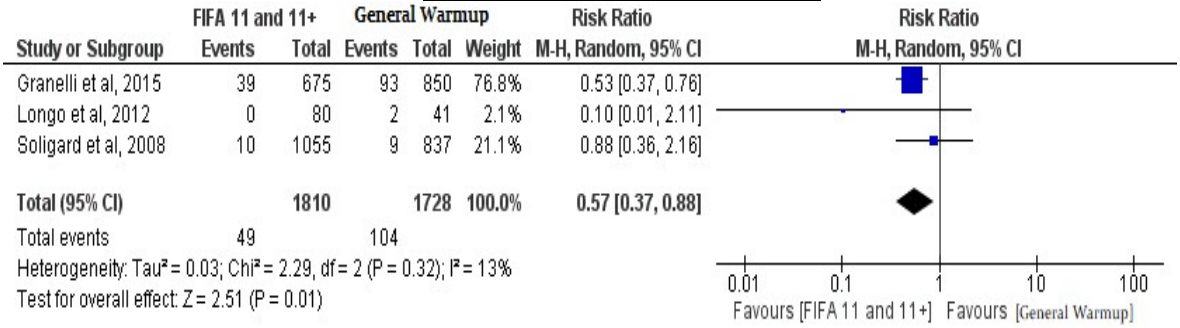
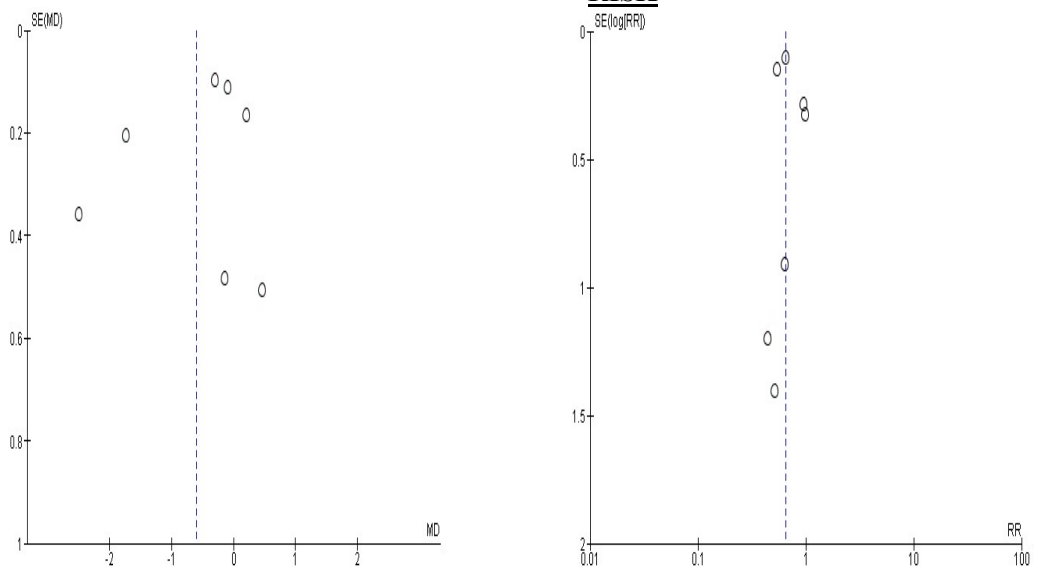


FIGURE 11: PUBLICATION BIAS - A) FUNNEL PLOT WITH SE, STANDARD ERROR, MD, MEAN DIFFERENCE; B) FUNNEL PLOT WITH SE, STANDARD ERROR, RR, RELATIVE RISK



Abbreviations: WU: Warm Up; RR: Risk Ratio; GWP: General Warm Up; FIPP: FIFA Injury Prevention Program; DWU: Dynamic Warm Up; IPP: Injury Prevention Program; MD: Mean Difference; MSD: Mean-Standard Difference; CI: Confidence Interval; PEDro: Physiotherapy Evidence Database; LE: Lower Extremity; IRR: Injury Risk Ratio; NMT: Neuromuscular Training; VJ: Vertical Jump; CMJ: Countermovement Jump; SQ: Squat Jump

TABLE 3

CHARACTERISTICS OF INCLUDED STUDIES (FIFA 11+ AND FIFA 11)

S. NO.	Study	Study Design	Level of Evidence	Country	Participants	Level of Play	Outcome	Sample Size (Experimental Group)	Sample Size (Control Group)	Measurement	Intervention/ Control
1	Muhammad ikhwanzein et al; 2017	Pre- Post study	IV	Indonesia	20 Male	High school futsal teams in Yogyakarta, Indonesia	Core muscle strength, explosive power of leg muscle, Agility	9	11	Plank test ; vertical jump test; Illinois agility test	11+ vs CON; 4 week, 2x per week(max 8 session)
2.	Impellizzeri et al; 2013	RCT	II	Italy	81 Male amateur football players	Official amateur championships of the Italian Football Federation	Balance; strength of flexors in concentric and eccentric conditions; dynamic postural control; core stability; isokinetic strength of extensor	42	39	Primary: time-to-stabilization test; eccentric/con centric flexors strength . Secondary: ecentric/ concentric extensors strength; Star excursion balance test; core stability test; vertical jump; 20-m sprint; agility t test	11+ vs CON; 9 weeks, 3x per week for 20 min (Max.. 27 session)
3	Steffen et.al; 2008	RCT	II	Norway	34 Female football players (age-16-18 yr)	Elite sport high schools , competitive level (13.3 h soccer activities per week)	Lower extremity isokinetic and isometric torque; jumping bility; 40 m single sprint; speed dribble	17	14	Isokinetic and isometric hamstrings and quadriceps strength (ratios); Drop and counter movement jump; 40 m sprint; slalom dribble	11+ vs CON; 10 weeks, 3 x per week (max 30 session)
4	Costa Silva et al;2015	Pre- Post Study	IV	Brazil	17 Male players	U-20 category from a Brazilian Championship Series A Team	Vertical jumps	9	8	Counter-Movement jump; squat jump	11+vs CON; 9 weeks, 3 x per week (max 27 session)
5	Saeed Abedinzadeh et al; 2017	Pre-Post study	IV	Iran	48 male players	Yazad Pishgaman team present in national league	Squat jump height; Squat jump+ body weight; Bosco index; Pre-stretch Index; % fast twitch fibers; Balance index; Endurance index; Power index	12	12	Bosco jump test	11+ vs CON; 8 weeks

Table Continued

S. N0.	Study	Study Design	Level of Evidence	Country	Participants	Level of Play	Outcome	Sample Size (Experimental Group)	Sample Size (Control Group)	Measurement	Intervention/ Control
6	Beijsterveldt et al 2012	Cluster RCT	II	Dutch	456 male players	Dutch high level amateur soccer competitions	Injury prevention	223	233	No. of injuries/ 1000 player hours	11 vs CON; 2009-2010 soccer season (sep- may) x twice/ week
7	Soligard et al; 2008	Cluster RCT	II	Norway	1892 female players	125 football clubs from the south, east and middle of Norway followed for one league season (eight months from March to October 2007)	Injuries to Lower extremities (foot, ankle, lower leg, knee, thigh, groin and hip)	1055	837	No. of injuries/ 1000 player hours	11+ vs CON group; clubs carry out at least two training sessions a week in addition to match play. The club practiced 2-5 times a week and played between 15 and 30 matches during the season.
8	Reis et al; 2013	Randomi-zed cohort study	III	Portugal	36 adolescent male futsal players	5.8 h futsal Activity per week	Strength; sprinting; agility; jumping; balance; Skill abilities	18	18	Isokinetic hamstrings and quadriceps strength (ratios); 5 and 30 m sprint; T-test; Counter Movement jump; Single leg stance; slalom dribble	11+ vs CON; 12 weeks, 2 x per week (max 24 sessions)
9	Longo et al; 2012	RCT	II	Italy	121 male basketball Player	Male under 12 basketball league, Male under 13 basketball league, Male under 15 basketball league, Male under 17 basketball league, Male nder 19 basketball league, and basketball third league	Primary: Injury to athlete, type of exposure (match and training), location in the body, type of injury(acute or overusel) Secondary: injury to lower extremity (foot, ankle, lower leg, knee, thigh, groin and hip	80	41	Injury rate per 1000 AE	11+ and CON; 9 Months (2009 april-2010) 3-4 times a week during the session

