



THE RELATIONSHIP BETWEEN JOINTS ANGLES AND SEASONAL PERFORMANCES OF JAVELIN THROWERS OF SOME SELECTED CLUBS OF OROMIA REGIONAL STATE : A BIOMECHANICAL STUDY

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ABSTRACT

The purpose of this study was to examine the relationship between joints angles and performance of the javelin throwers of some selected clubs of Oromia regional state, Ethiopia. For the accomplishment of the purpose of this study 20 male javelin throwers from six clubs (Burayu, Lagatafo, Sululta, Sebeta, Adama and Bishoftu) were selected as the subject. To acquire the kinematical data one high speed Nikon: Coolpix P900 video recording camera mounted at a height of 5 feet was placed 10 meters away perpendicular to the throwing line. After the complete warm up the players were asked to perform the event, three chances were given to each thrower and the only the best throw was selected for further analysis. The digitization of the obtained data was done with the help of Kinovea motion analysis software. All statistical procedures were conducted using the SPSS 23.0 Version software. Pearson product moment correlation coefficient was used to find out the relationship between angles joints and seasonal performance of javelin throwers. The finding of this study reveals that there is a significant relationship between shoulder angle joint and the performance ($r = 0.73, p < 0.05$) at the time of before releasing, during release Phase elbow angle ($r = -0.66, p < 0.05$) and wrist angle ($r = -0.59, p < 0.05$) have a significant relationship with performance and in the follow through phase the shoulder angle has significant relationship with performance ($r = 0.78, p < 0.05$). On the basis of the result it is concluded that at before release and follow throw phase shoulder joint angles has significant relationship with the performances and during release phase elbow angle and wrist angle have a significant relationship with the performances of the throwers.

Key words: Biomechanics, Javelin, Impulse, kinematics and Kinetics

1. INTRODUCTION

The javelin has a strong historic background around 3000 years, to the times of the Mycenaean's and the Romans. This event was originally designed as an offensive weapon and used in favor of the spear as it was lighter and could be thrown rather than thrust allowing, long distance attacks against an enemy. The event javelin saw its introduction to the sporting world in the games of the ancient Greek in around 500BC with a much lighter design than their military counterparts, the objective was to achieve the greatest distance. The throwing techniques in javelin, the velocity at which the thrower releases the implement is by far the most important factor (Morriss & Bartlett, 1996). The first javelin throwing competition at the Olympic game was held in Athens in 1906. The women held their first Olympic javelin competition in Los Angeles 1932 (Yesh, 2015) asserted that a quantitative biomechanical analyst is mainly interested in improving performance and reducing injury risk. Use a mixture of experimental and theoretical approaches to seek answers to such question (Bartlett, 2007). Ethiopian javelin highest achievement in male category is 67.99m by Bekelle Tola in 1989, Addis Ababa and in female category the highest achievement is 45.76m by Shura Utura in 2017, Addis Ababa. Ethiopia (EAF, 2018).

There are several problems in the application of biomechanics to sports, so the application of biomechanics in the qualitative analysis of sport skills by many coaches has been limited. More recent evidence (Knuudson, 2007) reveals that biomechanics scholars have long been interested in developing principles that facilitate the qualitative application of biomechanics to improve movement performance and reduce the risk of injury. Throwing is a popular but complex motor activity, has limited scientific documentation. Quantitative parameters such as release velocity, angles of release, linear and angular acceleration, mechanical energy transfer and net moments of force about a joint are also important (Ariel, 1973; Robert, 1985).

Dali and Richard (1987) concluded that the release velocity is still the most important factor in the javelin throw, but the angular velocity must be taken into consideration as well for it significantly influences javelin flight, the greatest difference between a good throw and a bad throw is the angular velocity and the throwers must consider the total procedure of the javelin throw and keep the direction of the javelin constant during the final phase. Throwing velocity is the most important factor for reaching high throwing distances in javelin throwing (Bartonietz, 2000; Morriss, Bartlett, & Navarro, 2001; Morriss & Bartlett, 1996) as cited in Hans-Peter, Frank and Maren (2017). Research has been done on various forms of ball and javelin throwing, yet the biomechanics of spear throwing were completely unknown (Maki, 2013).

2. METHODOLOGY

2.1. selection of Subjects

To achieve the objectives of this study 20 male javelin throwers from six clubs (Burayu, LagaTafu, Sululta, Sebeta, Adama and Bishoftu) were selected as the subject.

TABLE.1
. SELECTED THROWERS FROM DIFFERENT CLUBS

No.	Clubs	Javelin Throwers
1.	Burayu Athletics club	3
2.	LagaTafu Laga Dadhi Athletics club	4
3.	Sululta athletics project club	4
4.	Sebeta Athletics clubs	3
5.	Adama Athletics club	3
6.	Bishoftu Automotive club	3
Total		20

2.2. Equipments and Facilities

The experimental apparatus used in this research work were camcorder, tripod, measuring tap, lime power, markers and Javelin.

2.3. Data Acquisition

To acquire the kinematical data one high speed Nikon: Coolpix P900 video recording camera was used to capture the movements of throwers. The camcorder mounted at a height of 5 feet, placed at 10 meters away perpendicular to the throwing line. The shutter speed of the camcorder was adjusted at a higher speed (1/1000 of a second) in order to eliminate the blurring effects while processing the recordings. The throwers were asked to perform 3 throws.

2.4. Data Analysis

After recording, all the video footages were downloaded into personal computer and slashed to desired footages. Considering the clarity of the footage, accuracy bit and experts judgment only one best throw selected and subjected to biomechanical analysis.

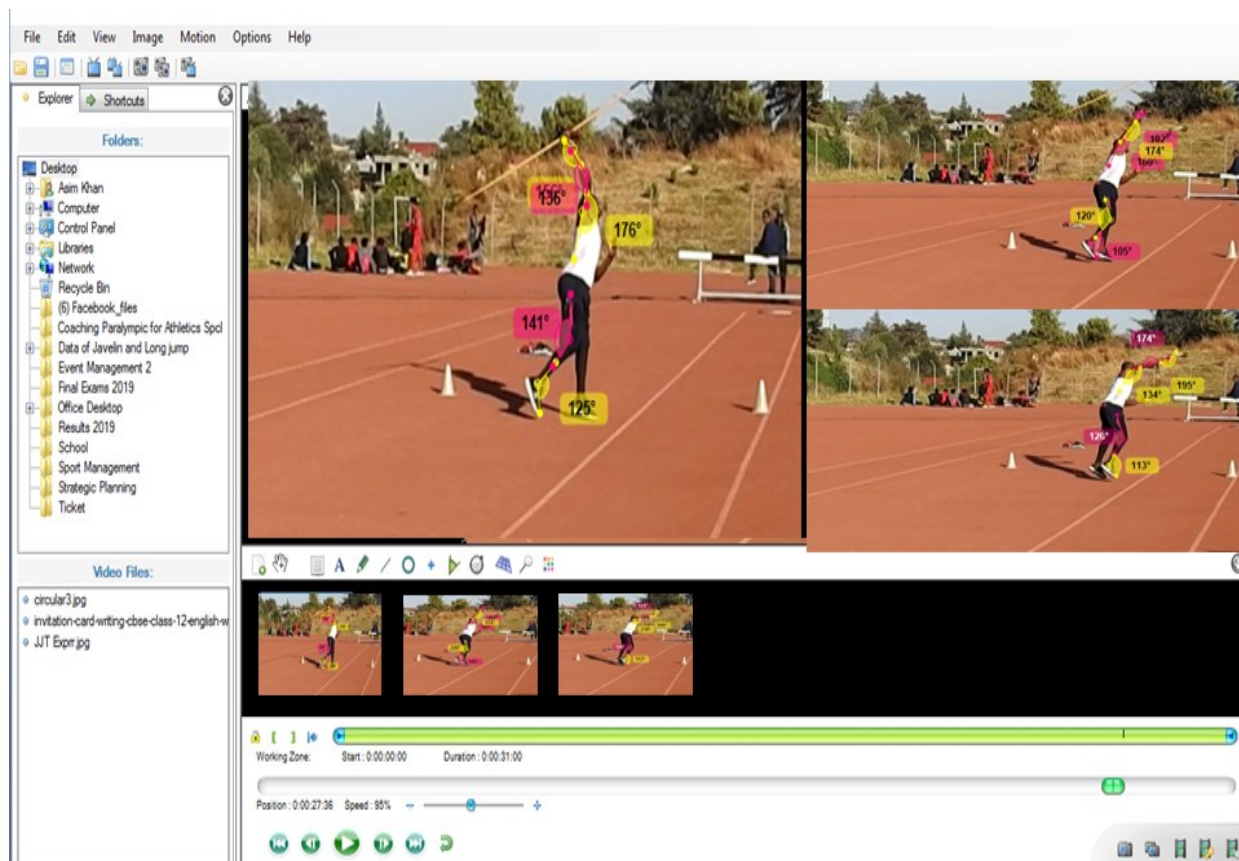


Figure 2.1 Kinovea biomechanical analysis of javelin throwers joint angles

2.5. Statistical Treatment

Pearson product moment correlation coefficient was used to find out the relationship between angles joints and seasonal performance of javelin throwers. The level of significance was set at 0.05 significant.

3. RESULTS

TABLE 2
CORRELATION COEFFICIENT MATRIX RESULTS OF JAVELIN THROWERS

Phases	Joints Angles	R-Value	Sig.
Before release	Ankle	0.34	0.07
	Knee	0.61	.956
	Shoulder	0.73	0.01
	Elbow	-0.32	.057
	Wrist	0.06	.372
During release	Ankle	0.23	.403
	Knee	0.43	.171
	Shoulder	0.31	.262
	Elbow	-0.66	0.01
	Wrist	-0.59	0.01
Follow through	Ankle	0.04	.294
	Knee	0.45	.057
	Shoulder	0.78	0.01
	Elbow	0.34	.707
	Wrist	-0.04	.120

From the above table.2, it is cleared that there is a significant relationship between shoulder angle joint and the performance ($r = 0.73$, $p < 0.05$) at the time of before releasing, during release Phase elbow angle ($r = -0.66$, $p < 0.05$) and wrist angle ($r = -0.59$, $p < 0.05$) have a significant relationship with performance. It is also found that in the follow through phase the shoulder angle has significant relationship with performance ($r = 0.78$, $p < 0.05$).

4. DISCUSSION

The findings of this study confirms that there is a significant relationship between shoulder joint angle and seasonal performances of the throwers at the time of before release, elbow joint and wrist joint angles have a significant relationship with seasonal performances at the time of release phase and during follow throw phase shoulder joint angle also has a significant relationship with seasonal performances of the javelin throwers.

These findings are in line with the findings of other researches. Finnish male throwers at release shoulder 2004-2012 ($r = -.43$) could affect the throwing distance (Riku, 2012). Thorclinson during berlin (2009) world men javelin championship completed a javelin throw with high angle of release 42 degree. Furthermore, difference was observed in rhythm and longer leg length during delivery phase (Leipzig et al, 2009). Similarly, Spotakova during Berlin (2009) world women javelin championship had faced some problem to get optimal javelin throwing angle and at the first trial completed a javelin throw with high angle of release 38.8degree on the third trial thrown 35.6 degree and thrown 59.74m. On contract, Abakuwama does not throw in a relaxed way during qualification 68.92m due to psychological pressure.

In consistent with our finding Jukka (2001) confirmed that During 1995-1998, athletics competitions in Finland there were 159 throws of 26 males, 98 throws of 15 females, throw distance range for women 55.00 - 66.00 m and men 75.00- 87.82 m. Finally,

Finland throwers javelin release angles between 18 and 32 degree. The release angle had significant relationship with throw distance only at individual level. Hui, Steve, and Bing (2010) stated that the athlete can focus more power horizontally than vertically, so the angle of release may be less than 45°. The optimal angle of release for an object that is minimally subject to the effect of air resistance approximates, but is less than 45°.

Dali and Richard (2001) suggested that the throwers must consider the total procedure of the javelin throw and keep the direction of the javelin constant during the final phase. The athletes should be encouraged to maintain a constant technique throughout all phases of the javelin throw. This aspect should be emphasized as one of the most important factors in their training.

There is evidence to suggest that there are some differences between the techniques of elite male and female athletes, suggesting that coaches may need to emphasize different aspects of technique for each gender. More research examining these techniques is required. The question regarding whether these differences are due to strength and structure differences or due to differences in neural patterns remains unanswered (Marion and Alexander, 2005).

5. CONCLUSION

On the basis of the findings of this study it is concluded that there is a significant relationship between shoulder joint angle and seasonal performances of the throwers at the time of before release, elbow joint and wrist joint angles have a significant relationship with seasonal performances at the time of release phase and during follow throw phase shoulder joint angle also has a significant relationship with seasonal performances of the javelin throwers.

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ANTHROPOMETRIC CHARACTERISTICS OF IN-RACE-VELOCITY PERFORMANCE OF NIGERIAN ELITE FEMALE SWIMMERS

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ABSTRACT

To achieve optimal performance in swimming certain anthropometric attributes are essential. The aim of this study was to examine the anthropometric characteristics of in-race velocity performance of elite Nigerian female swimmers. Measurements of anthropometric parameters of 56 female elite Nigerian swimmers were sourced through direct anthropometric standard protocol. Thereafter statistical analyses using Pearson correlation and multiple regressions were conducted with the aid of SPSS version 23.0. The result showed that anthropometry explained 30% ($p < 0.05$) of the variance in the velocity of 50 metre butterflyswimming competition among the swimmers. Correlation studies showed that weight, BMI, % body fat, arm girth, chest girth and thigh correlated significantly, albeit weakly, whereas age, weight, arm span and hip girth correlated negatively with swimmers velocity. In conclusion, optimal performance of Nigerian swimmers' in the 50metre butterfly swimming is determined predominantly by anthropometric variables relevant in swimming.

Keywords: Anthropometry, performance, butterfly swimming, Nigeria swimmers

1. INTRODUCTION

Understanding the importance of physique is essential to optimal performance in swimming. Suitable anthropometric characteristics play a vital role in swimming especially when combined effectively. For a successful performance to take place, no doubt, the athlete needs well-built anthropometric characteristics specific to the requirements of swimming and the particular swimming events in which he or she competes. Moreover, there are other factors such as physiological, biomechanical and psychological, interact with anthropometry for optimal swimming (Anderson *et al.*, 2006). According to Geladas *et al.* (2005) upper limb, grip strength and leg strength play important roles in 100 metre freestyle swimming performance in male swimmers who were 12 to 14 years of age. Charles and Bejan (2008) revealed the proportionality between body and height as being important in the performance of swimmers.

Studies confirmed that the swimmers with best performance have required anthropometric features needed for swimming (Daisy *et al.*, 2015; Jorge *et al.*, 2013). Hlavaty (2010) reported the role of body height in 50m freestyle male swimmers in a local championship. Grimston and Hay (1986) also reported that these anthropometric characteristics have influence on performance and also influence stroke mechanics. Supporting these claims, positive correlation between anthropometric parameters and swimming performance were reported (Barbosa *et al.*, 2015; Girolid *et al.*, 2006; Kukolji *et al.*, 1999). In contrast, previous investigators (Katch and Michael 1973; Smith 1978) had reported low correlations between height and final time for both males and females. In the view of Miyashita (1996) success in competitive swimming is defined as the shortest time needed to propel the swimmer's body over a given distance in the water. In swimming, greater propulsive force produces longer stroke length (East, 1970) and is seen in males more than in female. However, there are similar stroke frequencies in butterfly swimming event in both male and female swimmers (East, 1970; Craig *et al.*, 1985)

Previous studies investigating the importance of anthropometry in swimming performance have produced regional or ethnic outcomes, which may not be in sync with the possible outcomes in our immediate sub-saharan African environment. To date, no study of elite female butterfly swimmers participating in any organized competition in Africa, specifically West Africa has been reported. The 14th West African University Games and 19th Nigerian National Sports Festival provided a rare opportunity to study the best female swimmers in the West African sub-region. Therefore, the aim of this is to examine the relationship between anthropometric characteristics and performance variables female Nigerian swimmers. Overall view of the information from the data provided by the 14th West African University games and 19th Nigerian National Sport festival would help clarify whether anthropometric variables such as age, weight, height, arm span and girths in Nigerian swimmers are simply a reflection of their performance or whether other factors do play a role.