Table Continued

S. No.	Study	Study Design	Level Of Evidence	Country	Participants	Level of Play	Outcome	Sample Size (Experimental Group)	Sample Size (Control Group)	Measurement	Intervention/ Control
10	Palazon et al; 2016	Acute effects-Randomized, crossover and Counter balanced order study Chronic effects-RCT	II	Spain	41 male amateur football players	Official Amateur Championships of the Spanish Football Federation	Acute and Chronic effects of FIFA \11+ on several physical performance (Dynamic postural control; 10 m and 20m sprint time; jumping height; and joint ROM)	10	10	Y- balance test; 10 and 20 m sprint test; drop vertical jump test; Hip and ankle ROM	Acute effects(n=20) 11+ and CON; On randomized order on separate days Chronic effects(n=21) 11+ and CON; times a week for week
11	Akbari et al; 2018	RCT	II	Iran	24 male elite soccer players under 19 years	Experience 6.96±1.26 years	Vertical jump performance	12	12	Vertical jump test	11+ vs CON; 3 times per week for 8 weeks(max 24 sessions)
12	Grooms et al; 2013	Prospe-Ctive single-cohort study	III-2	Ohio	41 male collegiate football players	NCAA division III Collegiate soccer athletes	Lower extremity injury risk and time lost to lower extremity injury	34	30	injury incidence per 1000AE	11+ vs CON; 5-6 times/week for 2 seasons for 20 min
13	Ayala et al; 2017	RCT	II	Spain	40 male soccer players	First national juvenile league	Dynamic postural control; 10 and 20 m sprint; drop jump; agility; joint ROM; single leg hop limb symmetry	10	11	Y balance test; 10 and 20 m sprint test; vertical drop jump test; Illinois agility test; hip and ankle ROM;2 single leg	11+ vs Harmoknee vs Control; weeks, 3 x per week (max 12 sessions)
14	Nawed et al; 2018	pre-post observational study	IV	India	57 amateur male soccer players	Training/ week 6.01±0.31 hours	Leg power; speed; soccer specific agility	29	28	Vertical jump test; 20 m sprint test; T test; Illinois test	11+vs CON; 12 week, 5 times per week(max 60 sessions)
15	Hammes et al; 2014	RCT	II	Germany	256 male veteran football players(above 40 yr age group)		Players exposure hours and injuries	146	119		11+ vs CON; Once/week for 9 months for 20 min

Table Continued

S.NO.	Study	Study Design	Level of Evidence	Country	Participants	Level of Play	Outcome	Sample Size (Experimental Group)	Sample Size (Control Group)	Measurement	Intervention/ Control
16	Daneshjoo et al; 2013	Pre-Post observational study	IV	Iran	36 male soccer players	Professional level(daily training)	Isokinetic hamstring and quadriceps strength(ratio); Speed dribbling; 20 m single sprint; vertical jump; agility; soccer specific skill and kicking accuracy; Star Excursion Balance Test; Single Leg Stance	12	12	10 m speed test;20 m sprint; vertical jump test; Illinois agility test; wall-volley test	11+ vs harmoknee vs control; 8 weeks, 3 x per week (max 24 sessions)
17	Owoeye et al; 2014	RCT	II	Nigeria	416 male youth football league	Premier League Division of Lagos Junior League	Primary: injuries to players; type of exposure; injuries specific to lower extremity Secondary : injuries reported by body location , aetiology, mechanism and severity	212	204	Injury incidence per 1000 AE	11+ vs CON; 6 months (sep 2012- feb 2013) 2 training sessions every week
18	M. Zarei et al; 2018	RCT	II	Iran	82 male football players (14-16 yr age group)	Iranian premier league	Aerobic capacity; anaerobic power of lower extremity; lower extremity power; agility; dribbling skills; linear sprint ability; flexibility of lower back and hamstrings	42	40	YO-YO intermittent recovery test level 1; Bosco counter movement jump; vertical jump test; Illinois agility test; dribbling sprint test; Linear sprint test over distance of 9.1 m and 30.6 m;sit and reach test	11+vs CON; 30 weeks atleast 2 times per week (max 60 sessions)
19	Ayala et al; 2017	Randomized crossover and counter balanced study	II	Spain	16 amateur football players (8 male and 8 Female)	Official Amateur Championship the Spanish football federation	ROM; dynamic postural control; conventional and functional hamstrings-to-quadricpes strength ratios 10-20 m sprint times; jumping height; reactive strength	16	16	Joint ROM; Y balance test; Ham strings-to- quadriceps strength ratios; sprint time; Vertical drop jump; Reactive strength index	FIFA 11+vs Harmo-knee vs control; randomized order on a separate days 3 days per week 1.5 hours per session
20	Daneshjoo et al; 2012	Pre-post Observational study	IV	Malaysia	36 male young professional soccer players	Playing soccer professional level and training regularly	Proprioception; static balance; dynamic balance	12	12	Biodex isokinetic dynamometer; stork stand test; star excrusion balance test	FIFA 11+ vs Harmoknee vs control; 2 months(24 sessions)
21	Silver granelli et al; 2015	RCT	II	United states	1525, N=396	NCAA division 1 and 2men's soccer team	Athlete exposures; compliance; injury data	675	850	Incidence rate per 1000 AE's	11+ vs CON; 3 times per week for the duration of the season
	Total							2000	1707		

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A COMPARATIVE STUDY OF PHYSICAL FITNESS BETWEEN PHYSICAL EDUCATION AND NON-PHYSICAL EDUCATION STUDENTS

Mr. Dharamraj Singh[1] Dr. Divesh Chaudhary[2]

Affiliations

[1] M.P.Ed. Student, Department of Physical Education, Swami Vivekanand Subharti University, Meerut (U.P.).

[2] Assistant Professor, Department of Physical Education, Swami Vivekanand Subharti University, Meerut (U.P.).

ABSTRACT

The objective of this study was to investigate the physical fitness between the physical education and non-physical education students. Another purpose of the study was to evaluate the physical fitness components between mail students of physical education and non-physical education. The subjects of the study were 80 students (40 subjects for physical education and while another 40 subjects is other department of the university) in Swami Vivekanand Subharti University, Meerut. Age ranged the student between 18-22 years. Criterion measures for this study were different test items such as: Chin-Ups, Bent Knee Sit-Ups, Shuttle Runs (4X10 Mtr.), Standing Broad Jump, 50 Mtr. Dash and 600 Mtr. Run/Walk, administered to measure their level of fitness. To find out significant difference between two groups i.e. physical education and non-physical education students, t-test was employed. The result of the data reveals the significant difference found was found Chin-Ups, Bent Knee Sit-Ups, Shuttle Runs (4X10 Mtr.), Standing Broad Jump, 50 Mtr. Dash and 600 Mtr. Run/walk between physical education and non-physical education students

Keywords: Chin-Ups, Bent Knee Sit-Ups, Shuttle Runs , Standing Broad Jump, Run/Walk.

1. INTRODUCTION

Physical education is a part of general education program that contributes, primarily through movement experience to the total growth and development of all children, physical education is defined as education of the through movement, and must be conducted in a manner that merit this meaning. Physical education should teach children principles of human wellness. The necessitates cooperation with classroom teachers and an understanding of the overall school curriculum. The concept of human wellness is broader than the concept of good health and related to developing a total life style that promotes well being.