2. METHODOLOGY

2.1 Participants

A total of 56 female Nigerian Swimmers (age= 22.09±3.70 years, height= 1.64±0.05 m, weight 63.94±7.94 and BMI= 23.76±2.64 kg/m²) who participated in the 14th West African University Games and 19th Nigerian National Sports Festival hosted by Nigeria in

the year 2018 volunteered as subjects. The Helsinki principles on ethics in human research were strictly adhered to and informed consent was obtained from the athletes and their coaches. Ethical approval was obtained from Ethics Board of the University of Port Harcourt with the reference number: UPH/CEREMAD/REC/04. Approval letter of permission was obtained from the Nigeria Aquatic Federation and Local Organizing Committees of the different competitions.

2.2 Selection of Variables

Standard anthropometric protocol was adopted in the measurements of weight, height, BMI, Arm span, percentage body fat, arm girth, chest girth, hip girth and thigh girth.

2.3 Criterion Measures

For measurement of weight and height, an accurately-calibrated beam-type balance (stadiometer) which recorded the nearest 0.1kg and 0.1m was used. The arm span measurement was taken from a distance from the left to the right dactyion, when the palms are facing forward and the outstretched arms are abducted to the horizontal. An inextensible anthropometric tape was used to gauge the circumference of the body segments: arm, chest, hip and thigh. Michelli *et al.* (2017) formula for calculation of percentage body fat was adopted in this study. Time as a performance variable was defined as the time taken by the swimmer to swim from starting point to the finishing point. The timing results were sourced from the printed output of the automatic timing device as adopted in a study conducted by Patrick *et al.* (1996). Velocity which is the performance variable was calculated by dividing the size of the length of the swimming pool (50 m) and the time it takes the swimmer to get to the finishing point.

$$\text{Velocity} = \frac{\text{Length of the Swimming Pool}}{\text{Time traveled by the Swimmer from the Start to Finish}} \dots\dots\dots V = \frac{l}{t} \dots\dots\dots \text{Eq 1}$$

Where V= Velocity of the swimmer (m/s), l= length of the swimming pool (m)

t= Time traveled by the swimmer from the start to finish

2.4 Research Design

Preliminary and Final heats of the butterfly swimming event were recorded for female. The event analyzed in this study was the female 50m final heat for butterfly. The study employed descriptive research design. All the measurements were undertaken for two days: first day oversaw the anthropometric measurements of swimmers and profile checks. The second day was used to assess their performance variables such as time and velocity from the start to finish.

2.5 Experimental Protocol

The swimmers positioned from the starting position by lowering their upper body trunk waiting to react to the command Ready and Go. The starter and the timing officials were strategically positioned for better view of the subjects from start to finish. The reading of the stopwatch was made to start immediately the swimmers were immersed in the water. The time was stopped as soon as the swinging arm span passed through the finishing line and was recorded to 2 decimal places which is in agreement with the study conducted by Chandra *et al.* (2017).

2.6 Data Collection of Performance

Swimming performance was examined as the time spent in completing the 50 meters butterfly event in both official competitions. The 50 meters butterfly was selected because it was the event that had large numbers of participants.

2.7 Model Specification

The model specified in the study was in line with the hypothesis, for the need of providing quantitative baseline answers bordering on the research.

Performance of Female Swimmers (PFS) = $\sum f(\text{Age, Body Weight, Height, BIM, Arm Span, Body Fat, Arm Girth, Chest Girth, Hip Girth, Thigh Girth})$ -----Eq 2

2.8 Regression Estimation Equations for Female Swimmers

PFS = $\sum (\epsilon_0 + \epsilon_1 \text{Age} + \epsilon_2 \text{Body Weight} + \epsilon_3 \text{Height} + \epsilon_4 \text{BMI} + \epsilon_5 \text{Arm Span} + \epsilon_6 \text{Body Fat} + \epsilon_7 \text{Arm Girth} + \epsilon_8 \text{Chest Girth} + \epsilon_9 \text{Hip Girth} + \epsilon_{10} \text{Thigh Girth}) + \mu$ ----- Eq 3

μ is defined as stochastic or random variable. This represents other factors that are not captured in this study that could affect performance.

2.7 Statistical Analysis

As soon as the anthropometric and performance variables were collected, a series of statistical calculations were performed using SPSS version 23.0. The data from all preliminary and final heats were combined to form a single data bank for the 50 metre competition. First the descriptive results of anthropometric and performance variables were calculated. A correlation test was performed to know the linear relationship of anthropometry to velocity of the swimmer. Thereafter, multiple regression analysis was adopted to predict the extent anthropometry affects performance of the sampled athletes.

3. RESULTS

The mean and standard deviation for the experimental variables for the women are presented in Table 1. The correlation result in table 2, shows weak positive correlation between weight, BMI, percentage body fat, arm girth, chest girth and thigh girth to velocity performance at $p > 0.05$. Table 3 reveals the multiple regression analysis between anthropometric variables and performance variables of female swimmers. The result of R^2 change indicates 0.305, which means about 30% predictor variables contributed significantly to the prediction of swimming velocity performance.

TABLE 1

DESCRIPTIVE RESULTS OF KINANTHROPOMETRIC AND PERFORMANCE VARIABLES OF NIGERIA FEMALE SWIMMERS

S.No.	Variables	Mean±SD	Minimum	Maximum
1	Age (years)	21.36±2.82	18.00	29.00
2	Weight (kg)	58.39±9.82	43.00	107.00
3	Height (m)	1.65±0.08	1.40	1.85
4	BMI (kg/m ²)	21.34±3.06	16.51	34.15
5	Arm span (mm)	171.92±11.44	142.00	205.00
6	% Body Fat	24.92±3.84	19.01	41.33
7	Arm girth (cm)	10.26±1.16	6.50	14.20
8	Chest girth (cm)	33.06±3.34	22.00	46.80
9	Hip girth	30.09±3.61	20.00	45.00
10	Thigh girth	20.49±2.38	13.50	28.30
11	Time (sec)	36.88±5.59	31.25	49.75
12	Velocity (m/s)	1.38±0.18	1.00	1.60

TABLE 2
PEARSON CORRELATION RESULTS FOR NIGERIA FEMALE SWIMMERS

Performance Variables		Age (Yrs)	Weight (Kg.)	Height (M)	BMI (kg/m ²)	Arm Span (mm)	% Body Fat	Arm Girth (cm)	Chest Girth (cm)	Hip Girth (cm)	Thigh Girth (cm)
Time Taken by the Swimmer to swim	R P-Value	0.05 0.70	-0.03 0.82	0.07 0.60	-0.08 0.54	0.10 0.46	-0.04 0.77	-0.24 0.08	-0.03 0.82	0.21 0.12	-0.22 0.11
Swimming Velocity	R P-Value	-0.06 0.67	0.05 0.69	-0.04 0.76	0.09 0.52	-0.07 0.59	0.04 0.77	0.26 0.06	0.06 0.65	-0.17 0.22	0.23 0.09

** . Correlation is significant at the 0.01 level (2-tailed). * . Correlation is significant at the 0.05 level (2-tailed)

TABLE 3
MODEL SUMMARY OF MULTIPLE REGRESSION RESULTS OF NIGERIAN FEMALE SWIMMERS.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Chnge	F Change	df1	df2	Sig. F-change	Durbin watson
1	0.552*	0.305	0.150	0.16283	0.305	1.974	10	45	0.059	0.949

a. Predictors: (Constant), TGH, ASP, BMI, AGE, WST, HGT, ARM, CHT, BDF, WGT

b. Dependent Variable:PFM

Coefficients*

Model	B	Std Error	Beta	t	Sig	Lower Bound	Lower Bound	Zero Order	Partial	Part	Tolerance	VIF
(Constant)	3.944	3.408		1.158	0.253	-2.919	10.808					2.360
Age (years)	0.004	0.012	0.058	0.301	0.765	-0.028	0.020	-0.058	-0.045	0.037	0.424	169.185
Weight (kg)	0.019	0.029	1.074	0.664	0.510	-0.039	0.078	0.054	0.099	0.083	0.006	53.939
Height (m)	1.379	1.951	0.645	0.707	0.483	-5.309	2.551	-0.043	-0.105	0.088	0.019	110.14
BMI (kg/m ²)	0.014	0.075	0.248	0.190	0.850	-0.166	0.137	0.087	-0.028	0.024	0.009	2.024
Arm Span (mm)	0.002	0.003	0.147	0.834	0.409	-0.008	0.003	-0.074	-0.123	0.104	0.494	17.875
Percentage Body Fat (%)	0.033	0.024	0.718	1.366	0.179	-0.082	0.016	0.041	-0.199	0.170	0.056	4.727
Arm Girth (cm)	0.101	0.041	0.658	2.435	0.019	0.017	0.184	0.255	0.341	0.303	0.212	6.362
Chest Girth (cm)	0.018	0.017	0.341	1.089	0.282	-0.052	0.015	0.063	-0.160	0.135	0.157	2.436
Waist Girth (cm)	0.019	0.009	0.378	1.951	0.057	-0.038	0.001	-0.166	-0.279	0.242	0.411	4.349
Thigh Girth (cm)	0.015	0.019	0.203	0.785	0.437	-0.024	0.054	0.229	0.116	0.098	0.230	2.360

a. Dependent Variable:PFM

Source: Author's Compilation from SPSS Results Outputs, 2019

Regression equation of the above interpretations is as follows

$$PFS = 3.944 - 0.004AG + 0.019BW - 1.379HG - 0.014BM - 0.002AS - 0.033BF + 0.101AC - 0.018CC - 0.019WC + 0.015TC + \mu$$

Where $P_sFS_{velocity}$ = Velocity of the Female Swimmers
 μ = other excluding variables

From the Model Summary

$P_sFS_{velocity}$ F (10, 45) = 1.974, $\rho < 0.059$, $R^2 = 0.305$. This implies that all variables added are statistically significant to the prediction at $p < 0.05$

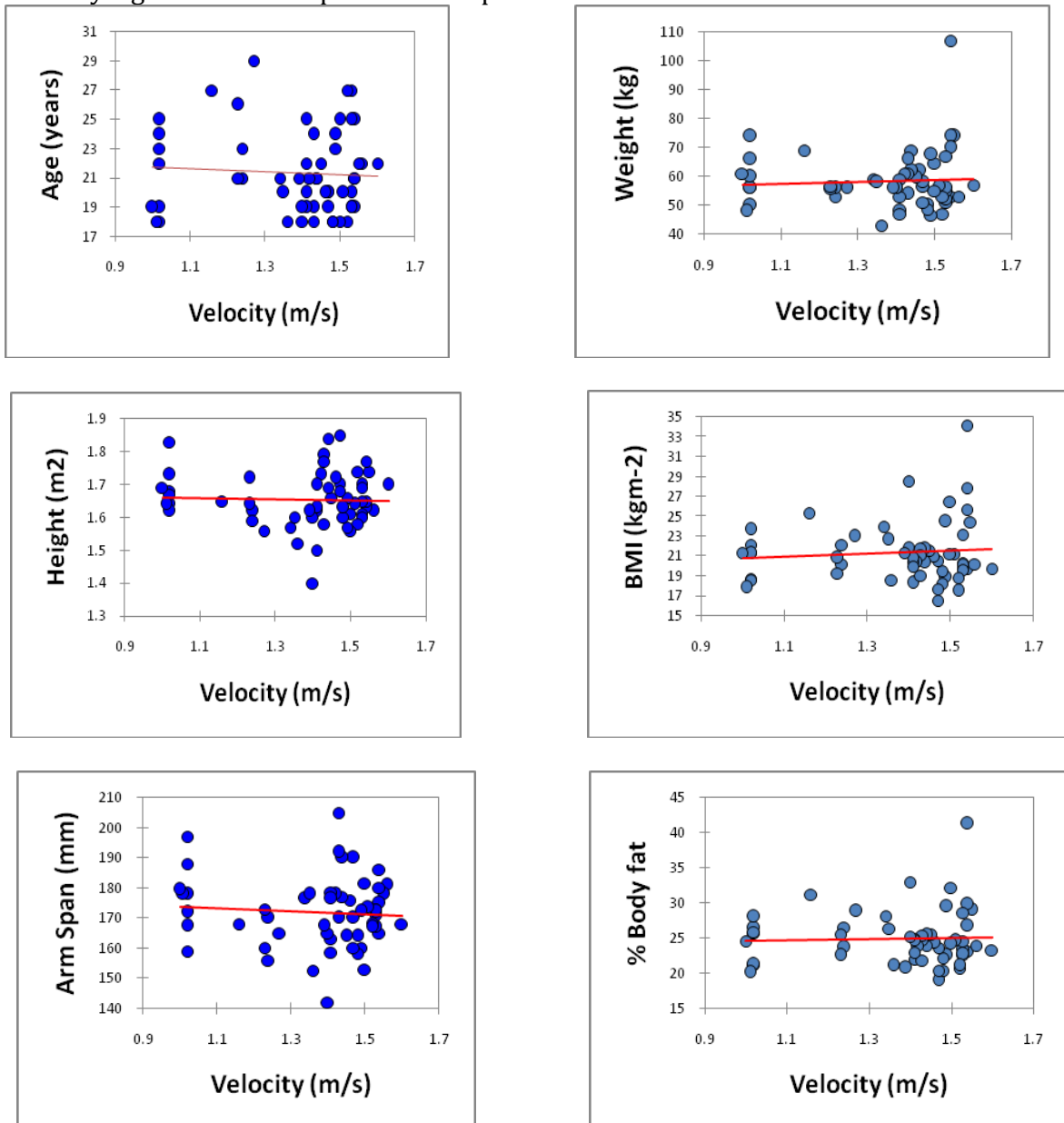


Figure1: correlation between the age, weight, height, BMI, Arm Span and percentage body fat and swimming velocity in a 50-m butterfly competition.

4. DISCUSSION

There are various lines of evidence to suggest an association between anthropometric characteristics and swimming velocity of swimmers. This study was conducted to examine the relationship between anthropometric variables and the performance of 50metre butterfly female swimmers. The results in table 4.3 turned out interesting and proved that the value of grand beta as -0.484 shows statistical significance and also contribute to predicting the swimmers. This is in agreement with the study of Jorge *et al.* (2012) who reported the connection of stroke index and performance in female swimmers grand beta value of -0.780. The result also revealed the connection between the predictor variables and the criterion variable. This is explained by the multiple correlation coefficient ($R=0.552$) as well as the determinant coefficient ($R^2=0.305$), which indicates 30.5% of the common information.

The remaining 69.5% of the information in the explanation of the overall criterion variable can be ascribed to other characteristics, techniques and athletes abilities which were not included in the study, however, considering the standard of the competitors, the techniques and fitness of the swimmers at the comparable levels. From the study also, the predictor variables which interact to contribute to the relationship between anthropometric variables and female swimmers' performance are age, height, body mass index, arm span, percentage body fat, chest girth and hip girth while weight, arm girth and thigh girth did not interact with other variables to contribute significantly to the performance outcome. This is slightly higher when compared with the value of Sladana (2011) who reported the multiple correlation coefficient ($R=0.44$) and the determinant of coefficient ($R^2= 0.19$).

The specific findings for the correlation between anthropometric variables and swimming velocity included the following: the very low positive correlation between weight, body mass index, percentage body fat, arm girth, chest girth and thigh girth and the swimming velocity in 50-m butterfly events (see table 2). This is in contrast with the study of Sladana (2011) who revealed the connection between the predictor variables and the criterion variable which can be explained by means of the multiple correlation coefficient ($R= 0.46$) and with a very weak negative correlation between age, height, arm span and hip girth and the swimming velocity. However, these variables are strong indicators of optimal swimming performance. This negative correlation for these anthropometric variables could result to the possibility of low swimming performance when they compete at the international level. Considering the fact that age, height and arm span are important anthropometric variables that aid in optimal performance.

The anthropometric mean values of weight, height and arm span in the present study were 58.39 ± 9.82 kg, 1.65 ± 0.08 kg and 171.92 ± 11.44 mm respectively, which are higher than the values in height 154.75 ± 7.47 cm and weight 43.96 ± 7.17 kg in the work done by Jose *et al.* (2010) using national swimmers in Spain. Damir *et al.* (2007) also recorded values in body weight, height and body mass index as 49.67 ± 3.82 kg, 160.70 ± 4.32 and 18.98 ± 1.38 kg/m² which are lower than the present study, these differences may be results of environmental and genetic factors which could have a negative effect on the swimmers when competing with their counterparts who possess well defined anthropometric structures at the elite level. Furthermore, a study by Tolga *et al.* (2017) recorded a decrease in body weight 42.0 ± 7.8 kg and height 152.2 ± 8.3 cm and higher in arm girth $24.3.0\pm 2.6$ cm

and hip girth 79.8 ± 7.5 cm and percentage body fat $13.5 \pm 3.2\%$ when compared with the present study that has arm girth 10.26 ± 1.16 cm, hip girth 30.09 ± 3.61 cm. However, in percentage body fat, our value is $24.92 \pm 3.84\%$ and is higher than the previous study. Interestingly, our study revealed high mean value in weight as compared to other studies, this may be disadvantageous to their performance, because of overweight which has been reported not to be suitable for swimming.

Sladana (2011) reported the mean values of female swimmers' weight as 51.9 ± 7.1 kg, 163.9 ± 10.5 cm for height and body mass index as 19.3 ± 1.9 kg/m² appeared lower than the present study and Patrick *et al.* (1990) have anthropometric variables values of female Olympic swimmers in the 100 meter race as age 19.43 ± 2.28 years and height 170.22 ± 7.51 cm and the time as 64.25 ± 3.49 which is similar to the values of our study except the time of swimming in our study which is reported as 36.88 ± 5.59 sec. Interestingly, the similarity in age and height of both studies could be results of race, environmental condition, the nature of the competitions and the selection criteria in both competitions.

It is of interest to consider that certain anthropometric variables might have an effect on the performance of swimmers, a notion that is reinforced by the information from the history of swimming records reported in the present study. It is paramount to understand the reality on ground at the national level so that coaches and athletes will see the need to improve in the training session and selection process. Furthermore, the strength of our study lies in its novelty in the African sub-saharan region and its subject recruitment who were considerably elite swimmers. This allowed for the exclusion of non-elite swimmers which may affect our analyses negatively. In this regards, Cochrane *et al.* (2015) alluded in their study that body height was responsible for propulsive force of swimmers. Our results show support of previous researches that have identified anthropometric variables as important predictors of swimming (Daisy *et al.*, 2015; Zuniga *et al.*, 2011; Silva *et al.*, 2007).

5. CONCLUSION

The current study provides an insight to the preliminary examination on the performance of selected swimmers. The result showed low percentage contribution of the interaction between predictor variables in relation to the criterion variables even though it is supported by the grand Beta value of -0.484. This shows statistical significance suggesting that null hypothesis is upheld and which implies that there exist relationship between anthropometric variables and swimming velocity. Although negative correlation exists between some anthropometric variables and swimming, one must appreciate the role of these variables to 50 metreswimming performance. This study has succeeded in building the typical performance profiles through regression equation of 50 metre race of Nigerian female swimmers. In this regards also, it has been convincingly shown that anthropometric measures are important for swimming assessment.

To acquire a more comprehensive relationship between swimming performance and anthropometric measurements, other factors such as shoulder width and hip joint flexibility could be identified as predictors of swimming performance.

Conflicts of Interest

The authors declare no conflict of interests.

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उद्यमी महिलाओं के तनाव प्रबन्धन पर शिक्षा के प्रभाव का अध्ययन

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सार

महिला उद्यमियों से आशय महिला जनसंख्या के उस भाग से है जो उद्यम के क्षेत्र में साहसिक भूमिका निभाती हैं। कोई भी उद्यम समाज की प्रगति का मूल आधार होता है महिलाओं के उद्यम स्थापित करने का प्रमुख उद्देश्य उन्हें आत्मनिर्भर बनाकर निर्धनता एवं बेरोजगारी को दूर करके राष्ट्र के आर्थिक विकास में योगदान देना है। देश की अर्थव्यवस्था में उद्यमी महिलाओं की बढ़ती हुई भागीदारी सुखद और सुरक्षित भविष्य की ओर एक सार्थक पहल मानी जा सकती है परन्तु आज घर और उद्यम की दोहरी जिम्मेदारी के कारण उद्यमी महिलाओं को तनाव की वजह से स्वास्थ्य संबंधी बीमारी और भूलने की बीमारी का खतरा बढ़ रहा है। उद्यम संबंधी आवश्यक जानकारी एवं शिक्षा का निम्न स्तर तनाव के स्तर को और अधिक बढ़ा देता है। विगत कई वर्षों से सतना शहर में उद्यमी महिलाओं की संख्या बढ़ी है विभिन्न उत्पादों के विक्रय, रेस्टोरेन्ट, शैक्षणिक संस्थान, हॉबी क्लासेस, ब्यूटी पार्लर, बुटिक, ट्यूशन क्लासेस, खाद्य संरक्षण आदि के क्षेत्र में सफल उद्यमी महिलाएं परिवार के आर्थिक स्तर में वृद्धि कर रही हैं, सतना शहर में महिला उद्यमियों के लिए अनेक संभावनाएं निहित हैं प्रस्तुत शोध कार्य में सतना शहर की महिला उद्यमियों के तनाव प्रबन्धन पर शिक्षा के प्रभाव का अध्ययन किया गया है। सतना शहर, सतना जिले का एक प्रमुख औद्योगिक क्षेत्र है और मध्य प्रदेश के मानचित्र में भी यह एक विशिष्ट स्थान रखता है। परिवहन, शिक्षा, सुविधाओं का विस्तार, नगरीकरण, औद्योगीकरण जैसे कारकों ने सतना को एक विकासशील शहर के रूप में स्थापित किया है। सतना शहर की उद्यमी महिलाओं का तनाव प्रबन्धन स्तर ज्ञात करने के लिए 'जतमे डंदंमउमदज' बंसम 'डैड्ड' डा. वंदना कौशिक और डा. नम्रता अरोराद्ध शोध उपकरण का उपयोग किया गया है। सतना शहर के संपूर्ण समग्र को सर्वप्रथम वार्ड में विभाजित किया गया। न्यादर्श के चयन हेतु वार्डों को संख्यात्मक क्रमानुसार विषम संख्या में लिया गया, 45 वार्ड में कुल 23 वार्ड लिए गए। प्रस्तुत शोध कार्य में सतना शहर की साक्षर एवं शिक्षित उद्यमी महिलाओं में 150 साक्षर (प्रायमरी से मिडिल) और 150 शिक्षित (हाई स्कूल से स्नातकोत्तर) कुल 300 महिलाएं ली गईं। उद्यमी महिलाओं का चयन उद्देश्यपूर्ण निदर्शन पद्धति से किया गया। शोध परक जानकारी प्राप्त करने के लिए तनाव प्रबन्धन मापनी के द्वारा महिला उद्यमियों से उनके उद्यम के क्षेत्र में होने वाले तनाव के बारे में जानकारी प्राप्त की गई। शोध द्वारा प्राप्त प्रदत्तों का संपादन, वर्गीकरण और सारणीयन करके सांख्यिकीय विश्लेषण के माध्यम से परिणाम प्राप्त किए गए। जिसके आधार पर निष्कर्षतः यह कहा जा सकता है कि शिक्षा उद्यमी महिलाओं के ज्ञान, निर्णय क्षमता और आत्म विश्वास को संवर्धित करती है शिक्षा के स्तर में वृद्धि तनाव प्रबंधन के स्तर को बढ़ाता है अर्थात शिक्षा उद्यमी महिलाओं की समस्याओं के समाधान में वृद्धि करती है।

1. प्रस्तावना

महिला उद्यमियों से आशय महिला जनसंख्या के उस भाग से है जो औद्योगिक क्रियाओं में साहसिक भूमिका निभाती हैं। कोई भी उद्यम समाज की प्रगति का मूल आधार होता है महिलाओं के उद्यम स्थापित करने का प्रमुख उद्देश्य उन्हें आत्मनिर्भर बनाकर निर्धनता एवं बेरोजगारी को दूर करके राष्ट्र के आर्थिक विकास में योगदान देना है। महिलाएँ किसी भी समाज अथवा राष्ट्र के उपलब्ध मानवीय संसाधनों के उस अहम हिस्से का प्रतिनिधित्व करती हैं जो दुर्भाग्यवश अभी तक राष्ट्र के आर्थिक, सामाजिक विकास की मुख्यधारा से पूरी तरह नहीं जुड़ पायी हैं। सदियों से महिलाओं के आर्थिक विकास के लिए सतत प्रयास किए जा रहे हैं यद्यपि परम्परागत रूढ़िवादी सोच से बाहर निकलकर महिलाओं ने उद्यम के क्षेत्र में अनेक चुनौतियों को स्वीकार करते हुए अपनी उपस्थिति दर्ज की है। महिला उद्यमियों ने प्रबंधकीय कौशल के आधार पर अपनी उद्यमीय क्षमता के कई अनुकरणीय उदाहरण प्रस्तुत किए हैं। देश की अर्थव्यवस्था में उद्यमी महिलाओं की बढ़ती हुई भागीदारी सुखद और सुरक्षित भविष्य की ओर एक सार्थक पहल मानी जा सकती है परन्तु घर और उद्यम की दोहरी जिम्मेदारी के कारण उद्यमी महिलाओं को तनाव की वजह से भूलने की बीमारी का खतरा बढ़ रहा है। यह शोध स्वीडेन की 800 ऐसी उद्यमी महिलाओं पर किया गया जो तलाक के बाद या फिर अपने जीवन साथी की मौत के बाद तनाव की वजह से उनको गंभीर बीमारी होने की संभावना बढ़ जाती है।

आज उद्यम के क्षेत्र में काम का दबाव अधिक होने से शिक्षित उद्यमी महिलाओं की अपेक्षा साक्षर उद्यमी महिलाओं में तनाव की समस्या लगातार बढ़ती जा रही है। उद्यमी महिलाओं का निजी जीवन, घर और उद्यम की जिम्मेदारी महिलाओं को अत्यधिक तनाव देने का काम करती है। ऐसे में कई बार नींद भी बुरी तरह से प्रभावित होती है। जिसके कारण उद्यम के बेहतर परिणाम भी प्राप्त नहीं होते हैं। तनाव की समस्या किसी को भी हो सकती है। इसके कारण महिलाओं के स्वभाव में भी बहुत परिवर्तन आ जाता है। अपने उद्यम में असफल हो जाने या फिर बीच में ही उद्यम बन्द हो जाने से यह बात महिलाओं के दिल के साथ-साथ दिमाग पर भी हावी हो जाती है। जब कोई महिला अपना उद्यम स्थापित करती है वह यह सोच-सोच कर तनाव ग्रस्त हो जाती है कि पता नहीं उसे सफलता मिलेगी भी या नहीं उसे अपनी सफलता में संदेह के कारण उसका तनाव बढ़ता जाता है। कोई भी महिला तनाव में रहकर अपने उद्यम का संचालन सही तरह से नहीं कर सकती है और तनाव के कारण वह उसी समस्या में उलझी रहती है। उद्यम संबंधी आवश्यक जानकारी एवं शिक्षा का निम्न स्तर तनाव के स्तर को और अधिक बढ़ा देता है। घरेलू कुटीर एवं लघु उद्योग के कार्यक्षेत्र से जुड़ी महिलाएं निरक्षर या साक्षर भी होती हैं जिससे उनमें तनाव का स्तर अधिक उच्च देखा जाता है।

विगत कई वर्षों से सतना शहर में उद्यमी महिलाओं की संख्या बढ़ी है विभिन्न उत्पादों के विक्रय, रेस्टोरेन्ट, शैक्षणिक संस्थान, हॉबी क्लासेस, ब्यूटी पार्लर, बुटिक, ट्यूशन क्लासेस, खाद्य संरक्षण आदि के क्षेत्र में सफल उद्यमी महिलाएं जहां एक ओर परिवार के आर्थिक स्तर में वृद्धि कर रही हैं, वहीं दूसरी ओर उद्यमी महिलाओं को रोजगार के अवसर उपलब्ध कराकर समाज के आर्थिक विकास में अपना योगदान दे रही हैं। सतना शहर में महिला उद्यमियों के लिए अनेक संभावनाएं निहित हैं प्रस्तुत शोध कार्य में सतना शहर की महिला उद्यमियों के तनाव प्रबन्धन पर शिक्षा के प्रभाव का अध्ययन किया गया है।

महेश झा (2012) – ने अपने शोध कार्य में पाया कि भारतीय महिलाएं सबसे ज्यादा तनाव में रहती हैं। 121 विकसित और उभरते हुए देशों में कराए गए नीलसन सर्वे में सामने आया कि तेजी से उभरते हुए देशों में महिलाएं आज भी दबाव में हैं। सर्वे में 87 प्रतिशत भारतीय महिलाओं ने कहा कि ज्यादातर समय वे तनाव में रहती हैं और 82 प्रतिशत का कहना है कि उसके पास आराम करने के लिए भी वक्त नहीं होता है।

एसोमैच के सर्वे (2015) के अनुसार – घर और उद्यम की दोहरी जिम्मेदारी के कारण उद्यमी महिलाओं का तनाव बढ़ता है। जिम्मेदारियों के चलते वे अपनी सेहत को नजर अंदाज करती हैं। घर वालों के उदासीन और उपेक्षा पूर्ण रवैये के कारण कभी-कभी महिलाएं अवसाद और चिड़चिड़ेपन का शिकार हो जाती हैं। अधिक तनाव और श्रम के कारण या उद्यम में किसी बड़े हादसे के कारण अनेक प्रकार की शारीरिक और मानसिक बीमारियां उन्हें घेर लेती हैं। 78 फीसदी उद्यमी

महिलाओं को कोई न कोई लाइफ स्टाइल डिऑर्डर है। 42 फीसदी महिलाओं को पीठदर्द, मोटापा, अवसाद, मधुमेह, उच्च रक्तचाप के चलते दिल की बीमारी का खतरा तेजी से बढ़ रहा है।

बी एम जे ओपन (2015) – ने अपने शोध कार्य में पाया कि उद्यम के क्षेत्र में तनाव में रहने वाली महिलाओं में भूलने की बीमारी ज्यादा देखी गई है और तनाव के कारण ही महिलाओं में ब्लड प्रेशर और ब्लड शुगर का स्तर भी बढ़ने लगता है।

शोध उद्देश्य :- महिला उद्यमियों के तनाव प्रबन्धन पर शिक्षा के प्रभाव का अध्ययन करना।

शोध परिकल्पना :- शिक्षित महिला उद्यमियों का तनाव प्रबन्धन का स्तर साक्षर उद्यमी महिलाओं की तुलना में ज्यादा अच्छा होता है।

अध्ययन का समग्र :- सतना शहर, सतना जिले का एक प्रमुख औद्योगिक क्षेत्र है और मध्य प्रदेश के मानचित्र में भी यह विशिष्ट स्थान पर है। परिवहन, शिक्षा, सुविधाओं का विस्तार, नगरीकरण, औद्योगीकरण जैसे कारकों ने सतना को एक विकासशील शहर के रूप में स्थापित किया है। बिड़ला सीमेन्ट फैक्ट्री, सतना सीमेन्ट फैक्ट्री, मैहर सीमेन्ट, यूनिवर्सल केबल्स फैक्ट्री एवं प्रिज्म सीमेन्ट, बीडी और चूना उद्योग जैसे कई बड़े उद्योगों के साथ छोटे उद्यम भी स्थापित हैं जिसमें उद्यमी महिलाओं की भी सशक्त भागीदारी है। सतना शहर में उद्यमी महिलाएं विभिन्न उत्पादों के विक्रय, रेस्टोरेन्ट, शैक्षणिक संस्थान, हॉबी क्लासेस, ब्यूटी पार्लर, बुटिक, ट्यूशन क्लासेस, खाद्य संरक्षण आदि के क्षेत्र में जहां एक ओर परिवार के आर्थिक स्तर में वृद्धि कर रही है, वहीं दूसरी ओर महिलाओं को रोजगार के अवसर उपलब्ध कराकर समाज के आर्थिक विकास में अपना योगदान दे रही हैं।

2. शोध प्रविधि

प्रस्तुत शोध कार्य में उद्यमी महिलाओं के तनाव मापन के लिए तनाव प्रबन्धन मापनी शोध उपकरण को प्रयुक्त किया गया है। शोध द्वारा प्राप्त प्रदत्तों का संपादन, वर्गीकरण और सारणीयन करके सांख्यिकीय विश्लेषण के माध्यम से निष्कर्ष प्राप्त किए जाएंगे।