Several concept-based fitness education curriculum models exist for both the middle school and senior high school levels. They include Fitness for Life: Middle School **(Corbin et al., 2007); Personal Fitness for You (Stokes and Schultz, 2002); Get Active! Get Fit! (Stokes and Schultz, 2009);** Personal Fitness: Looking Good, Feeling Good **(Williams, 2005);** and Foundations of Fitness **(Rainey and Murray, 2005).** Activities in the curriculum are designed for health benefits, and the ultimate goal for the student is to develop a commitment to regular exercise and physical activity. It is assumed that all children can achieve a health-enhancing level of fitness through regular engagement in vigorous- or moderate-intensity physical activity.

physical fitness is responsible by the each biological system of the human body or vice-versa. In this the all systems of the human body work together with coordinative movements that allow us to perform daily activities. Physical fitness is affected by numerous factors in individual like- heredity, environment, age, sex, daily routine lifestyle and much more countless factors. Physical fitness can also be termed as 'physical efficiency' because the physical fitness mean the capability of the person regarding physical aspects and the similar thing to the term 'physical efficiency', it is also related to the body capability regarding to the physical aspects. **(Pate Russell R., 1988)**

Physical fitness refers to a physiologic state of well-being that allows one to meet the demands of daily living or that provides the basis for sport performance, or both. Health-related physical fitness involves the components of physical fitness related to health status, including cardiovascular fitness, musculoskeletal fitness, body composition and metabolism. In large epidemiologic investigations, physical activity and physical fitness are often used interchangeably, with fitness commonly being treated as a more accurate (albeit indirect) measure of physical activity than self-report.100 Physical fitness appears to be similar to physical activity in its relation to morbidity and mortality2,34 but is more strongly predictive of health outcomes than physical activity.6,29,100 Most analyses have shown a reduction of at least 50% in mortality among highly fit people compared with low fit people. **(Warburton, Darren ER, Crystal Whitney Nicol & at al., 2006)**

2. METHODOLOGY

2.1 Selection of Subjects

The subjects of the study were randomly 80 students (40 subjects for physical education and while another 40 subjects is other department of the university) in Swami Vivekanand Subharti University, Meerut. Age ranged the student between 18-22 years.

2.2 Selection of Variables

Necessary data were collected for arm and shoulder girdle strength, abdominal strength, agility, explosive strength, speed and cardiovascular endurance with the help of different test items such as: chin-ups, bent knee sit-ups, shuttle runs (4x10 mtr.), standing broad jump, 50 mtr. dash and 600 mtr. run/walk, administered to measure their level of fitness.

2.3 Statistical Analysis

Comparison of the physical fitness component between the physical education and non-physical education students, t-test was computed. To find out the significant difference between physical education and non-physical education students, the level of significant was set at .05 level.

3. RESULTS

To find out chin-ups between the means of physical education and non-physical education students, t-ratio statistics was used and presented in table -1.

TABLE 1
COMPARISION OF MEANS OF CHIN-UPS BETWEEN PHYSICAL EDUCATION AND NON-PHYSICAL EDUCATION STUDENTS

Subjects	M	MD	σ DM	t-ratio
Physical Education Students	7.13	2.68	0.808	3.317*
Non-Physical Education Students	4.45			

*Significant at .05 level
t.05(79) =1.66

It is evident from Table1 that, significant difference was found between the mean scores of physical education and non-physical education students in relation to chin-ups as the t-value was found 3.317 which was higher value than the required value at .05 level of significance. The scores are also illustrated in below figure-1

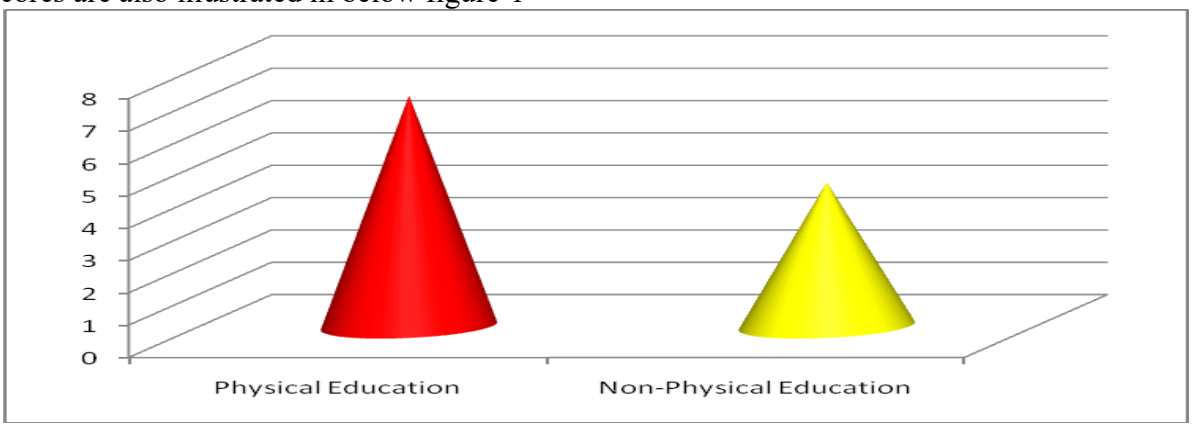

Figure -1: Mean scores of physical education and non-physical education students in chin-ups

TABLE 2
COMPARISION OF MEANS OF MEANS OF BENT KNEE SIT-UPS BETWEEN PHYSICAL EDUCATION AND NON-PHYSICAL EDUCATION STUDENTS

Subjects	M	MD	σ DM	t-ratio
Physical Education Students	33.75	12.70	1.96	6.465*
Non-Physical Education Students	21.05			

*Significant at .05 level
t.05(79) =1.66

It is evident from Table2 that, significant difference was found between the mean scores of physical education and non-physical education students in relation to bent knee sit-ups as the t-value was found 6.465 which was higher value than the required value at .05 level of significance. The scores are also illustrated in below figure-2

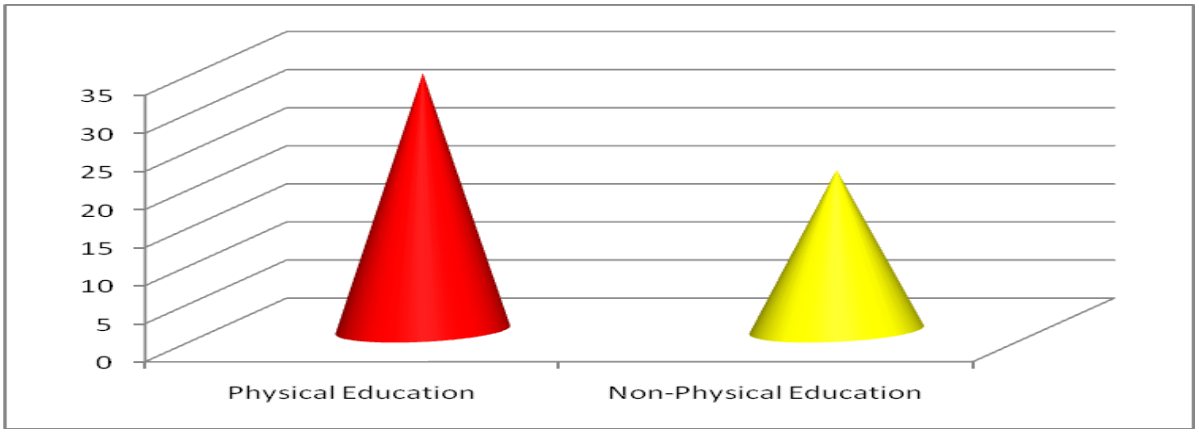

Figure -2: Mean scores of physical education and non-physical education students in chin-ups

To find out shuttle run between the means of physical education and non-physical education students, t-ratio statistics was used and presented in table-03.