2.1 शोध उपकरण

प्रस्तुत शोध कार्य में सतना शहर की उद्यमी महिलाओं के तनाव प्रबन्धन स्तर ज्ञात करने के लिए 'जतमे डंदंमउमदज बंसम' षडैद्ध षडा. वंदना कौशिक और डा. नम्रता अरोराद्व शोध उपकरण का उपयोग किया गया है। इस मापनी में कुल पदों की संख्या 36 है। इन 36 पदों में 18 धनात्मक पद तथा 18 ऋणात्मक पद सम्मिलित हैं। धनात्मक पदों के उत्तरों में पूर्णतः सहमत को 5 अंक, सहमत (उच्च) 4 अंक, सहमत (निम्न) 3 अंक, असहमत (निम्न) 2 अंक, असहमत (उच्च) 1 अंक और पूर्णतः असहमत 0 अंक निर्धारित हैं जबकि ऋणात्मक पदों में सहमत को 0 अंक, सहमत (उच्च) 1 अंक, सहमत (निम्न) 2 अंक, असहमत (निम्न) 3 अंक, असहमत (उच्च) 4 अंक और पूर्णतः असहमत 5 अंक निर्धारित हैं।

2.2 न्यादर्श का चयन

प्रस्तुत शोध कार्य में सतना शहर की उद्यमी महिलाओं के तनाव प्रबन्धन स्तर का अध्ययन करने के लिए सतना शहर की समस्त उद्यमी महिलाओं का अध्ययन किया जाना व्यवहारिक दृष्टिकोण से संभव नहीं होने के कारण सतना शहर के संपूर्ण समग्र को सर्वप्रथम वार्ड में विभाजित किया गया। न्यादर्श के चयन हेतु वार्डों को संख्यात्मक क्रमानुसार विषम संख्या में लिया गया, 45 वार्ड में कुल 23 वार्ड लिए गए। प्रस्तुत शोध कार्य में सतना शहर की साक्षर एवं शिक्षित उद्यमी महिलाओं में 150 साक्षर (प्रायमरी से मिडिल) और 150 शिक्षित (हाई स्कूल से स्नातकोत्तर) कुल 300 महिलाएं ली गईं। उद्यमी महिलाओं का चयन उद्देश्यपूर्ण निदर्शन पद्धति से किया गया।

2.3 प्रदत्तों का संकलन

शोध परक जानकारी प्राप्त करने के लिए तनाव प्रबन्धन मापनी के द्वारा महिला उद्यमियों से उनके उद्यम के क्षेत्र में होने वाले तनाव के बारे में जानकारी प्राप्त की गई। मापनी देने के पूर्व उन्हें शोध उद्देश्य की जानकारी दी गई तथा उन्हें आश्वस्त किया गया कि उनके द्वारा दी गई जानकारी अकादमिक एवं शोध कार्य में ही प्रयुक्त की जाएगी।

2.4 न्यादर्श की विशेषताएं:- प्रस्तुत शोध अध्ययन में न्यादर्श की निम्न लिखित विशेषताएं हैं -

1. सभी महिलाएं हैं।
2. सभी महिलाएं उद्यमी हैं।
3. महिलाओं की आयु 25 से 46 वर्ष की हैं।
4. महिलाएं विवाहित, अविवाहित दोनों हैं।
5. कुछ महिलाएं साक्षर और कुछ महिलाएं शिक्षित हैं।
6. महिलाएं सभी धर्मों से हैं।
7. सभी महिलाएं शहरी हैं।

प्रस्तुत शोध में न्यादर्श हेतु स्कूल संचालक, कोचिंग क्लास का संचालन, ब्यूटी पालर संचालिका, रेस्टोरेन्ट संचालिका, बुटिक संचालिका को चयनित किया गया है।

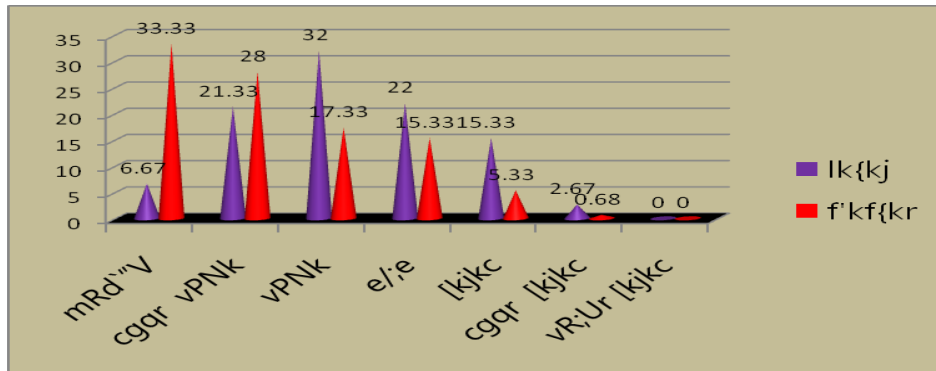
3. परिणाम एवं विवेचना

प्रस्तुत शोध कार्य में सतना शहर की साक्षर एवं शिक्षित 300 उद्यमी महिलाओं के तनाव प्रबंधन पर शिक्षा के प्रभाव का अध्ययन किया गया है।

तालिका क्र. 1
सर्वेक्षित उद्यमी महिलाओं के तनाव प्रबंधन पर शिक्षा के प्रभाव का विवरण

क्रमांक	तनाव प्रबंधन स्तर	छात्र 300				योग	
		साक्षर महिला छ=150		शिक्षित महिला छ=150		संख्या	प्रतिशत
		संख्या	प्रतिशत	संख्या	प्रतिशत		
1	उत्कृष्ट	10	6.67	50	33.33	60	20.00
2	बहुत अच्छा	32	21.33	42	28.00	74	24.67
3	अच्छा	48	32.00	26	17.33	74	24.67
4	मध्यम	33	22.00	23	15.33	56	18.67
5	खराब	23	15.33	8	5.33	31	10.33
6	बहुत खराब	4	2.67	1	0.68	5	1.66
7	अत्यन्त खराब	0	0.00	0	0.00	0	0.00
योग		150.00	100.00	150.00	100.00	300.00	100.00

स्रोत : सर्वेक्षण पर आधारित।



स्रोत : तालिका क्रमांक - 1

तालिका क्रमांक 1 से स्पष्ट है कि कुल सर्वेक्षित उद्यमी महिलाओं में 24.67 प्रतिशत उद्यमी महिलाओं में तनाव प्रबंधन का स्तर बहुत अच्छा पाया गया। 24.67 प्रतिशत उद्यमी महिलाओं में तनाव प्रबंधन का स्तर अच्छा रहा। केवल 20.00 प्रतिशत उद्यमी महिलाओं में तनाव प्रबंधन का स्तर उत्कृष्ट पाया गया। 18.67 प्रतिशत उद्यमी महिलाएं ऐसी थीं। जिनका तनाव प्रबंधन का स्तर मध्यम रहा। 10.33 प्रतिशत उद्यमी महिलाओं में तनाव प्रबंधन स्तर खराब पाया गया। 1.66 प्रतिशत उद्यमी महिलाओं में तनाव प्रबंधन स्तर बहुत खराब पाया गया और किसी भी उद्यमी महिलाओं में तनाव प्रबंधन स्तर अत्यंत खराब नहीं पाया गया।

तालिका के अवलोकन से यह भी स्पष्ट होता है कि कुल सर्वेक्षित उद्यमी महिलाओं में से साक्षर महिलाओं में 32.00 प्रतिशत महिलाएं ऐसी थीं। जिनका तनाव प्रबंधन स्तर अच्छा रहा। 22.00 प्रतिशत महिलाओं में तनाव प्रबंधन स्तर मध्यम रहा। 21.33 प्रतिशत महिलाओं में तनाव प्रबंधन का स्तर बहुत अच्छा रहा। 15.33 प्रतिशत महिलाओं में तनाव प्रबंधन का स्तर खराब रहा। 6.67 प्रतिशत महिलाओं में तनाव प्रबंधन का स्तर उत्कृष्ट रहा। वहीं 2.67 प्रतिशत उद्यमी महिलाएं ऐसी थीं जिनका तनाव प्रबंधन का स्तर बहुत खराब रहा। वहीं शिक्षित महिलाओं में 33.33 प्रतिशत महिलाओं में तनाव प्रबंधन स्तर उत्कृष्ट पाया गया। 28.00 प्रतिशत महिलाओं में तनाव प्रबंधन का स्तर बहुत अच्छा रहा। 17.33 प्रतिशत महिलाओं में तनाव प्रबंधन का स्तर अच्छा रहा। 15.33 प्रतिशत महिलाओं में तनाव प्रबंधन का स्तर मध्यम पाया गया। 5.33 प्रतिशत महिलाओं में खराब तनाव प्रबंधन पाया गया। 0.68 प्रतिशत महिलाओं में तनाव प्रबंधन का स्तर बहुत खराब रहा।

उपरोक्त तालिका में प्रदर्शित आंकड़ों के विश्लेषण से निष्कर्ष स्वरूप यह कहा जा सकता है। कि सतना शहर की उद्यमी महिलाओं में तनाव प्रबंधन स्तर अच्छा पाया गया। तथा जैसे-जैसे महिलाओं की शैक्षणिक योग्यता बढ़ती जाती है। वैसे-वैसे तनाव प्रबंधन स्तर भी बढ़ता जाता है।

तालिका क्रमांक 1.1

सर्वेक्षित साक्षर एवं शिक्षित उद्यमी महिलाओं के तनाव प्रबंधन स्तर संबंधित प्राप्त परिणामों का तुलनात्मक अध्ययन

शिक्षा ;मकनबंजपवदद	मध्यमान ;डमंदद	स्तर ;समअमसद	मानक विचलन ;जंदकंतक कमअपंजपवद	क्रांतिक अनुपात ;बपजपबंस तंजपवद	संभावना/अनुमान ;त्तवइंइपसपजलद
साक्षर	123 ⁹⁸⁴	अच्छा प्रबंधन	16 ⁷⁷⁴	7 ¹³	0 ⁰⁰¹
शिक्षित	138 ⁹⁹³	बहुत अच्छा प्रबंधन	19 ⁷⁷⁶		

'0⁰⁰⁵ स्तर पर सार्थकता हेतु जत्र 1.64 ,298^द

उपरोक्त तालिका में सर्वेक्षित उद्यमी महिलाओं की तनाव प्रबंधन स्तर पर शिक्षा के प्रभाव संबंधी तुलनात्मक परिणाम प्रदर्शित किये गये हैं। इन परिणामों से स्पष्ट हो जाता है कि साक्षर और शिक्षित उद्यमी महिलाओं में तनाव प्रबंधन के स्तर में सार्थक अंतर है। प्राप्त आंकड़ों के अनुसार साक्षर उद्यमी महिलाओं का मध्यमान 123.48 तथा मानक विचलन 16.74 है तथा शिक्षित उद्यमी महिलाओं का मध्यमान 138.93 तथा मानक विचलन 19.76 है। प्राप्त क्रांतिक अनुपात 7.13 जो की आवश्यक सार्थकता स्तर 0.005 टी-मान 1.64 से बहुत अधिक है। यह अंतर दर्शाता है कि दोनों समूहों की महिलाओं के तनाव प्रबंधन की क्षमता में महत्वपूर्ण अंतर है। अतः साक्षर उद्यमी महिलाओं का तनाव प्रबंधन स्तर अच्छा पाया गया। और शिक्षित उद्यमी महिलाओं का तनाव प्रबंधन स्तर बहुत अच्छा पाया गया। इन निष्कर्षों के आधार यह कहा जा सकता है कि उद्यमी महिलाओं की शिक्षा का स्तर बढ़ने के साथ-साथ उनका तनाव प्रबंधन स्तर बढ़ता जाता है।

निष्कर्षतः यह कहा जा सकता है कि शिक्षा उद्यमी महिलाओं के ज्ञान, निर्णय क्षमता और आत्म विश्वास को संवर्धित करती है शिक्षा के स्तर में वृद्धि तनाव प्रबंधन के स्तर को बढ़ाता है अर्थात् शिक्षा समस्याओं के समाधान में वृद्धि करती है यदि महिला उद्यमियों को पारिवारिक व सामाजिक स्तर पर पर्याप्त सहयोग प्रदान किया जाए एवं महिला उद्यमियों को नए तकनीकी ज्ञान तथा कम्प्यूटर प्रशिक्षण के साथ-साथ विपणन के क्षेत्र में उचित मार्गदर्शन प्रदान किया जाए तो उनके आत्मविश्वास व निर्णय लेने की क्षमता बढ़ने के साथ अधिक से अधिक महिलाएं उद्यम के क्षेत्र में उच्च स्तरीय प्रदर्शन के साथ देश के आर्थिक विकास में महती योगदान दे सकती हैं।

शोध कार्य का मूल उद्देश्य भावी साक्षर और शिक्षित उद्यमी महिलाओं के उद्यम के क्षेत्र में आने वाली समस्याओं से उन्हें अवगत कराना है अतः यह शोध कार्य महिलाओं को उद्यम के क्षेत्र में आगे आने के लिए मील का पत्थर साबित होगा।

4. सुझाव

1. उद्यमी महिलाओं को अपनी क्षमता व शक्ति को पहचान कर स्वावलंबी व आत्मनिर्भर बनने का प्रयास करना चाहिये।
2. उद्यमी महिलाओं को अपने उद्यम से संबंधित प्रशिक्षण प्राप्त कर नवीन उत्पादन, तकनीक, विपणन पद्धति आदि से अवगत होना चाहिए।
3. उद्यमी महिलाओं द्वारा संघ अथवा समूह बनाए जाने चाहिए।
4. उद्यमी महिलाओं के प्रति परिवार और समाज का सहयोगात्मक दृष्टिकोण होना चाहिए।
5. महिलाओं में उद्यमिता की भावना को विकसित करने के लिये सरकार के द्वारा विशेष प्रशिक्षण कार्यक्रम आयोजित किये जाने चाहिए।
6. अर्थव्यवस्था में वृद्धि करने के लिए जेडर गैप को खत्म करना चाहिए।
7. बैंक ऋण की औपचारिकता में कमी की जानी चाहिए। तथा समस्त कार्य सरल व स्थानीय भाषा में किये जाने चाहिए।

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**EFFECT OF CONSTRUCTIVIST APPROACH IN TEACHING
ENGLISH GRAMMAR TO SCHOOL LEVEL MALE
STUDENTS OF JABALPUR DISTRICT**

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ABSTRACT

The present study was carried out to find the effectiveness of constructivist approach on variable of English as a subject. The design adopted in the study was quasi-experimental. Purposive sampling method was adopted while selecting the sample for the present study. Four middle schools of Jabalpur city were purposively selected for the study seeking convenience in conducting the experiments for the study. The experimental group (N=200) students were given treatment using Constructivist Approach learning methods whereas the control group (N=200) students were thought through Traditional Method of Teaching. Hence, altogether 400 students of class VIII were considered in the study as a sample. In order to collect the relevant data for the present study, the investigator prepared and used the (i) Educational materials (English Grammar) (ii) Achievement Measuring Tools. The obtained data was classified and tabulated and subjected to statistical treatment using the Mean, Standard Deviation and 't' test. In the light of the findings it may be concluded that male students of selected schools had similar knowledge of English before the experiment as the results showed that boys of control group Obtained 't' value was 1.28, (p>0.05). In contrast to these findings it is concluded that boys and girls of Control groups during were same at the entry level. , control group had also shown significant improved in achievement reason behind that English is a language of practice and since there were regular classes been conducted in all the schools which were considered for the present study. Apart from knowledge construction, certain qualities like working cooperatively in a group, peer understanding and adjustment and also in building self- confidence had strengthened during learning process.

Keywords: Teaching, School, Male students, Constructivist approach

1. INTRODUCTION

Knowledge is only an explanation and an assumption but not the final answer for all questions. In contrast, it will be discarded along with the human process and new assumption will appear. Besides, knowledge cannot summarize the world rules precisely. In other words, we cannot apply knowledge to certain problems directly.

We have to analyze certain issue based on practical conditions. In addition, constructivists agree that knowledge cannot live on its physical form and out of specific entity. Although language and signals endow knowledge with certain forms, it does not mean learners have same understandings toward these statements, just as one hundred people will have one hundred different understandings toward Hamlet. These understandings are based on individual learners' experiences and backgrounds, what is determined by specific learning experience (**Jia, 2010**).

This research work started with the help of trained teachers in four schools. Trained teachers did know the students' centred teaching but their teaching behaviours were almost teachers-centred. So, there always arises such questions: What is constructivism? How is it different from conventional way of teaching? What is a sharp line that distinguishes the conventional and constructivism ways of teaching, one on the left and another on the right? What are the similarities and differences between these two methods? To answer the first question, the standard source a dictionary was consulted. Page & Thomas defines' constructivism as a: "viewpoint in learning theory and child development which holds that a child actively constructs his/her own ways of thinking as a result of innate capabilities interacting with his/her experience (**Mahapatra, 2014**). Teaching English Grammar to school level children's of Jabalpur District "

Objectives of the Study

1. To study the effect of Constructivist Approach (CA) on Learning Achievement in English of Students of Jabalpur.
2. To examine the different dimension(s) of achievement in English of students of Jabalpur

2. METHODOLOGY

2.1 Statement of the problem

Constructivism is a school of thought that views knowledge as subjective, where there is a possibility of multiple interpretations. As an approach it facilitates students to construct knowledge and apply it in various situations. It helps the students, not only in acquiring knowledge but also in thinking skills and value development. This is particularly essential in Social Studies education, where achievement in Social Studies, development of critical thinking ability and value preference are seen as outcomes of Social Studies teaching. Hence the present study is entitled as: "Effectiveness of Constructivist Approach on variable of English as a subject.

2.2 Selection of Sample

Purposive sampling method was adopted while selecting the sample for the present study. Four middle schools of Jabalpur city were purposively selected for the study seeking convenience in conducting the experiments for the study.

The experimental group (N=200) students were given treatment using Constructivist Approach learning methods whereas the control group (N=200) students

were thought through Traditional Method of Teaching. Hence, altogether 400 students of class VIII were considered in the study as a sample.

2.3 Selection of Variables

Independent Variables : Constructivist Approach

Dependent Variables: Academic Achievement

Control Variable : Adolescents of Middle schools

2.4. Teaching Methods

2.4.1 English Language Teaching Methods:

The grammar -translation method, the Direct method, Audiolingual method, Bilingual method, Dr. Michael West's the new method, and Suggestopedia etc., are among the methods used commonly by the teachers of English in India. An attempt, therefore, has been made to review these methods as below:

2.4.2 Translation Method:

This method, also known as the classical method, is one of the oldest or traditional methods of teaching English. In Europe it was used in the teaching of Latin and Greek for several centuries, and got introduced in India with the arrival of the British (**Khalid, 2012**).

2.4.3 The Direct Method:

The direct method, sometimes also called as the 'reform' method, 'natural' method, 'psychological' method, 'phonetic' method and 'anti- grammatical' method, was established in France and Germany around 1900, and introduced in India in the early 20th century as a reform which was needed in the methods of teaching English (**Breen and Candlin, 1980**).

2.4.4 The Audio-Lingual Method:

During the World War II, American soldiers had an urgent need to learn languages like-German, French, Chinese or Japanese to communicate effectively when posted in various countries. The Army Specialised Training Programme (ASTP) was established in 1942 by American linguists to meet this urgent need. 55 American Universities were involved in the programme by the beginning of 1943. This technique of teaching was initially called the 'Army Method' and was the first to be based on linguistic theory and behavioural psychology. The objective of this programme, as stated by Richards Jack, C. and T.S. Rodgers, was for students "to attain conversational proficiency in variety of foreign languages (**Moulto &William, 1940**).

2.4.5 The Bilingual Method:

This method was developed by Dr. C.J. Dodson. As the name suggests, the method makes use of two languages- the mother tongue and the target language. Hence, this can be considered as a combination of the direct method and the grammar-translation method. 'Selection, 'Gradation', 'Presentation', and 'Repetition' are the four cardinal principles of all language teaching methodology (**Dodson, 1972**).

2.4.6 The New Method:

This method was evolved by Dr. Michael West, who taught English in India for a number of years and was well-aware of the English language teaching situation in India. He found that for Indian learners of English, learning to read English was easier than speaking it. He recommended an emphasis on reading not only because he regarded it as the most useful skill to acquire in a foreign language but also because, as Stern points out: "it was the easiest skill with the greatest surrender value for the student in the early stages of language learning (**Tickoo, 1988**).

2.4.7 The Structural Approach:

This approach as Kripa K. Gautam states “is based on the belief that language consists of ‘structures’ and that the mastery of these structures is more important than the acquisition of vocabulary. Since structure is what is important and unique about a language, early practice should focus on mastery of phonological and grammatical structures rather than on mastery of vocabulary”. This approach, according to Kulkarni ‘emphasizes the teaching and learning of the basic items or materials that constitute the framework of a language’.

TABLE 1
SAMPLE DISTRIBUTION

Experimental Condition	Boys	Girls	Total
Experimental Group	100	100	200
Control Group (Control)	100	100	200
Total	200	200	400

2.5 Tools

In order to collect the relevant data for the present study, the investigator prepared and used the (i) Educational materials (English Grammar) (ii) Achievement Measuring Tools.

2.6 Development of Tools

As it was directed by CBSE (Central Board of Secondary Education) that all CBSE affiliated school will follow the NCERT curriculum, no other book shall be used. So before developing instructional material researcher had decided selected topics of Grammar for class VIII according to English textbook. As there was no separate grammar book prescribed by NCERT the researcher had considered English Text Book ‘Honey Dew for class VIII’ published by NCERT to get the important topics in Grammar. On the basis of the selected topics researcher had prepared lesson plans. Following topics were selected for the study.

1. Parts of Speech (Word Forms)
2. Verb forms
3. Active and Passive Voice
4. Direct and Indirect Speech

2.7 Administration of test

Administration of Pre-Tests The tools were administered to the students of both the experimental and control groups as a pre-test i.e. before treatment. The students of both groups were simultaneously pre-tested on previous knowledge of English Grammar.

2.8 Implementation of Experiment

The instructional materials based on 5E Model were developed and implemented to the experimental group for a period of 3 months. Consulting the English teacher of control group the duration i.e. number of periods required for teaching the selected lessons was decided. The investigator taught lesson/units using constructivist approach to the experimental group. Classes were taken in the regular English periods of the school. It was assured that the regular English teacher covered the units approximately in the same

number of periods using alternative strategies like lecture method, used charts, etc. for the other group. In the present study alternative strategy is referred to control group. The investigator got continuous feedback from the experimental group students and their regular teachers. The unit test was given as soon as each lesson was completed apart from daily assignments.

2.9 Statistical Analysis

The obtained data was classified and tabulated and subjected to statistical treatment using the following statistical techniques

Descriptive statistics

- Mean
- Standard Deviation

Inferential Statistics

- 't' test

3. RESULTS AND DISCUSSION

TABLE 2
COMPARATIVE RESULTS OF PRE TEST SCORES OF EXPERIMENTAL AND CONTROL GROUPS OF BOYS

	Gender	N	Mean	SD	't'/CR	P-Value
Experimental Pre	Boys	100	13.00	4.46	1.28	>.0.05
Control Pre	Boys	100	12.26	4.40		

Degree of freedom – 198, Significant at 0.05 level (1.97), Significant at 0.01 level (2.60)

It is evident from the above table it is clear that at pre -test level there was no statistical significant differences in the mean scores of the male students in experimental group (13.00, SD=4.46) and Control group (12.26, SD=4.40), as the obtained 't' value is 1.28 which is less than p value ($p > 0.05$) which suggests that groups were properly equated and all the male students had same entry level before the treatment.

TABLE 3
COMPARATIVE RESULTS OF EXPERIMENTAL AND CONTROL GROUPS ON PRE-POST TEST SCORES OF BOY'S.

	Boys	N	Mean	SD	T/CR	P-Value
Experimental	Pre	100	13.00	4.46	6.42	<0.000
	Post	100	16.70	2.85		
Control	Pre	100	12.26	4.40	8.243	<0.000
	Post	100	16.71	3.04		

Degree of freedom – 198, Significant at 0.05 level (1.97), Significant at 0.01 level (2.60)

To determined the effectiveness of constructivist approach with regard to learning English language, the significance of difference between mean pretest and mean posttest of experimental and control groups were explored by employing t-test and the values are presented in table 2.

It is observed from data depicted in table 2 that the t-value of experimental group between pre-post test is higher than the table value at 0.05 level of significance and the p-value is <0.05, hence the difference among the groups in boys (Experimental group) was found to be statistically significant. Data depicted in above table on comparison of pre-test and post-test scores of Boys (Control Group) also revealed the significant difference

between the pre-post test scores, as the obtained t value (8.243) was much higher than the required table value and p value was <0.05 which shows that the difference between the pre test and post test scores are statistically significant. Level of significance was set at 0.05 level.

4. CONCLUSION

In the light of the findings it may be concluded that male students of selected schools had similar knowledge of English before the experiment as the results showed that boys of control group Obtained 't' value was 1.28, (p>0.05). In contrast to these findings it is concluded that boys and girls of Control groups during were same at the entry level

The finding infers that the students exposed to conventional learning retained certain ideas to prevail in a result based assessment. However, control group had also shown significant improved in achievement reason behind that English is a language of practice and since there were regular classes been conducted in all the schools which were considered for the present study. Apart from knowledge construction, certain qualities like working cooperatively in a group, peer understanding and adjustment and also in building self- confidence had strengthened during learning process.

The teachers provided democratic classroom atmosphere, which not only provided the students an opportunity to talk, discuss, experiment and prove their ideas as correct but also helped in learning better. It also gave an opportunity in improving good relationship among the students and with the teacher. The new innovative evaluation techniques used were found interesting as well as challenging and it helped the students in motivating themselves.

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A COMPARATIVE STUDY TO ASSESS LEVEL OF OCCUPATIONAL STRESS AMONG PHYSICAL EDUCATION TEACHERS WORKING IN GOVERNMENT AND PRIVATE SCHOOL OF HIMACHAL PRADESH

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BSTRACT

The objective of the study was to find out the effect of HIIT & SET training on repeated sprint ability of football players. For the purpose of study seventy five male district level football players, aged between 18-25 years, were randomly selected from Birbhum, WB. Twenty five were randomly selected for high intensity interval training (HIIT) group, twenty five were randomly selected for SET group and twenty five were selected as the control group for the study. Repeated sprint ability was considered as the variable for the study. Eight weeks high intensity interval training (HIIT) and SET training were administered to the experimental group. The data was computed by descriptive statistics, ANCOVA and LSD post-hoc test were used for the analysis of the data. The result of the study revealed that the HIIT group significantly improves the repeated sprint ability.

Key Word: HIIT training, SET training, Repeated sprint ability Football players

1. INTRODUCTION

Stress is an unavoidable phenomenon in human life. Though the type of stress may differ but almost any aspect of life can lead to stress, be it lack of friends, lack of money, unemployment or even employment. Rapid industrialization, increasing urbanization and receding support over the last few decades have contributed to rise in stress level. Few years ago, it was not considered as an important public health problem in many countries but recently stress has gained worldwide attention due to its potential hazards.

Stress is generally recognized as an unpleasant emotional state. According to **Kyriacou (1978)**, stress is result of prolonged pressures that can't be controlled by the coping strategies that an individual has.¹ **Olson et al (1989)** defined stress as "a state of tension that arises from an actual or perceived demand that calls for an adjustment or adaptive behaviour". Stress can attribute to poor performance, absenteeism, job dissatisfaction, accidents and various health problems (**Keiper & Busell, 1996**). Distress can lead to hypertension, diabetes mellitus, stroke and ulcers among other illness (**www.stress.org, 2008**).

Occupational stress: a worldwide phenomenon Occupational stress has been considered as leading stressor among adults.⁴ According to International Labour Organization (ILO), occupational stress affects all countries, all professions and all categories of workers. 52 World Labor Report of 1993 identified occupational stress as one of the most serious health issues of the twentieth century while few years later World Health Organization (WHO) termed it as "World Wide Epidemic" (**www.stress.org, 2007**).

Occupational stress is defined by National Institute for Occupational Safety and Health (NIOSH, USA) as, "the harmful physical and emotional responses that occur when the requirements of the job do not match the capabilities, resources, or needs of the worker" (**www.cdc.gov, 2008**). Occupational stress is also known as "job stress", "work related stress" or "work stress". World Health Organization defines this in a similar way as, "a pattern of reactions that occurs when workers are presented with work demands not matched to their knowledge, skills or abilities and which challenge their ability to cope" (**WHO, 2007**).

Occupational stress can lead to poor health make people feel sick, both at workplace and at home(**www.osha.europa.eu, 2008**) Usual early signs of job stress include headache, sleep disturbance, stomach upset and difficulty in concentration. Later this leads to major diseases like cardiovascular diseases (for example stroke, myocardial infarction) mental health problems (for example depression and burnout) and musculoskeletal disorders (for example involvement of back and upper extremity). In addition to physical and psychological signs and symptoms, occupational stress can also lead to behavioral symptoms like loss of appetite; increased consumption of alcohol, drugs and tobacco; isolation from others; poor job performance and change in close family relationships. Besides, workers who are stressed are more likely to be less productive, poorly motivated and less safe at work (**WHO, 2003**).

International Labour organization (ILO) considers occupational groups like policemen, prison officers, miners, doctors, nurses, teachers and journalists among the most stressful professions (**www.ilo.org, 2008**) Recently teachers' stress has received widespread recognition reflecting difficulties encountered by them (**Boyle, et.al., 1995**). In the last two decades, there have been a lot of studies on occupational stress among

school teachers (**Nhundu, 1999**). According to **Day (2000)**, “for many teachers, last 20 years have been years of survival, rather than development .

Teachers all over the world are facing the problem of occupational stress, though extent of the problem varies. According to **Kristensen (2005)** about 10 to 40 percent of teachers are suffering under extreme stress or burnout, in European countries. (**Maslach, Schaufeli & Leiter (2001)** argues for even higher stress level among teachers of Asian countries

2. METHODOLOGY

2.1 Selection of Subject

For the purpose of the study, 100 physical education teachers from various schools of Una, Himachal Pradesh were selected and further divided into two groups where 50 from government schools were kept in first group and 50 teachers from private aided, and private unaided as the second group.

2.2 Instrument

Occupational Stress Index (O.S.I) by **Dr. A K Shrivastava & Dr. A P Singh** was adopted in the study to measure the level of stress among the teachers.

2.3 Statistical Analysis

To estimate the level of occupational stress descriptive statistics mean, standard deviation and ‘t’ test were employed.

3. RESULTS

Table 1
DISTRIBUTION OF SAMPLE ON LEVEL OF OCCUPATIONAL STRESS ACCORDING TO THEIR EMPLOYMENT STATUS.

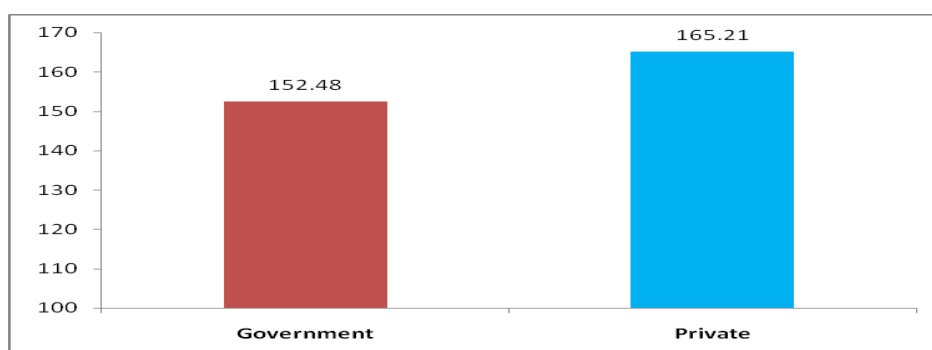
Sr. No.	Demographic Variable	Mean	Level of Stress
1	Government	152.48	Moderate
2	Private	165.21	High

Above table shows the level of stress among the teachers where teachers from government schools had mean scores of 152.48 and were in moderate stress level and teachers from private schools had mean score 165.21 which indicated high occupational stress among the teachers from private schools.

TABLE 2
COMPARISON OF MEAN SCORES ON OCCUPATIONAL STRESS AMONG PHYSICAL EDUCATION TEACHERS FROM PRIVATE AND GOVERNMENT SCHOOLS

Government/Private	N	Mean	SD	t-ratio	P-Value
Private	50	165.21	17.14	5.43	0.000
Government	50	152.48	11.64		

From the above table mean of occupational stress score of teachers from private school mean is 165.21 and teachers from government schools mean is 152.48. The difference between the two mean is highly ($t=5.43$) $df=98$, $P < 0.05$) and it is concluded that the physical education teachers from Private schools have significantly high occupational stress than the teachers from government schools.



4.CONCLUSION

Results of the study concluded that the physical education teachers from private schools of Himachal Pradesh had more occupation stress when compared with teachers from government schools. It is necessary to provide infrastructure facilities and necessary training through training sessions, seminars, workshops etc. to encourage teachers and to minimize the level of stress among the teachers from private schools.