TABLE 3

T-RATIO OF THE MEANS OF SHUTTLE RUNS BETWEEN PHYSICAL EDUCATION AND NON-PHYSICAL EDUCATION STUDENTS

	Students		t- ratio
	Physical Education	**Non-Physical Education**	
Mean	**10.99**	**13.81**	**-6.333***
S.D	**.97**	**2.64**	

Significant at .05 level

t-value required to be significant at 79 df =1.66

It is evident from table-3 that, significant difference was found between the mean scores of physical education and non-physical education students in relation to shuttle runs as the t-value was found -6.333 which was higher value than the required value at .05 level of significance. The scores are also illustrated in the figure-3

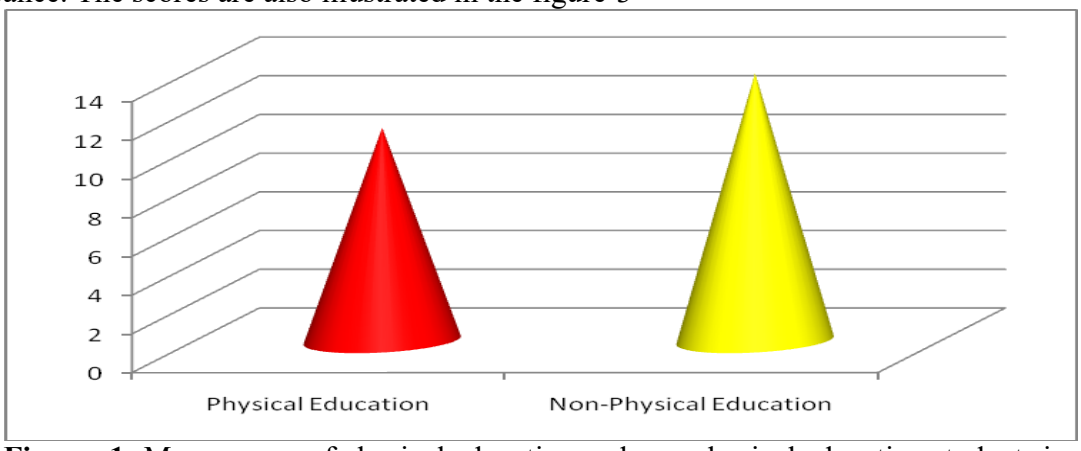

Figure -1: Mean scores of physical education and non-physical education students in Shuttle Run

To find out standing broad jump between the means of physical education and non-physical education students, t-ratio statistics was used and presented in table-04.

TABLE-4
T-RATIO OF THE MEANS OF STANDING BROAD JUMP BETWEEN PHYSICAL EDUCATION AND NON-PHYSICAL EDUCATION STUDENTS

	Students		t- ratio
	Physical Education	**Non-Physical Education**	
Mean	**2.14**	**1.37**	**15.801***
S.D	**.217**	**.219**	

Significant at .05 level
t-value required to be significant at 79 df =1.66

It is evident from table-4 that, significant difference was found between the mean scores of physical education and non-physical education students in relation to standing broad jump as the t-value was found 15.801 which was higher value than the required value at .05 level of significance. The scores are also illustrated in the figure-4

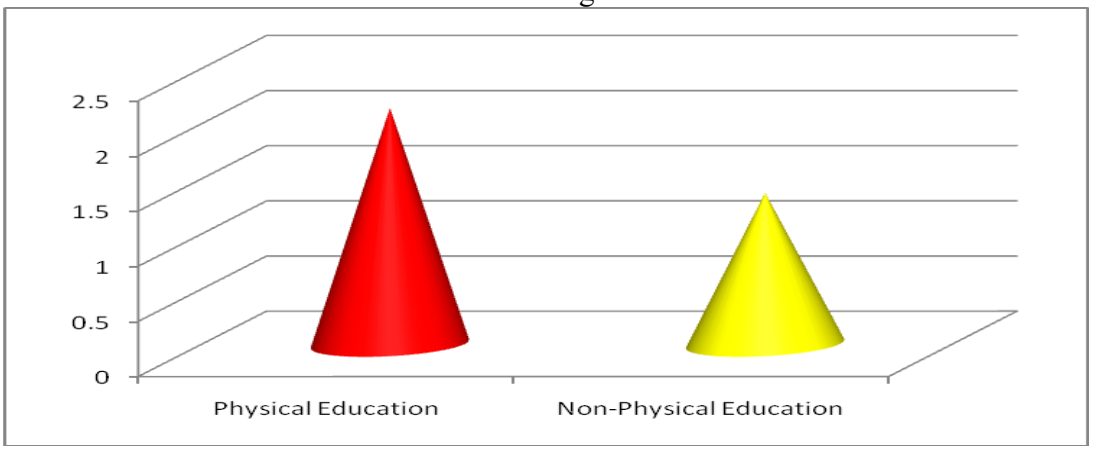

Figure -4: Mean scores of physical education and non-physical education students in Standing Broad Jump

To find out 50mtr dash between the means of physical education and non-physical education students, t-ratio statistics was used and presented in table-05.

TABLE 5
T-RATIO OF THE MEANS OF 50MTR DASH BETWEEN PHYSICAL EDUCATION AND NON-PHYSICAL EDUCATION STUDENTS

	Students		t-ratio
	Physical Education	**Non-Physical Education**	
Mean	**7.38**	**8.29**	**-6.595***
S.D	**.75**	**.45**	

Significant at .05 level
t-value required to be significant at 79 df =1.66

It is evident from table-5 that, significant difference was found between the mean scores of physical education and non-physical education students in relation to 50mtr dash as the t-value was found -6.595 which was higher value than the required value at .05 level of significance. The scores are also illustrated in the figure-5

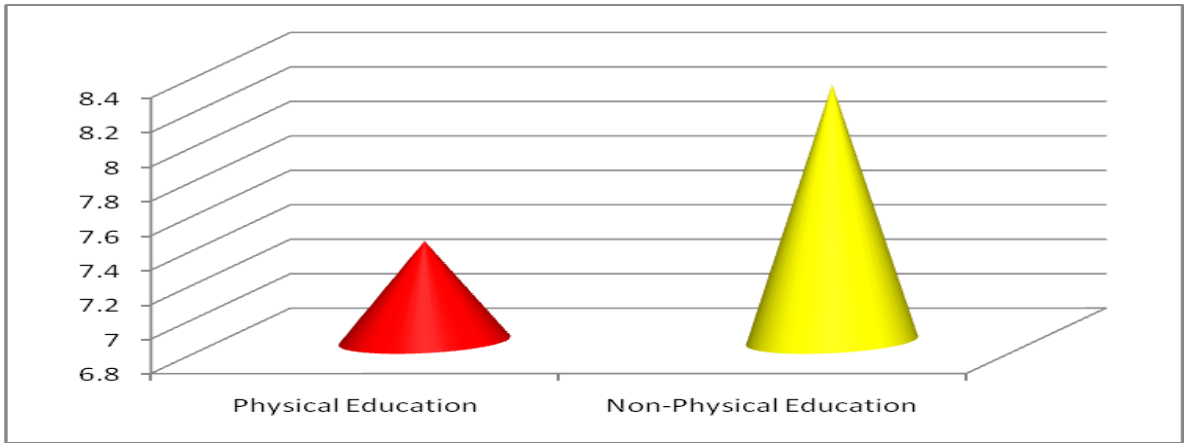

Figure -5: Mean scores of physical education and non-physical education students in 50 Meter Dash

To find out 600mtr run/walk between the means of physical education and non-physical education students, t-ratio statistics was used and presented in table-06.