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ANAEROBIC CAPACITY ON ENDURANCE PERFORMANCE OF ZONAL ENDURANCE ATHLETES

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ABSTRACT

Anaerobic power enables body to function without oxygen at maximum intensity. The purpose of the study was to ascertain anaerobic power on endurance performance of Sri Lankan school zonal endurance athletes. Fourteen (N=14) endurance athletes have been assigned for this study from Jaffna Central College, their age ranges between 16y to 20y. Running based anaerobic sprint (RAST) was administered to measure anaerobic power such as maximum power (MA.P), minimum power(MI.P), average power(AV.P) and fatigue index(FI). Endurance performance was measured by time trail test of 800M and 1500m. The Pearson's Correlation Coefficient was employed to find out level of correlation. Correlation probability level was fixed at 0.05level. Results revealed that MI.P had positive correlation with 1500M performance($r=0.90$). Other of variables have shown negative correlation with MA.P($r=-0.86$),AV.P($r=-0.87$),FI($r=-0.540$). 800M performance had negatively correlated with MA.P($r=-0.570$), MI.P($r=-0.580$), AV.P($r=-0.612$), FI($r=-0.756$). Study concluded that anaerobic power and fatigue index should be improved for Sri Lankan school zonal endurance athletes.

Key words- Maximum power, minimum power, average power, fatigue index,

1. INTRODUCTION

Anaerobic capacity is an ability to produce maximum amount of adenosine triphosphate that can be produced via anaerobic metabolism such as alactic and lactic acid during maximal exercise (Minahan, et.al, 2007). Alactic system contributes less than 5 second of high burst of exercise extended time of exercise leads to lactic acid system from 10 seconds to 2 minutes. Lactic acid system is called fast glycolysis system which play important role on performance of elite endurance athletes during the high intensity running. Conversely in Sri Lankan, non elite endurance athletes have lack of anaerobic endurance due to their nature of training and physiological capacity such as muscles fiber VO_2 max, cardio respiratory ability. There is significant differences in characters between elite and trained endurance athletes, particularly anthropometric and physiological variables (Aouadi, et.al.,2012 & Armstrong.et.al.,2011) length of training (Hrysomallis,et.,2012) and physical performance (Augustsson,et.,al., 2000 & Blackburn.et.al., 1998) .

An anaerobic power and fatigue index ability plays key contribution in endurance performance of elite athletes but it is unclear in non elite athletes. Hence the elite level of athletes performs high intensity endurance training about 90% of heart rate. Middle distance runners need to have optimal level of anaerobic capacity to delay onset of blood lactate accumulation (OBLA). Additionally anaerobic power (muscles explosive) contributes for perfect running mechanism, good starting, and excellent finishing. Consequently middle distance runners perform high intensity endurance with greater output. In Sri Lankan training setting endurance athletes usually performs aerobic based running, which does not influencing much on middle distance performance.

Sri Lankan zonal level of endurance athletes perform about 60% to 80% of intensity . Anaerobic power is required for high intensity running to delay lactate accumulation as well as commence good start, correct mechanic of body movement and finishing. Additionally, anaerobic ability is needed in endurance events when maximum and intense power is required resynthesis of ATP contribute to boost up the activity. Thus it leads to middle distance runners to succeed in competition.

Sri Lankan Zonal level of endurance athletes usually follow regular type of aerobic base training such as continue type of running, or long running and have no anaerobic base training. These aerobic based training may help to recover quickly in sporting activity but unable to improve tempo. Moreover aerobic training increase type I muscles fibre which does not produce optimal level of anaerobic power output. Anaerobic power is highly correlated with type II muscles fibres, which produce lactic acid that lead to fatigue. Therefore lactate threshold training is essential to improve anaerobic capacity. Regular endurance based athletes cannot reach optimal power output due to nature of training. Consequence, the anaerobic type of training will not facilitate to improve anaerobic power in contrast participant may reach minimum level of anaerobic power output. Therefore the present study was conducted to disseminate knowledge to the trainers and coaches.

2. MATERIALS AND METHODS

To achieve the objective of the study fourteen (N=14), age 16-20y, two year training experience and represented Sri Lankan zonal level school competitive middle distance runners were selected from Jaffna Central College. The data were collected on anaerobic power such as maximum power, minimum power, average power and Fatigue index were measured by running based anaerobic sprint ability (RAST) conducted in separate day. Endurance performance was measured by time trial performance of 800M and 1500M. Endurance performance have been

measured in various day. Pearson co-efficiency correlation was administered to find out relationship between anaerobic ability and endurance performance, correlation level was fixed at 0.05 levels

3. RESULTS

Result revealed that minimum anaerobic power was correlated with 1500M performance ($r=0.90$) and other variables had negative correlation with MA.P($r=-0.86$), AV.P($r=-0.87$), FI($r=-0.540$). 800Mperformance had negative correlation with MA.P($r=-0.570$), MI.P($r=0.580$), AV.P($r=-0.612$), FI($r=-0.756$).

TABLE -I
MEAN AND CORRELATION OF ANAEROBIC POWER, FATIGUE INDEX AND ENDURANCE PERFORMANCE

Variables	Mean/watt	r= 800m	r = 1500m
Max.power	262.78	-0.57	-0.86
Min.power	151.71	-0.58	0.90
Ave.power	202.85	-0.61	-0.87
Fat.Index	2.73	-0.75	-0.54

FIGURE-I
GRAPHS SHOW RELATIONSHIP BETWEEN ANAEROBIC POWER, FATIGUE INDEX AND ENDURANCE PERFORMANCE OF 800M

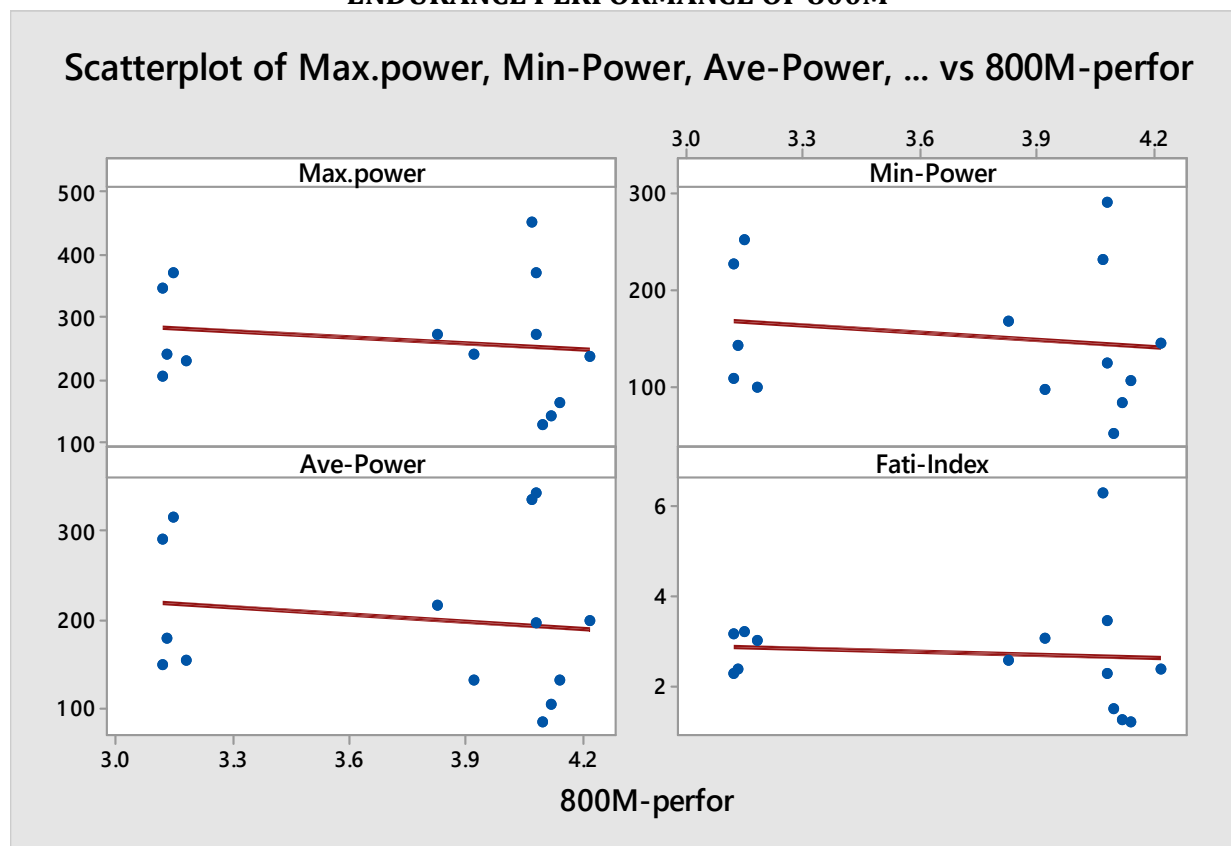
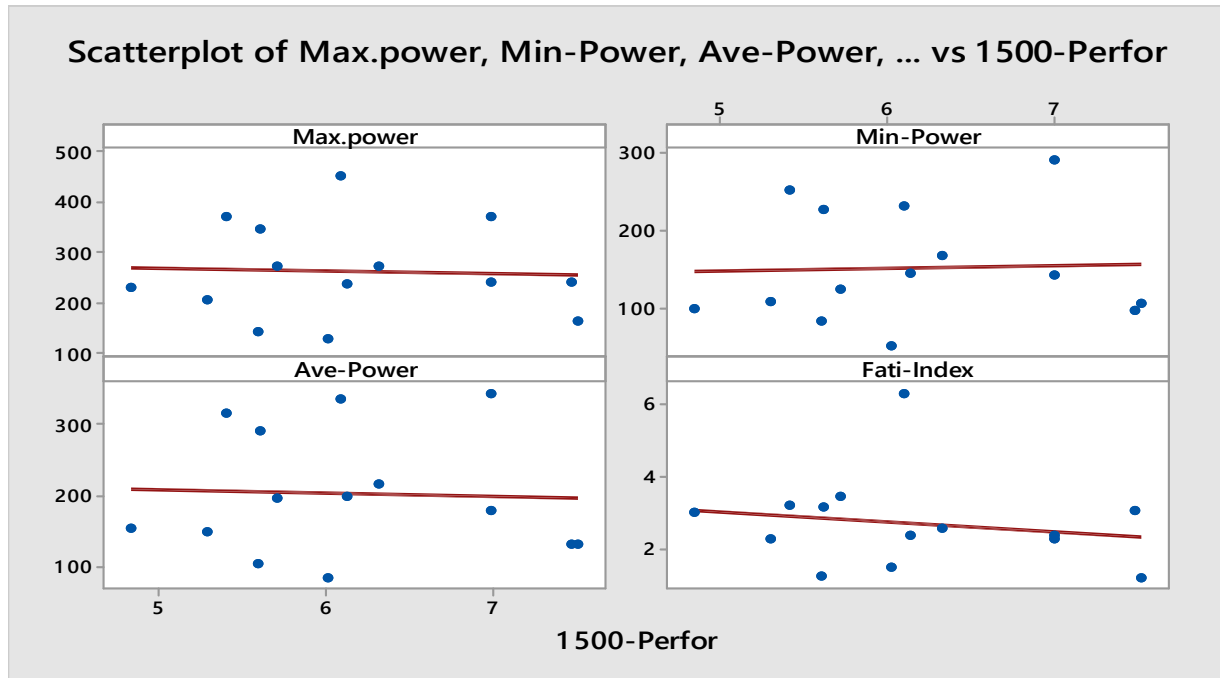


FIGURE-II
GRAPHS SHOW RELATIONSHIP BETWEEN ANAEROBIC POWER, FATIGUE INDEX AND
ENDURANCE PERFORMANCE OF 1500M



4. DISCUSSION

Anaerobic power is a maximum force produced by muscle during the high burst of running. It depends on several muscle characters such as muscle strength, hypertrophy, explosive power and power to improve running performance. Peak anaerobic power can be maintained until 10s during high intensity sprint that contribute ATP-PC system for improving the endurance performance. Mostly this type of energy is required for high intensity sprint without controversial. However, a recent study has found that anaerobic power also is required for endurance athletes to reach steady state performance.

Running based anaerobic sprint test is primarily used for running sports such as endurance, basketball and football to measure anaerobic power of heart, metabolism and muscular function. Consequently, anaerobic capacity is basis to delay onset blood lactate accumulation (OBLA) When athletes run at high intensity blood lactate concentration increases. This is evaluated by RAST test that has 6 trials with 10s recovery between repetitions. The athletes, who have good lactate threshold, can reach the peak performance. Nevertheless, the athletes do not have adequate anaerobic power will reduce maximum power, and on their RAST increases fatigue index. Non elite athletes have correlated minimum power with 1500m performance ($r=0.90$). According to Normative data minimum power between 674 to 319 watts shows good performance(Draper,et.al,1997) but the mean value show by in present study is 152watts. This indicates participants are non elite endurance athletes, who need to additionally improve the anaerobic ability. Anaerobic endurance training develops high intensity of endurance ability as well as certain proportion of aerobic capacity. Previous studies claimed that high intensity intermittent training may improve both anaerobic and aerobic systems significantly(Gaitanos,1993)

Further commonly in practice, the repeated sprint ability was evaluated by RAST test(Mackenzie,et., 2005). Previous research finding revealed that athletes have enough strength and speed, who can achieve certain level of maximum power was between 1054 to 676 watt, minimum power was between 674 to 319 watts and average power was 661watt(Esbjörnsson,et.,1993). This level can be reached by elite level of endurance athletes due to their competitive training but present study participants reached mean of maximum power range 263watts, which negatively correlated with 800m performance($r=-0.57$) and 1500m performance($r=-0.86$). This indicates that participants need to enhance anaerobic endurance, which may reflect RAST whole performance such as maximum power, minimum power, average power and fatigue index. Particular events may demand certain quality of physical performance, for a example 800m and 1500m. Athletes should have peak maximum power compared to marathon and 10000m athletes due to the nature of events. This study found that poor anaerobic power and fatigue index has been observed among Sri Lankan zonal endurance athletes. This is caused by lower anaerobic threshold and participants being non elite athletes. The relative contribution of aerobic metabolism increases during the repeated high -intensive exercise with an insufficient recovery phase(Gaitanos,et.,1993, Bogdanis ,et.al.,1996, Paroli,et.al.,1999, Spencer,et.al.,2005). Conversely previous study has claimed that physiological and performance responses to repeated sprint are markedly influenced by the sprint distance (Pavlović,et.al.,2015). Generally endurance athletes have good recovery and delay onset of blood lactate accumulation (OBLA) that helps to maintain power during repeated sprints. Yet, a study revealed the aerobic system is more related to power maintenance in an intermittent activity with a high number of short repetitions (12×20m) than long repetitions (6×40m).

RAST test regards the fatigue index as a key factor to determine anaerobic power. Generally fatigue index indicate at the level at which the lactate is accumulated during anaerobic endurance. Running at anaerobic endurance demand more glycogen rather than oxygen. High fatigue index leads to lower ability power over several repeated sprints. Intensive or high intensity running raises blood lactate concentration increases hydrogen ions concentration and muscles fatigue and research finding revealed that fatigue index(RAST) is greater than >10, which should improve lactate tolerance (Draper, N. And Whyte, 1997)But present study found that fatigue index mean 2.7 , which is lower rate compared to normative data of RAST. Thus their fatigue index negatively correlated with 800m ($r=-0.75$) and 1500m($r=-0.54$) performance. This fatigue index indicates good lactate tolerance but the performance did not correlate with anaerobic power.

5. CONCLUSION

In conclusion, participants are non-elite athletes are not physiological adapted to perform at high intensity running, which intensity running improves anaerobic capacity. It contributes to improve the endurance performance for good starting, correct mechanism, finishing, delay lactate accumulation. Thus study concludes the participants need to concentrate on anaerobic capacity to improve endurance performance.

6. RECOMMENDATION

From the conclusion, it was recommended that middle distance performance depends on anaerobic threshold, which can be achieved by various anaerobic based training to enhance middle distance performance.

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THE EFFECT OF YOGA ON CARDIO RESPIRATORY ENDURANCE OF TEACHER TRAINEES

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ABSTRACT

Aim of this study is to make clear whether yoga has any effect on the cardio respiratory endurance of teacher trainees. This study has been conducted on eighty students from Kerala University College of Teacher Education. These students were randomly divided into experimental and control groups of forty each. A twelve week training programme was given to the experimental group after taking the pre test for the selected variable. The control group did not involve in any type of training. After the training programme, a post test was conducted for both groups. The data were analysed by using mean, standard deviation and t-test. The result reveals a significant improvement in the cardio respiratory endurance of teacher trainees due to yoga.

Key Words: Yoga, Cardio Respiratory Endurance

1. INTRODUCTION

Yoga is believed to be an activity that can provide the same benefits as any type of well-organised physical exercise program, that improves general health and stamina, purifies and strengthens the body, mind and soul and improving those conditions brought about by sedentary lifestyles of people. It is an ancient Indian way of life which includes many asana and breathing exercises. It has been well documented the physiological and psychological benefits of yoga. Regular practice of yoga promotes strength, endurance, flexibility and facilitates characteristics of friendliness, compassion, and greater self-control, while cultivating a sense of calmness and well-being. **(Williams, Steinberg & Petronis, 2003)** The practice of yoga can enhance health and overall fitness, regulate all the body functions in a balanced manner and is helpful in providing sustainable health. It shows the way to perfect health, perfect mind control with one's own self. In addition to the beneficial effects on flexibility and relaxation, some yoga postures may achieve the recommended level of intensity for cardiovascular fitness

Cardio respiratory endurance refers to the ability of the body to perform prolonged, large-muscle, dynamic exercise at moderate-to-high levels of intensity. Cardio respiratory endurance is an important part of overall physical fitness. It is the ability of the lungs and heart to take in and transport adequate amounts of oxygen to working muscles, allowing activities that involve large muscle masses (eg. running, swimming, bicycling) to be performed over long periods of time **(Fox, Edward, 1971)**. Maintaining cardio respiratory endurance helps people to perform activities at a moderate level of intensity for an extended period. Cardio respiratory fitness, also called cardiovascular fitness or maximal aerobic power, is the overall capacity of the cardiovascular and respiratory systems and the ability to carry out prolonged strenuous exercise. The maximal oxygen consumption ($VO_2\max$) attained during a graded maximal exercise to voluntary exhaustion has long since been considered by the World Health Organization as the single best indicator of cardio respiratory fitness **(Boucher, 2007)**. Maximum oxygen consumption or aerobic capacity is abbreviated as $VO_2\max$. In $VO_2\max$, 'V' signifies the volume of the O_2 that is being utilized by exercising muscles in the body, whereas; 'max' indicate the maximum amount of O_2 that is utilized during muscular exercise. Generally, there is linear relation between exercise and $VO_2\max$ therefore; it increases as exercise intensity increases. Adequate supplement and maximum utilization of supplied oxygen would enable person to work efficiently for long. For better physical work performance, there are numbers of cardio respiratory adjustments being made by the body such as increase respiratory rate, oxygen uptake, heart rate, cardiac output and importantly marked increase in utilization of available oxygen by the cells. **(Araujo, Heardy & Stein, 2013)**.

The present investigation is an attempt to find out whether yoga has any effect on the cardio respiratory endurance of teacher trainees.

The objective of this study is to find out the effect of yoga on cardio respiratory endurance of teacher trainees. This study is delimited to B.Ed students of Kerala University College of Teacher Education. The study is limited to female students. The personal behavioural styles of students were beyond the control of the investigator is also considered as a limitation of the study. There will be significant change in the cardio respiratory endurance of teacher trainees due to yoga training.

2. METHODOLOGY

2.1 Selection of Subjects

For the purpose of this study, 80 students from Kerala University college of teacher education were selected as subjects. The average age of the subjects was 22 years.

2.2 Design of the Study

Randomly selected 80 subjects were divided into two equal groups as 'A' and 'B'. After taking the pre-test for the selected variable, the training programme was given to the experimental group 'A', and 'B' served as the control group. The experimental group 'A' had undergone the training programme in yoga for five days in a week for 12 weeks. After twelve weeks of training as per the schedule, a post-test was conducted for the same variable to both groups.

2.3 Administration of Training Programme

The experimental group was given an organised training programme for 12 weeks. The programme was of 40 minutes duration for five days in a week. This was monitored and controlled by the investigator. The control group did not involve in any session of training.

2.4 Statistical Technique

To find out the significance of difference between the pre-test and post-test data on the selected variable for the experimental and control groups, the 't'-test was applied.

3. RESULTS AND DISCUSSION

The t-test was employed to analyse the significant difference between pre-test and post-test on the selected variables.

TABLE 1
SIGNIFICANCE OF DIFFERENCES BETWEEN THE PRE-TEST AND POST-TEST MEANS OF
CARDIO RESPIRATORY ENDURANCE OF THE EXPERIMENTAL GROUPS

Test	N	Mean	MD	SD	SE	't' value
Pre-test	40	26.27	0.51	0.214	0.0339	15.001*
Post-test	40	25.76				

* Significant at 0.05 level

t-.05 (78) = 2.03

TABLE 2
SIGNIFICANCE OF DIFFERENCES BETWEEN THE PRE-TEST AND POST-TEST MEANS OF
CARDIO RESPIRATORY ENDURANCE OF THE CONTROL GROUPS

Test	N	Mean	MD	SD	SE	't' value
Pre-test	40	26.59	0.02	0.083	0.0133	1.942
Post-test	40	26.61				

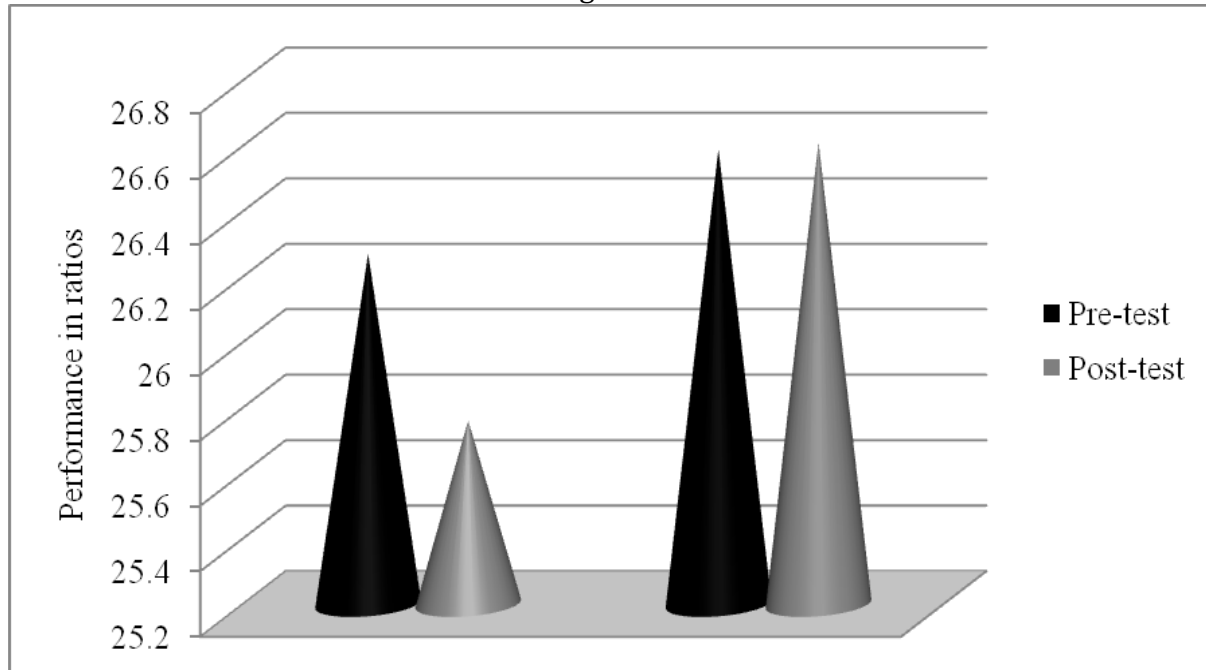
* Significant at 0.05 level

t-.05 (78) = 2.03

The table 1 &2 shows that the post-test mean (25.76) of the experimental group is less than the pre-test mean (26.27) . In the case of the control group, the post-test mean (26.61) is greater than the pre-test mean (26.59). The 't' value (15.001) of the experimental group and the 't' value (1.942) of the control group, both derived from the 't' test, prove highly significant for the experimental group and insignificant for the control group, as compared to the tabulated 't' value (2.03), at 39 degrees of freedom at 0.05 level of significance. Hence the result of cardio respiratory endurance of the experimental group

(Yoga) is statistically found significant. The results are also diagrammatically presented in figure 1.

Figure 1



4. CONCLUSION

The analysis of data clearly showed that due to yoga training, the cardio respiratory endurance of teacher trainees was significantly improved.

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THE EFFECT OF DIFFERENT JOINTS' ANGLES ON THE PERFORMANCE OF OROMIA REGIONAL STATE CLUBS LONG JUMPERS: A KINEMATICAL STUDY

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ABSTRACT

Ethiopia is the potential area in order to produce world class long jumpers. However, intensive work has been never done on the area of biomechanics. Thus, this study was designed to assess the Biomechanics analysis of long jumpers' on Oromia region athletic clubs. For the purpose of this study 20 long jumpers from six clubs (Burayu, Lagatafo, Sululta, Sebeta, Adama and Bishoftu) were selected as the subject. To acquire the kinematical data one high speed Nikon: Coolpix P900 video recording camera mounted at a height of 5 feet was placed 10 meters away perpendicular to the long jump pit. All subjects were performed three jumps, all the jump performances were recorded and downloaded in the personal computer and only best performance of each subject was selected for further analysis. The digitization of the obtained data was done with the help of Kinovea motion analysis software. The kinematical variables for the study were taken as ankle, knee, shoulder and elbow joints angle. All statistical procedures were conducted using the SPSS 23.0 Version software. A level of significance was set at 0.05. Pearson product moment correlation coefficient was used to find-out the relationship between long jumpers' seasonal best performance and joint angles in different phases. Multiple regressions coefficient was used to analyze the effect of release parameters angles at release during take-off on jumping distance. The result of this study shows that Knee joint angle has significant relationship with the performance at take-off preparation ($r = -0.67, p < 0.05$) and Take-off phase ($r = -0.53, P < 0.05$). Knee angle during take-off preparation phase and take off phase explained by 67.6% of variance ($R^2 = .676, F(18, 2.72) = 15.1, p < 0.05$). Effect size of long jump take-off preparation knee angle was significant ($R^2 = .676, F(18, 2.72) = 15.1, Beta \text{ value } (B) = -0.016, p < 0.05$) and take off phase ($R^2 = .676, F(18, 2.72) = 15.1, Beta \text{ value } (B) = -0.014, p < 0.05$). on the basis of the findings of this study it is concluded that both phases (take-off preparation and take-off), knee joint angle has low effect size on long jumpers' seasonal performances.

Key words: Biomechanics, Joints Angles, kinematics and Long Jumpers.

1. INTRODUCTION

The biomechanical approach to movement analysis can be qualitative and quantitative, with movement observed and described, meaning that some aspect of the movement measured. In such an approach, the motion characteristics of a human or an object are described using such parameter as speed and direction, how the motion is created through the application of forces both inside and outside the body, and the optimal body positions and action for efficient, effective motion (Akwinder & Nishan, 2016).

There are several problems in the application of biomechanics to sports, so the application of biomechanics in the qualitative analysis of sport skills by many coaches has been limited. More recent evidence (Knuudson, 2007) reveals that the biomechanics scholars have long been interested in developing the principles that facilitate the qualitative application of biomechanics to improve movement performance and reduce the chances of injury.

The optimal angle of the leg at touchdown compensates for both vertical and horizontal braking impulses (Seyfarth et al., 2000 and Bridgett and Linthorne, 2006). Graham-Smith and Lees (2005) study has indicated that during the contact phase when the foot is in contact with the ground the knee angle approaches 144 ° which is slightly lower than the result revealed by Adrian and Cooper (1995) who indicated that at the knee angle the point of contact is close to 158 ° however also of the view that due to the knee absorbing the various forces deepest flexion angle had decreased to 133°. The other component on which the performances relay is take-off and is one of the most technical parts of the long jump. Hussain, et. al., (2011) find out that male and female intervarsity level long jumpers significantly differ in their last stride length, velocity of last stride and take-off leg knee angle, which indicates that enhancement in these variables will have impact in the total covered distance performance.

The long jump is horizontal jumping field event. The primary goal of maximizing the horizontal distance jumped; a sprint-like approach on a runway (often the same one) to a take-off marker; an attempt to achieve a desired flight phase trajectory; and demands scientific training for the athletes (Melvin, 2016). Long jumping is a well-recognized discipline within the track and field sports and it has been a part of the Olympic Games since the restart of the modern games in Athens 1896 (Graham-smith & Lees, 2005). Ethiopian long jump achievements in national championship reveal that Gashaw Beza jumped 7.50m in 1989, Addis Ababa, Ethiopia. Hiwot Sisaye, during African Championships in 1993 registered 6.23 m in Durban, South Africa (Long jump results, 2012).

Thomas, Luis & Wolfgang (2001) suggests that the applied pattern biomechanics of long jumpers allows one to identify structural changes of movement patterns during a singular movement as well as individual movement styles within the same type of movement and they asserted that last stride was the most contributing factors for the long jumpers personal best. Other supporting literature (Mikael & Daniel, 2015) pointed out that long jumping technique has been widely studied both on elite athletes and with models made for determining optimal techniques. However, studies looking at women long jumping are scarce and there is still no consensus regarding which variables are the most important for determining long jumping performance then finally in their study they concluded that speed of long jumper determines long jumpers jumping distance by 40%

additionally speed, accuracy and technique explained long jumpers jumping distance by 55%.

There is evidence to suggest that there are some differences between the techniques of elite male and female athletes, suggesting that coaches may need to emphasize different aspects of technique for each gender. More research examining these techniques is required. The question regarding whether these differences are due to strength and structure differences or due to differences in neural patterns remains unanswered (Marion and Alexander, 2005).

Graham-Smith, et. al. (2005) and Bridgett, et. al, (2006) reveals that there is a unanimous agreement among several of these key variables affecting the long jump in the current scientific literature, there are still lies a challenge in understanding the complete picture and possible interrelationships between factors related to a successful long jump. Thus, the researchers designed to assess the biomechanics analysis of long jumpers' on Oromia regional state athletic clubs.

2. METHODOLOGY

2.1. Participants

To achieve the objectives of this study 20 male long jumpers from six clubs (Burayu, Lagatafo, Sululta, Sebeta, Adama and Bishoftu) were selected as the subject.

TABLE 1
SELECTED JUMPERS FROM DIFFERENT CLUBS

No.	Clubs	Long Jumpers
1.	Burayu Athletics club	3
2.	LagaTafo Laga Dadhi Athletics club	4
3.	Sululta athletics project club	4
4.	Sebeta Athletics clubs	3
5.	Adama Athletics club	3
6.	Bishoftu Automotive club	3
Total		20

2.2. Tools and Equipments

For the purpose of this study standard and specific tools and equipments were used to capture and analyze the data. The experimental apparatus used in this research work were camcorder (Nikon: Coolpix P900) with tripod, measuring tap, motion analysis software (Kinovea) and computer.

2.3. Identification of variables

2.3.1. Independent variable

Joints angle(ankle, knee, shoulder and elbow) during different Phases (take-off preparation, take-off, flight and landing).

2.3.1. Dependent variable

The dependent variable which was taken in this study was the long jump performance (covered distance).

2.4. Procedure of data collection and analysis

To acquire the kinematical data one high speed Nikon: Coolpix P900 video recording camera mounted at a height of 5 feet was placed 10 meters away perpendicular to the long jump pit. All subjects were performed three jumps. The recorded video footages were downloaded, slashed and edited by using the downloaded version of STHVCD55 Software.

Digitization, smoothing and analysis were conducted using the Kinovea motion analysis software.



Figure 2.2 Kinovea biomechanical analysis of long jumpers’ joint angles

2.5. Statistical Treatment

It is an important aspect of any endeavor to reach at last inferential point, for this the raw data were arranged sequentially, tabulated and subjected for the descriptive statistical analysis, followed by Pearson product moment correlation coefficient to find out the relationship between long jumpers’ seasonal performance and long jump phases’ joint angles. Multiple regression coefficient was used to analyze the effect of release parameters’ angles at release during take-off on jumping distance.

3. RESULTS

TABLE 3.1
CORRELATION COEFFICIENT MATRIX RESULTS OF LONG JUMPERS

Phases	Joints Angles	R Value	Sig.
Take-off Preparation	Ankle	-0.16	0.49
	Knee	-0.67	0.001
	Shoulder	0.18	0.43
	Elbow	-0.67	0.001
Take-off	Ankle	-0.09	0.71
	Knee	-0.53	0.02
	Shoulder	-0.38	0.1
	Elbow	0.22	0.34
Flight	Ankle	-0.02	0.94
	Knee	0.3	0.19
	Shoulder	0.35	0.13
	Elbow	0.1	0.67
Landing	Ankle	0.11	0.63
	Knee	-0.12	0.61
	Shoulder	-0.12	0.61
	Elbow	-0.14	0.54

The above table indicates that during take-off preparation phase knee angle has a significant relationship with long jumping performance ($r = -0.67, p < 0.05$) and also knee angle has a significant relationship with seasonal jumping performance of athletes ($r = -0.53, P < 0.05$ during take-off phase. Thus, both take off preparation and take off phase knee angle has a significant relationship with athletes' seasonal performance.