TABLE 6
T-RATIO OF THE MEANS OF 600MTR RUN/WALK BETWEEN PHYSICAL EDUCATION AND NON-PHYSICAL EDUCATION STUDENTS

	Students		t.ratio
	Physical Education	**Non-Physical Education**	
Mean	**2.10**	**2.51**	**-5.313***
S.D	**.38**	**.32**	

Significant at .05 level
t-value required to be significant at 79 df =1.66

It is evident from table-6 that, significant difference was found between the mean scores of physical education and non-physical education students in relation to 600mtr run/walk as the t-value was found -5.313 which was higher value than the required value at .05 level of significance. The scores are also illustrated in the figure-6

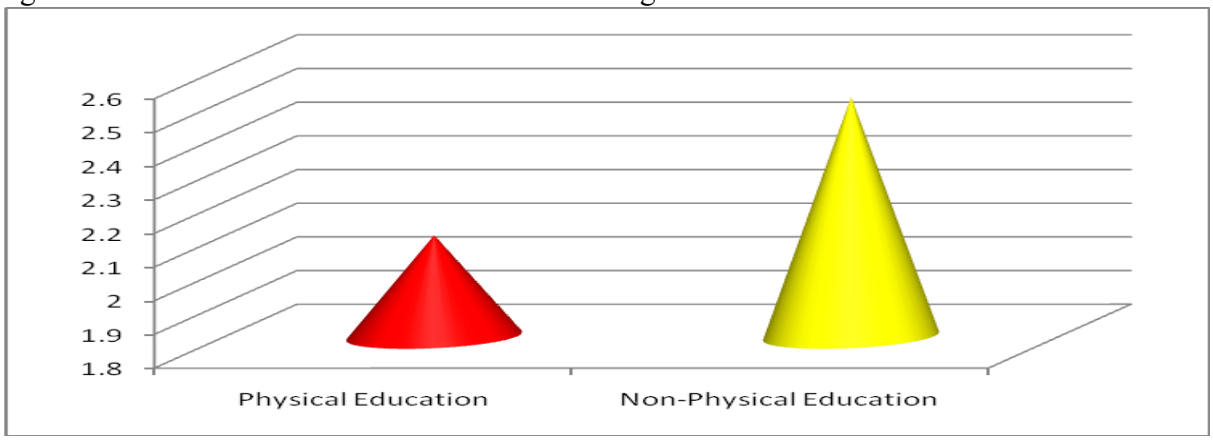

Figure -6: Mean scores of physical education and non-physical education students in chin-ups

4. DISCUSSION

The present investigation was designed to know the physical fitness between physical education and non-physical education students. The purpose of this study was many folds and

revealed some specific differences between the students. Though, the Master Student did not tend to explore personal life of students but, some of the facts could not be unattended hence, found necessary to know the physical fitness components between physical education and non-physical education students in Swami Vivekanand Subharti University, Meerut (U.P.). **AAPHER Youth Fitness Test (1976)** used for the purpose helped to know the significant difference in various physical fitness of the students.

5. CONCLUSIONS

The result of the study was to compare the physical fitness between physical education and non-physical education students. Though these exist significant difference between physical education and non-physical education students. Where the calculated mean difference found in pull ups, sit ups, standing broad jump, shuttle run, 50 yards dash and 600 yards run and walk. The result is in the direction of **Guta , 2017)** conducted a study on topic, "Comparative Study of Physical Fitness Components between Physical and Non-Physical Education Male Students in Nekemte College of Teacher Education" The findings of the present study reveals that there were significant difference found in pull ups, sit ups, standing broad jump, shuttle run, 50 yards dash and 600 yards run and walk for knowing the abdominal strength, explosive strength, arm and shoulder girdle strength, agility, speed & cardiovascular endurance respectively.

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A COMPARATIVE STUDY OF SELF CONCEPT BETWEEN SPORTSMAN AND NON SPORTSMEN

Shiv Bhushan Pandey[1]

Affiliation:

1. Sport Officer, Govt. College, Shahdol (M.P.)

ABSTRACT

This study compared the relationship between the self concept among school children who took part in sports and those who did not. The sample comprised 150 children, aged 14-16 years. Self-concept was assessed using the Pierres Harris Self-Concept Scale consisting of 40 questions. students were classified into sportsman and non sportsman based on their participation in active sports and participation at the district level tournaments. The data was analysed using "t" test for each of the measure at .05 level of confidence. The self concept level of the students who are sportsman is higher than those of the students who are non sportsman..

Keywords: Physical fitness, pulse rate, non-sportsmen, self concept

1. INTRODUCTION

Self-concept can be defined as the totality of a complex, organized, and yet dynamic system of learned attitudes, beliefs, and evaluative judgments that people hold about themselves Self-concept can be defined as the totality of a complex, organized, and yet dynamic system of learned attitudes, beliefs, and evaluative judgments that people hold about themselves

Self-concept can be defined as the totality of acomplex, organized, and yet dynamic systemof learned attitudes, beliefs, and evaluativejudgments that people hold about themselves **(Katja W, 2018).** The term self-concept is ageneral term used to refer to howsomeone thinks about, evaluates or perceives themselves. Tobe aware of oneself is to have a concept of oneself.According to **Baumeister (1999)** self concept is". The individual's belief about himself or herself, including theperson's attributes and who and what the self is"

Over the last decades, the conceptualization ofthe self-concept has experienced a tremendoustransformation. First viewed as a unitary andstable entity, the self-concept now holds amultidimensional, multifaceted, and dynamicstructure that controls and guides how peopleprocess self-relevant information in allaspects of their lives **(Oyserman et al. 2012).**

So many researches were performed regarding effects of a variety of sports, physical activities and exercises on psychological factors. For instance**, Kharazi (2008)** stated in his research that a study had observed self-concept will improve in harmony with strength development/increase after 12 weeks strengthening training. He also mentioned that in another study had mentioned in their research that dumbbell workout has the highest effect, aerobic exercise had the lowest effect and combined exercises has interstitial effect on improvement and development/increase of self-concept (4). Goni found a significant relationship between physical education of secondary school students and their self-concept development/increase (**Goni 2000**).

The objective of the study is to examine self concept among sportsman and non sportsman students.

2. METHODOLOGY

The purpose of this study was to compare the self concept between the sportsman and non sportsman adolescent students. For the purpose of this study, the participation of the students in extramurals which was being recorded by the physical education teacher of the respective schools was taken into account. Age of the subject was obtained from the school records. Participants were selected from various schools of Shahdol district. 150 students were selected as the sample of the study.

After briefing the objectives of the study proper consent was taken from the principal and students before conducting study. 40 items Piers-Harris Children's Self- Concept Scale was administered to reflect a child's overall self-concept, plus subscale scores (Behavioral Adjustment, Freedom from Anxiety, Happiness and Satisfaction, Intellectual and School Status, Physical Appearance and Attributes, and Popularity) that permit more detailed interpretation. The age of the students was collected from the respective school records. Scoring: Score of the subjects for the pieers self concept questionnaire was done by giving 1 point to every positive answer given to the questions asked.

Statistical Technique:

't' test was computed to examine the significance of difference among the group/

3. RESULTS

Statistical analysis of test data collected from one hundred and fifty students 75 sportsman and 75 non sportsman on the scores of self concept.

TABLE 1
COMPARATIVE ANALYSIS OF TEMPERAMENTAL QUALITIES AS A DIMENSION OF SELF CONCEPT AMONG SPORTSMAN AND NON-SPORTSMAN

Subscales	Students	Mean	SD	't'
Temperamental Qualities	Sportsman	4.82	0.26	4.45
	Non-Sportsman	3.55	0.89	
Academic Status	Sportsman	6.10	0.65	4.58
	Non-Sportsman	5.90	1.1	
Intellectual abilities	Sportsman	5.81	0.72	6.25
	Non-Sportsman	5.32	0.99	
Habits and Behaviour	Sportsman	4.68	0.58	4.81
	Non-Sportsman	4.21	1.05	
Emotional Tendencies	Sportsman	4.86	0.81	4.67
	Non-Sportsman	3.35	0.96	
Mental Health	Sportsman	6.25	1.21	1.67
	Non-Sportsman	5.21	0.89	
Socio Economic Status	Sportsman	4.77	0.66	1.81
	Non-Sportsman	4.03	0.27	
Self Concept	Sportsman	37.29	2.56	12.3
	Non-Sportsman	31.07	2.91	

The test of significance of difference between the mean scores of sportsman and non sportsman students indicated significant difference in Temperamental Qualities (t=4.45,p=0.01), Academic Status (t=4.58,p=0.01), Intellectual abilities (t=6.25,p=0.01), Habits and Behaviour (t=4.81,p=0.01), Emotional Tendencies (t=4.67,p=0.01), mental health (t=1.67,p=0.01), socio economic status (t=1.81,p=0.04). and overall self-concept score was (t=12.3,p=0.01), from the anbalysis it was observed that difference was found to be significant at 0.05 level of confidense with 148 df. Which means that the students who are active in sports or some type of games have high self-concept than the students who are non-sportsman,

4. DISCUSSION

The result of the study showed that there is a significant difference between the self concept level of students those who are sportsman to that of students those who are non sportsman at .05 level of confidence. The results of this study are in keeping with those of previous studies that have separately examined the effect of gender,students who are involved in sports and games have greater self- concept than students who are non sportman. Students those who are non sportsman considered their athletic abilities to be poor. The introduction into schools of exercise programs suitable for post pubertal students may help this group improve their self-concept in addition to their general health and fitness. This suggests that they may also benefit psychologically and physically from an appropriate fitness program.

5. CONCLUSION

In view of the findings of the present study following conclusion may be drawn from the result presented above. The self concept level of the students who are sportsman is higher than those of the students who are non sportsman.

6. RECOMMENDATIONS

Since the study did not divide the subjects as girls and boys there is a scope to test if there is any change in the self concept of girls and boys. As the result reveled that the obese have a low level of self concept a study can be undertaken to plan a 6 weeks exercise programme for the students who are non sportsman and see if there is any change in their level of self concept.

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EFFECT OF EIGHT WEEKS TRAINING ON PHYSICAL FITNESS PERFORMANCE OF SCHOOL LEVEL FEMALE BASKETBALL PLAYERS OF SHAHDOL.

Shiv Bushan Pandey[1]

Affiliation:

1. Sport Officer, Govt. College, Shahdol (M.P.)

ABSTRACT

The objective of the present study was to find out the effect of eight weeks of training on the results of the physical fitness test of Shahdol Madhya Pradesh 's female basketball players. To achieve the study goal, a total of 30 female basketball players who took part in an inter-school basketball tournament were selected on a random basis. The participants were administered the AAHPER physical health test to assess the effects of eight weeks of physical exercise training.. The participants' pre- and post-training performance is used to determine physical health. To interpret data obtained from the analysis, the 't' test was applied at 0.05 significance level. The findings revealed that eight weeks of physical fitness training had a positive impact on the success of female basketball players in the Shahdol District. It is concluded that coaches must offer physical training to basketball players in order to enhance the quantities of speed, flexibility , agility, strength & stamina in order to achieve sports excellence. The results showed that eight weeks of physical fitness training had a positive influence on the performance of the Shahdol District female basketball players. It is concluded that coaches must provide basketball players with physical fitness in order to improve speed, flexibility, agility, strength & endurance in order to achieve excellence in sports.

Keywords : Physical fitness, Basketball, Training, School, Female, Performance

1. INTRODUCTION

In children , physical activity facilitates motor growth and physical fitness. For youth aged 5-17 years, the World Health Organisation recommends at least 60 minutes of mild to intense physical exercise a day. With regular muscle building workouts done at least three days a week, most physical activity can be aerobic. (**WHO, 2010**). Athletes and coaches are searching at opportunities to maximise fitness and mitigate injury risks in order to improve athletic success. Training both muscle strength and cardiorespiratory health within a training period [i.e. concurrent training (CT)] is a promising way to improve performance. The individual results generated by ET and ST could be potentiated by CT and improved athletic ability more than ET and ST training alone. A beneficial relationship between ST and ET will decrease the time spent on ST and ET and increase the time for sport-specific skills to recover or learn. Indeed, CT can yield greater performance improvements in time trials for runners and cyclists compared to single-mode ET. (**Rønnestad and Mujika, 2014).** Furthermore, as successful cyclists mixed cycling and active strength exercise for the lower limb, CT increased mean power output more than ET during a 45 min cycle-ergometer test than ET **(Aagaard et al., 2011)** While an increasing number of research indicate that exercise in people with spinal cord injury may enhance physical health, there are still no rigorously established recommendations for recommending exercise to this demographic of clinical practise. Exercise prescribing and promotion are problematic without guidance. Using systemic approaches that integrate robust analysis with the practical participation of a multidisciplinary team of stakeholders, high-quality recommendations are created. (**Brouwers 2010)**

A Study focused on determining the effects of different modes of upper body exercise on physical capacity, reflected by peak oxygen uptake and power output. Methodological quality was evaluated for each of the 25 studies included. **Valent (2007**).concluded that upper-body exercise may increase physical capacity among people with SCI.

The purpose of the present study was to find out the effect of eight weeks of training on the results of the physical fitness test of Shahdol Madhya Pradesh 's female basketball players. It was hypothesized that there would be a significant difference on the physical fitness performance of female basketball players in pre and post training.

2. METHODOLOGY

2.1 Selection of Subjects

The subjects for the present study consists of 30 female basketball players of schools of Shahdol within the age of 14-16 years who have participated in inter school in the year 2018-19 were selected for the study.

2.2 Selection of Variables

The selected subjects physical fitness was measured in five motor tests - speed, flexibility, agility, strength and endurance. Further the sample was given training for eight weeks during the morning and evening sessions. After the training, physical fitness is again measured in terms of performance of the players in all the five physical fitness tests which were used in pre training condition.

2.3 Test Administration

50 meter dash test was used to estimate the speed. The time taken by the subjects to complete the test in sec. was the net score of the subjects. Sit and reach test was used to assess lower body flexibility (score in inches). Shuttle run test was used to monitor the speed and agility of subjects (time in sec.). The time taken by the subjects between the audible signal start and the finishing of the run was recorded to be the score (time in sec.). The flexed arm hang for

girls to measure the arm and shoulder muscle strength (in 60 Sec.). The 12 min. cooper run & walk test was used to estimate the cardiovascular endurance of the subjects (distance covered measure in mtr.)

2.4 Statistical Analysis

Mean, Standard deviation and t-test was computed to find out the results for further analysis.

3. RESULTS

TABLE 2
PRE-POST TEST SCORES ON FIVE PHYSICAL TESTS PERFORMANCE OF FEMALE BASKETBALL PLAYERS

Tests	Conditions	Mean	S.D.	t-value
Speed	Pre	8.9	0.483	6.81*
	Post	8.35	0.614	
Flexibility	Pre	13.57	2.814	6.061*
	Post	16.99	3.520	
Agility	Pre	10.25	0.881	0.98
	Post	10.68	0.624	
Strength	Pre	8.45	2.23	5.35*
	Post	12.95	3.52	
Endurance	Pre	2342.65	421.241	4.03*
	Post	2538.54	385.352	

*** Significant at 0.05 level**

Table 1 indicates that the pretest mean value of speed test performance of the pretest is 8.9 and posttest is 8.3. The mean value shows that the basketball girls have taken more time to complete the given task in pre training while less time is taken in post training condition. The standard deviation of speed in pre and post is 0.593 and the 't' value is 6.81. Mean Scores on flexibility test performance is 13.57 and posttest is 16.99 and the obtained 't' value is 6.06. The pretest mean score of agility test performance is 10.25 and posttest mean value is 10.68. 't' value is 0.98 Hence there was no significant difference was found in regard of agility. Score on strength revealed pre test mean score 8.45 and posttest mean is 12.95 which shows that the basketball girls' strength is found better after the experiment. The 't' value is 5.35 showed significant difference The pretest mean value of 12 min. cooper run & walk test performance is 2342.65 and posttest mean value is 2538.54. It indicates that basketball girls have covered less distance in pre training while more distance is covered in post training conditions and the 't' value is 4.761 revealed significant difference. level of significance was set at 0.05 level.

4. CONCLUSION

The physical fitness test results is dramatically different in terms of speed, stability, stamina, power and endurance. There is no substantial discrepancy in pre- and post-training environments in the physical activity test results of agility tests. Eight week physical fitness exercise training program has a huge impact on the success of Shahdol basketball female players.

5. RECOMMENDATIONS

It is suggested that coaches offer physical fitness sessions to basketball players in order to develop substantial amounts such as speed, stamina, mobility, strength and endurance to attain athletic excellence. At the primary level, related research may be performed on other games and activities.

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A COMPARATIVE STUDY OF SELF CONCEPT BETWEEN URBAN AND RURAL SPORTSMEN

Bhaskar Dutt Tripathi[1] & Dr. Minakshi Pathak[2]

Affiliations:

1. Research Scholar, Shri Satya Sai University of Technology and Medical Science, Sihore (Madhya Pradesh)
2. Dean , Shri Satya Sai University of Technology and Medical Science, Sihore (Madhya Pradesh)

ABSTRACT

This study compared the self concept among urban and rural sportman. The sample comprised 50 sportsman, aged 14-16 years. For the assessment of self-concept of the subjects, "Swatva Bodh Parikshan"- a test of self concept, designed by Sherry ,Verma and Goswami (1988) was used. players were classified into sportsman and non sportsman based on their participation in active sports and participation at the district level tournaments. The data was analysed using "t" test for each of the measure at .05 level of confidence. The self concept level of the students who are sportsman is higher than those of the students who are non sportsman..

Keywords: Physical fitness, pulse rate, non-sportsmem, self concept

1. INTRODUCTION

Self-concept is an overarching idea we have about who we are—physically, emotionally, socially, spiritually, and in terms of any other aspects that make up who we are (**Neill, 2005**)[1]. We form and regulate our self-concept as we grow, based on the knowledge we have about ourselves. It is multidimensional, and can be broken down into these individual aspects. The influential self-efficacy researcher **Roy Baumeister (1999)** defines self-concept as the individual's belief about himself or herself, including the person's attributes and who and what the self is.

A similar definition comes from the (**Rosenberg's 1979)** book on the topic; he says self-concept is the totality of an individual's thoughts and feelings having reference to himself as an object. Self-concept is related to several other "self" constructs, such as self-esteem, self-image, self-efficacy, and self-awareness. In the following section, we will explain these slight—yet important—differences.

Many studies have associated the practice of PA with self-concept. Meta-analyses confirmed these positive relationships in PA program-based interventions aimed at improving self-concept **(Liu 2015),** as well as in observational studies (**Babic 2014**).

However, some results seem contradictory; many studies proved that PA is positively related to self-concept (**Sonstroem 1997**), For instance, some studies found that the positive relationship between PA and self-concept relied on the kind of sport practiced (**Slutzky and Simpkins 2009**), only occurred among girls was conditional based on body mass index (BMI) (**Reddon 2017**).

The objective of the study is to examine self concept among sportsman and non sportsman. The purpose of this study was to compare the self concept between the sportsman and non sportsman adolescent students.

2. METHODOLOGY

2.1 Selection of Subjects

For the purpose of this study, the participation of the students in extramural which was being recorded by the physical education teacher of the respective schools was taken into account. Age of the subject was obtained from the school records. Participants were selected from various schools of Shahdol district. 50 students were selected as the sample of the study.

2.2 Instrumentation

After briefing the objectives of the study proper consent was taken from the principal and students before conducting study. For the assessment of self-concept of the subjects, "Swatva Bodh Parikshan"- a test of self concept, designed by Sherry ,Verma and Goswami (1988) was used. The statement of the test has simple and declarative about self seeking responses in "Yes" or "No. It is a forty-eight item test, yielding scores in eight different dimensions of self-concept and on the total. The age of the students was collected from the respective school records.

2.3 Statistical Technique

't' test was computed to examine the significance of difference among the group.

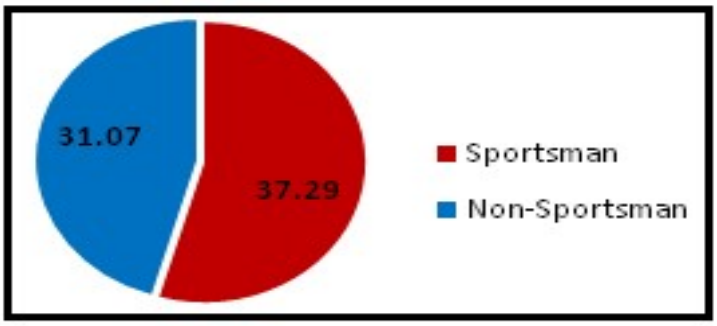
3. RESULTS

Statistical analysis of test data collected from one hundred and fifty students 25 sportsman and 25 non sportsman on the scores of self concept.

TABLE 1

COMPARATIVE ANALYSIS OF SELF CONCEPT AMONG SPORTSMAN AND NON-SPORTSMAN SPORTSMEN.

Subscales	Students	Mean	SD	't'	'p'
Self Concept	Sportsman	37.29	2.56	12.3	0.01*
	Non-Sportsman	31.07	2.91		



Comparative analysis on self-concept of sportsmen and non sportsmen revealed significand difference among the groups, obtained data showed mean scores on self concept of sportsman is 37.29 and sd 2.56 whereas non sportsman mean scores is 31.07 and standard diviation 2.91. computed 't' value 12.30 was much higher than the required table value to be significant at 0.05 level of confidence.

4. DISCUSSION

The outcome of the present research revelaed that there is a significant difference between the group of sportsmen and non sportsman. 't' was computed to determine the significance of difference at .05 level of significance. The findings of this research are in line with those of previous studies that have explored the impact of sports and games have a greater self-concept than non sportsman.

From the results it was clear that there was a significant difference in their self concept levels. This may be due to the better self-concept and self-respect of the sportsman and also may be because of the variations of the age group or gender.

5. CONCLUSION

Finally it may be concluded that the pshychological variables like self concept level of the sportsman is higher than non sportsman and could be considered as the important factors to be successful in the field as well as in society.

6. RECOMMENDATION

The study may be recommended as a similar study may be conducted with a larger sample, including other games. An indepth study of subfactors of self-concept maybe taken up.

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COMPARATIVE STUDY BETWEEN CONSERVATIVE AND OPERATIVE TREATMENT OF FIFTH METATARSAL BASE FRACTURE IN YOUNG ADULTS AND ATHLETES.

Dr. Ranjit Kumar Dutta[1]

Affiliation :

1. M.B.B.S., M.S (Ortho), Dip. In Sports Med. (JU), Associate professor, Department of Orthopedic Surgery, Jagannath Gupta Institute of Medical science & Hospital, 137, K.P. Mondal Road, Buita, Budge Budge, Kolkata – 700137, duttaranjitkumar1952@gmail.com

ABSTRACT

Fifth metatarsal base fracture is a common foot injury in young adults and athletes. This study was done to compare between conservative and surgical treatment in displaced avulsion fracture of fifth metatarsal base in young adults and athletes. Forty-eight patients with displaced fifth metatarsal base avulsion fracture were selected by randomization. Four (8.33%) patients were lost to follow up. Conservative group were immobilized with below knee P.O.P. cast, while operative group were treated by closed reduction and fixation with percutaneous screw or tension band wiring. All patients were followed up at 3 months, 6 months and 12 months. All cases had primary union except for 4 (Four) patients from conservative group and 1 (one) patient from operative group. In conservative group 2 patients results in mal union and 2 with frequent mild to moderate plantar pain. There was non-union of one patient from operative group. The result was better in operative group at 6 months after treatment, but there was no significant difference at 3 months and 12 months. The average time of full weight bearing and returning to work was significantly shortened in operative group than conservative group.

Keywords: Avulsion fractures, closed reduction, conservative treatment, fifth metatarsal base fixation

1. INTRODUCTION

The metatarsal bone fracture accounts for about 35% of all foot fractures. Commonest of them is fifth metatarsal bone fracture. Jone's first reported the fracture of the base of the fifth metatarsal bone in 1902 (**Jones, 1902**). Dameron Jr. and Quill Jr. classified the fracture as Zone 1- fractures are tuberosity avulsion fractures (93%), Zone 2 - fractures are meta diaphyseal fractures, called Jone's fracture (4%) and Zone 3 - fractures are proximal shaft stress fracture (3%). The mechanism of fifth metatarsal base fracture was believed to be an abduction force on the forefoot with simultaneous ankle plantar flexion (**Quil, 1995**). Zone 3 fractures were treated operatively. But there is no clear evidence that which one is superior. The management of the fifth metatarsal base fractures, specifically Zone1 fractures, continued to be a controversial topic. Some prefers conservative treatment for simple displaced avulsion fractures of the Fifth metatarsal base while others favor for operative treatment (**Gen-Bin, Bing and Yun-Feng, (2017**). Conservative treatment was to immobilize with a below knee P.O.P. cast for 2 weeks to avoid venous thrombosis as well as muscular atrophy of lower limbs. After 2 weeks cylinder P.O.P. cast was applied for 4-6 weeks. Several studies show that conservative treatment should have satisfactory outcome. Fractures with mild displacement should be treated for 4 weeks with below knee P.O.P casts.

In contrast some studies show that, conservative treatment results in delayed union and thus delays to return in normal activities. There are also studies that only anatomic reduction and fixation could reconstruct the fifth metatarsal bone and help the patients to early return in normal activities. In this study I had compared the conservative and surgical treatment of Fifth metatarsal base fracture in young adults and athletes (**Mologne, et. al. 2005**)

2. METHODOLOGY

2.1 Sample

From February, 2017 to August, 2019, a total of 48 patients of displaced fifth metatarsal base fracture were included in my study. Four of the above 48 patients were lost in follow-up. I have selected conservative and operative group by randomization. 22 patients were selected for conservative group and 22 patients for operative group. Average age of the patients were18 years to 30 years (young adults and athletes).

2. 2 Procedure

Timing of treatment was within 2 weeks of fracture. I excluded patients with other metatarsal fractures, open fractures, pathological fractures, osteoporotic fracture and previous history of surgery. Among them 28 patients were male and 16 patients were female. 18 patients were athletes, who were engaged with mild to moderate training regularly before injury (10 patients in operative group and 8 in the conservative group). 41 of them had isolated fifth metatarsal base fracture while 3 had fractures in other site of the body along with fifth metatarsal base fracture.

Patients in conservative group were immobilized with a below knee P.O.P. cast at neutral position of ankle joint. Cast was applied for 2 weeks to reduce swelling, there after a below.

TABLE I
INCLUSIVE & EXCLUSIVE CRITERIA

Inclusion Criteria	Exclusion Criteria
- Age: 18 years to 30 years, young adults and athletes. - Isolated, traumatic fifth metatarsal base fracture. - Gap at fracture site was 2 mm or above. - Follow-up at 3 months, 6 months and 12 months	- Age: Less than 18 years and more than 30 years. - Meta-diaphyseal shaft of fifth metatarsal. - Gap at fracture site was less than 2mm. - Non-traumatic or any pathological fractures. - Time to treatment more than 2 weeks. - Missing initial radiograph.

Knee Cylinder P.O.P. cast was applied for 4 weeks, movement of the knee and hip were encouraged from the beginning to avoid venous thrombosis as well as muscular atrophy of lower extremity during immobilization (**Akiman, et al, 2016**) In surgical treatment I have used two methods, 13 patients were treated by screw fixation and 9 patients by tension band wiring technique (**Husain and De Fronzo, 2000**).

Screw Fixation: - Under spinal anesthesia, surgery was done with a tourniquet in thigh. After anesthesia closed reduction was done under C-arm control and hold the reduction with a pointed reduction clamp. One tip of the clamp was placed proximally at the inferior side of the fifth metatarsal base avoiding sural nerve injury, and the other tip was placed distal to the fracture site, along the metatarsal shaft making a small hole by a drill bit or k-wire to hold the other tip. Thus reducing the fracture and locking the clamp a small 1 cm incision was made at the plantar side of the fifth metatarsal base avoiding sural nerve. Then the soft tissue was distracted by an artery forceps, a hole was drilled and a 4.5 / or 5.5 mm cannulated stainless steel screw was tapped under the guidance of guide wire (**Porter, Duncan & Meyer, 2005**)

Post operatively limbs were elevated with a short leg cast in neutral position of ankle joint for 2 weeks, thereafter P.O.P cylinder cast was applied for next 2-4 weeks before weight bearing. Knee and hip movements were encouraged from the very beginning.

Tension –Band Wiring Technique For Fifth metatarsal Base Fracture: After spinal anesthesia patient was placed in supine position. A sand bag was placed under the involved hip to position the extremity in neutral rotation. Tourniquet was applied and a 4 cm long incision was made just lateral to the fifth metacarpal fracture and after dissecting soft tissue, the fracture site was exposed, Freshening of the fracture edges were done and two cortical screws were fixed on the proximal and distal fragments, 1 cm away from the fracture site. Screws were placed more on plantar side, because this side of fifth metatarsal is tension side. The fracture was reduced with compressive force and a stainless steel wire loop was tightened around the screws in figure of 8 fashion. The knot was tightened, trimmed and placed away from the skin to avoid irritation. The screws were counter sinked to avoid the possibility of irritation due to a prominent screw head. Subcutaneous tissues were sutured with absorbable suture after the wound was thoroughly irrigated. Post operatively a short leg cast was used for 6 weeks. After 6 week's patients were given walker boots and progressive weight bearing was allowed as tolerated. All patients were allowed to return in full actively when they were clinically asymptomatic and had progressed to union of fracture, as indicated by radiography and confirmed by C.T. scan. If the hard wire cause discomfort, I remove it after union, otherwise I don't remove it as it usually do not cause any discomfort. I removed it in two patients for skin irritation (**Sarimo, et.al. 2006**)

TABLE 2
TREATEMENT OF FIFTH METATARSAL BASE FRACTURES

Fracture Type	Treatment Type
-Acute non-displaced fifth metatarsal base fracture.	-Non-weight bearing below knee P.O.P. cast for 4 to 6 weeks. -Weight bearing Orthotic for 6 to 10 weeks. -Consider early surgical fixation in athletes. -Conservative treatment: 2 weeks with below knee P.O.P cast followed by 6-8 weeks below knee cylinder P.O.P. cast.
-Acute displaced (2 mm or more) fifth metatarsal base fracture.	II. Operative treatment: 1. Closed reduction and internal fixation with 4.5 / or 5.5 cm cannulated stainless-steel screw. 2. Open reduction and tension band wiring in fig of 8' fashion.

TABLE 3
INPROVEMENT IN FOLLOW-UP

	3 Months	6 Months	12 Months	Average
Conservative Treatment Total patients - 22	14 (63.6%)	16 (72.7%)	20 (91%)	75.76%
Operative treatment Total patients - 22	15 (68%)	19 (86.4%)	21 (95.4%)	83.3%

3. RESULTS & DISCUSSION

Forty-four patients were followed up for 12 months. In surgical group all surgical incisions were healed except one which had mild infection and it was cured by treatment for 2 weeks with antibiotic and regular dressing Union was delayed in this patient. All other patients of operative group had primary Union. Two patients in conservative group had mal union and one of them had mild to moderate pain during walking. Patients were allowed to walk with partial weight bearing on toes with an axillary Crutch from the 4th week and full weight bearing were allowed after 8 to 10 weeks post operatively depending on clinical and radiological union. Full weight bearing time were different for two groups. Operative group were allowed to full weight bearing earlier (i.e. 6 to 8 weak, after receiving treatment), whereas conservative group were allowed weight bearing at 8 to 12 weeks of treatment.

Follow up was done by me at 3 months, 6 months and 12 months after treatment. It was observed that at 6 months operative group were better than conservative group but at 3 months and 12 months there were no difference in two groups. When the patients had normal gait and felt no pain or just little discomfort was considered the time to return to work. Normally the time to return in work was 8 to 10 weeks in operative group and 10 to 12 weeks in conservative group, after treatment and the patient in operative group had better results than those in conservative group. Immediately after treatment and in 12 months there was no significant difference between the 2 groups. Only at 6 months, operative group shows slight better result.

4. CONCLUSION

In fifth metatarsal base feature operative treatment shows better result in 6 months' follow-up whereas no significant difference were observed in 3 months and 12 months follow-up. So it is the choice of patients as well as treating surgeon, which method they will select.

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