TABLE 3.2
REGRESSION COEFFICIENT RESULTS

Independent variables	B	Std. Error	Sig.
(Constant)	7.57	0.597	0.01
Knee Angle during Take-off Preparation Phase	-0.016	0.004	0.01
Knee Angle during Take-off Phase	-0.014	0.005	0.02
Note: $R^2 = .676, F = 15.1, *p < .05,$			

The multiple regression result output reported that knee angle during take-off preparation phase and take off phase explained by 67.6% of variance ($R^2 = .676, F(18, 2.72) = 15.1, p < 0.05$). Hence, from the analysis one could understand that in both phase knee joint angle significantly impacting the performance of Oromia regional state clubs long jumpers. Effect size of long jump take off preparation knee angle was significant ($R^2 = .676, F(18, 2.72) = 15.1, \text{Beta value (B)} = -0.016, p < 0.05$) and long jump take off knee angle ($R^2 = .676, F(18, 2.72) = 15.1, \text{Beta value (B)} = -0.014, p < 0.05$). Moreover, both take off preparation knee and take off knee have low effect size on athletes' long jumping' seasonal performance.

4. DISCUSSION

The results of this study show that the relationship between both phases take off preparation and take-off, knee joint angle has significant relationship with athletes' long jumpers' seasonal performance. Similar study conducted by Nicholas, et. al., (2011) suggested that relationships between run-up velocity, take-off technique, and jump distance. Correspondingly, Oleg et al., (2018) found that significantly higher take-off velocity and its horizontal component, and significantly shorter ground contact time exhibited by the athletes of the higher performance level, as well as a strong correlation between effective distance and knee angle at touchdown in the group of jumpers of lower performance level. Those that badly agree with the simulation results include significantly higher vertical velocity at take-off and larger take-off angle in the more qualified group of jumpers, as well as the lack of strong correlations between effective distance and take-off velocity, horizontal take-off velocity, take-off angle, leg angle, and CG height at touchdown. Obviously, this is due to differences in power ability of the athletes between and into two qualification groups, which does not correspond to the initial positions defined for the simulation.

In consistency with this study Linthorne, et al., (2011) reveals that in all jumps the horizontal take-off force was predominantly a backwards braking force and so the athlete's horizontal velocity was substantially reduced during the take-off. The athlete's braking impulse increased with increasing run-up velocity, but not so much as to negate the increase in run-up velocity. The optimum long jump take-off technique is a compromise between the conflicting desires of generating vertical impulse and minimizing the horizontal braking impulse. In agreement with this study Nicholas, Maurice and Lisa

(2005) reported that for all athletes, to produce low take-off angles were produced using progressively shorter and slower run-up. The take-off speed decreased and the take-off height increased as the athlete jumped with a higher take-off angle. The calculated optimum take-off angles were in good agreement with athletes' competition take-off angles. Study conducted in Japan by Yutaka, Michiyo and Hiroyuki (2011) reveals that the World group indicated the greater horizontal center of gravity velocity and smaller decrease in the horizontal center of gravity velocity during the take-off preparation and take-off than those of the Japan group and The Japan group tended to flex and extend the knee joint of the support leg, and to raise the trunk in earlier timing during the preparation phase.

In this study multiple regression result suggested that both phases (take off preparation and take off) knee have low effect size on athletes' seasonal performances. In agreement to this study, other similar study Nemtsev, et. al. (2018) suggested that optimum leg plant angle is likely to depend on the athlete's anthropometric factors (e.g. limb segment lengths) and the athlete's physical conditioning (maximum running velocity; eccentric leg strength). Other factors such as the 'vigor' of the arms and free leg during the take-off may also interact in a complex way with the optimum leg plant angle. When using her competition run-up length, the athlete in the present study used a leg plant angle of about 63°.

Other finding Lees, Fowler and Derby (1993) reveals that the touch off down take-off angle was responsible for generating vertical velocity. The study was concluded that there was evidence for mechanical, biomechanical and muscular mechanisms. Morinaga et al., (2003) investigated the takeoff preparatory and takeoff motion in good- and poor-jumps for six male long jumpers and found out that the trunk in the good jumps leaned forward at the takeoff and the decrease in the horizontal Center of gravity velocity was smaller than in the poor jumps.

5. CONCLUSION

On the basis of the finding of this study we can conclude that during take-off preparation and take-off phase knee angle has a significant relationship with long jumpers seasonal performance.

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EFFECT OF CIRCUIT STRENGTH TRAINING ON AEROBIC AND ANAEROBIC CAPACITY ON JUNIOR BASKETBALL PLAYERS

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ABSTRACT

Basketball is a high intensity running game highly demand aerobic and anaerobic energy pathway. The purpose of the study was to find out the effect of the circuit strength training on aerobic and anaerobic capacity on junior basketball players. Fifteen(n15) basketball players have been recruited from Jaffna central college as experimental group(EG) and fifteen (n=15)basketball players have been recruited from Jaffna Hindu college as control group(CG). EG has undergone 12 weeks of circuit strength training. Pre test data was collected from both group before commencing the study in selected variables such as aerobic and anaerobic capacity. Aerobic capacity was measured from 1.5KM run test and anaerobic capacity was measured from 300m running. After completion of experimental study post test data was collected from EG and CG. t statically test was administered to find out significant level. Significant level fixed at 0.05 level. Result revealed that anaerobic capacity has shown significant level of improvement of EG and aerobic capacity has not shown improvement. Control group had any more improvements in certain variables. Result concluded that 12 weeks circuit strength training had significant level of improvement on anaerobic capacity but CG had no more improvement in certain variables

Keyword: Aerobic, Anaerobic, Strength training

1. INTRODUCTION

Basketball game is aerobic base anaerobic sports demand fast glycolysis energy system as dominants (Mc karthy and Agre, 1995). Basketball is considered an intermittent high-intensity sport that requires mainly anaerobic metabolism (Hoffman, et.al., 1999). However slow a glycolysis energy system contributes for quick recovery and prolongs minutes of running. ATP-PC system contributes sudden attack of movement during ball shooting. However, the duration of a basketball game (40–48 min) requires a high level of aerobic metabolism to enhance the resynthesis of creatine phosphate, lactate clearance from active muscle and removal of accumulated intracellular inorganic phosphate (Arazi & Asadi, 2005). It seems clear that the physical fitness of basketball players and game performance can be influenced by both aerobic and anaerobic metabolism (Narazaki, et.al., 2009). This aerobic and anaerobic capacity may be improved by strength training. This circuit base strength training develops the aerobic capacity through performing many repetition and sets. Aerobic capacity is base to build anaerobic capacity of players. Basketball players should have excellent anaerobic capacity to do high intensity running and ideal quick movement. However anaerobic capacity is also highly depend on aerobic capacity.

Aerobic capacity is highly depend on major three factors such as $VO_2\max$, running economy, and lactate threshold. $VO_2\max$ play major contribution in the development of aerobic capacity that determine amount of oxygen utilized by body during running. Low $VO_2\max$ level affect the basketball performance and the recovery of basketball players. Endurance athletes have high $VO_2\max$ it is about 85ml however basketball players should have slightly less than endurance athletes as playing anaerobic sports. When adopt circuit base strength training which has no negative impact on aerobic capacity (Hoffman, et.al., 1999). This strength training boosts muscular endurance that reduces to muscles fatigue and improves myoglobin. Muscles strength develop anaerobic capacity through improving fast twitch muscles fiber, ATP – PC energy system, fast glycolytic system, increase stroke volume and cardiac output. Enhancing this variables contribute in the development of aerobic and anaerobic capacity.

Circuit based training increase certain amount of strength and muscular hypertrophy. It helps to produce external force against resistance. Previous review literature found that strength has been correlated with basketball performance. Thus basketball players should have adequate strength to produce better performance in competition. Strength is correlated with anaerobic performance. Strength training contributes in the development of energy contribution to increase glycogen storage (Steven & Faoasm, 2005). Circuit based strength training play key role in the adaptation of athletes to sports as well as produce peak testosterone which lead to peak performance and strength.

Circuit based strength training is a important to basketball players as it is developing muscular characters such as muscles fibers some previous research has marked that strength training limited aerobic capacity of basketball players and it is important for quick recovery and continue to tolerate game pressure in competitive situation. Therefore there are unclear result produced in previous study thus present study is to be revealed that effect of circuit based strength training on aerobic and anaerobic capacity of basketball players.

2. METHODOLOGY

2.1 Sampling Design

Fifteen basketball (n=15) players have been recruited from Jaffna central college as experimental group and fifteen (n=15) control group participant has been selected from Jaffna Hindu college. Participant age range was 17 years old, they have represented national school basketball championship with more than 3 years experience in basketball game.

Experimental group has followed weekly 3 days training consistently for 12 weeks. Before commencing the intervention aerobic and anaerobic pre test data was collected from participants. 1.5 km run test was administered to measure aerobic capacity, completed timing recorded in minutes, anaerobic capacity was measured by 300m run test best timing was recorded in second. Before conducting intervention sufficient explanation was given to participant to understand objective of study. Thereafter consent was collected from participants and parents.

2.2 Training protocol

TABLE 1
WEEKLY TRAINING PROGRAMME OF SELECTED EXERCISES

Type s of Exercise	1 & 2 70 %	3 & 4 75 %	5 & 6 80 %	7 & 8 85%	9 & 10 90 %	11 & 12 95%
Snatch	10R×2S	8R×3S	6R×2S	3R×4S	2R ×4S	2R ×4S
Squat	12R×1S	12R×2S	8R×2S	7R×3S	6R×2S	3R×3S
Bench press	15R×1S	12R×2S	9R×2S	7R×2S	6R×2S	3R×3S
Lunges	13R×1S	12R×2S	10R×1S	8R×2S	5R×2S	2R×4S
Step up	14R×1S	12R×2S	9R×2S	7R×2S	5R×2S	3R×3S
Dead lift	12R×1S	12R×2S	8R×2S	7R×3S	6R×2S	3R×3S

R= repetition, S =sets, %= percentage of intensity

3. RESULTS

TABLE 2
EFFECT OF CIRCUIT STRENGTH TRAINING ON AEROBIC AND ANAEROBIC CAPACITY OF BASKETBALL PLAYERS.

Variables	Test type	Mean	SD	P - value
Aerobic capacity	Pre- test-Experimental Group	8.670	0.717	0.174
	Post- test- Experimental Group	8.519	0.954	
	Pre test-Control Group	8.561	0.971	0.374
	Post test- Control Group	8.374	1.009	
Anaerobic capacity	Pre- test- Experimental Group	45.948	2.418	0.000**
	Post- test- Experimental Group	43.859	3.010	
	Pre test- Control Group	45.791	2.098	0.560
	Posttest- Control Group	45.897	1.839	

** Significant level <0.05

Result of the study revealed that circuit strength training had significant improvement on anaerobic capacity of experimental group (0.000<0.05) conversely that control group has not shown any improvement on anaerobic capacity. Moreover aerobic

capacity of experimental group did not improve in aerobic capacity($0.05 < 0.174$) as well as aerobic capacity of control group did not improve in their aerobic capacity($0.05 < 0.374$).

4. DISCUSSION

Basketball players should have adequate muscular charters to do rapid movements, shooting accuracy, preventing from sports injury, delay lactic acid accumulation, quick recovery. Therefore strength training need to be adopted to the players with appropriate load. Aerobic endurance training in conjunction with muscle strengthening provides peak performance for short and long energy demands (**Brown, 2006**). In this connection that circuit base strength training insists the body for greater physiological adaptation, it may be neurological or morphological. These motor tasks are movements that make agility an imperative skill for basketball athletes (**Meckel, Machnai, & Eliakim, 2009**). Neurological adaptation is important for motor unit recruitment, increasing the number of motor unit produce greater force production without controversial conversely reducing number of motor unit produce low force production (**Robergs, & Roberts, 2000**). Basketball players should have required amount of neurological adaptation, which helps to successful movement's pattern. In basketball speed voluntary occur during basketball attempt in side D circle thus circuit base strength training should be adopted. Improving all those variables enhance anaerobic capacity of basketball players it is confirmed in present study.

Circuit base strength training improve type II muscles fiber, this improvement contribute in the development of maximum strength and power (**Leverit, & Peter, 2003**).⁹ which helps develop significant level of anaerobic capacity without controversial. Conversely who follow regular endurance sports have higher type I muscles fiber (**Moore, et. al., 2004**) which has contributed in the development of volume of oxygen uptake. Which sports demand anaerobic capacity as dominant energy that sports should follow strength training. Advantage of circuit base strength training improves aerobic capacity and anaerobic capacity but based on present study protocol that have developed significant level of anaerobic capacity no negative changes in aerobic capacity. Circuit base strength training increasing hypertrophy of muscles cells it increase muscles contractile unit and hypertrophy which helps to force production. Increasing number of contractile unit may be associated with perfect shooting in basketball game (**Brown, 2006**).

The activation status of both aerobic and anaerobic energy systems require energy to do during the game is required (**Saltin, et. al., 1976**). Aerobic capacity is important for basketball players for rapid recovery as it is demanding high intensity of repetition up and down suppose if players don't have adequate recovery it will affect their sporting performance (**Lasuren, et. al, 2002**). this game demand 60% of anaerobic and dominant energy system for game 40% aerobic capacity. Phosphagen energy system and anaerobic glycolysis which produces two routes of anaerobic metabolism is adenosine triphosphate (**Robergs, & Roberts 1997**). circuit based training has low level of recover between station which will enhance aerobic capacity however previous research has highlighted strength training might improve aerobic capacity and some studies revealed it is unclear (**Sale peg, 1992**). therefore present study found strength training had no negative impact endurance capacity without controversial as found major physiological changes in muscles. Strength training affect your type I muscles fiber which is directly related with volume of oxygen uptake and mitochondria it is power house during aerobic running (**Wilmore & Costill 2012**). Moreover resistance training affects the number of connective tissue, capillary

density. These both are important for enhancing aerobic capacity as well as strength training contribute in the development of cross sectional area of muscles fiber. Thus present study found circuit based strength training has no negative impact on aerobic capacity

5. CONCLUSION

Basketball is short sprint sports; it contains much high intensity repetition and low intensity running. Circuit base strength training has been adopted to improve aerobic and anaerobic. Many numbers of repetitions, station of exercise and set improve aerobic and anaerobic. Particularly circuit base training contains low level of recovery between stations that develop the anaerobic endurance. However strength training has no negative impact on aerobic capacity as it is developing anaerobic variables such as myofibriller, ATP-PC system, and type II muscles fiber. Therefore present study concluded that circuit training improved anaerobic capacity of basketball players.

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COMPARATIVE STUDY OF LUNG CAPACITY AND BLOOD PRESSURE BETWEEN KABADDI AND WRESTLING PLAYERS

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ABSTRACT

The objective of the study was to investigate lung capacity and blood pressure between kabaddi and wrestling game players. Another purpose of the study was to find out relationship in lung capacity and blood pressure between Kabaddi and wrestling game players. The subjects of the study were collected from the 100 subjects (50 subjects from kabaddi games, while another 50 subjects were from wrestling games), who were selected from different organizations either affiliated to the government body at center or in the state, to public or private sector, to different sports boards or councils who are engaged in coaching either for kabaddi and wrestling players. The age level of subjects ranged from 20 to 25 years. All the subjects will be the residents at India. Stand and progressive matrices organizational to measure lung capacity between kabaddi and wrestling players, Spiro meter was used and blood pressure measure between kabaddi and wrestling players, Sphygmomanometer was used. To find out significant difference lung capacity and blood pressure between kabaddi and wrestling game players, t-test was used. To find out relationship lung capacity and blood pressure between kabaddi and wrestling game players, Product moment correlation was computed. The result of the data reveals the insignificant difference found was found lung capacity between kabaddi and wrestling players, Significant difference found was found blood pressure between kabaddi and wrestling game players. Further it also shows that significant difference relationship lung capacity and diastolic blood pressure between kabaddi and wrestling game players, insignificant difference relationship systolic blood pressure between kabaddi and wrestling game players.

Keyword: Lung Capacity, Blood Pressure, Kabaddi Game, Wrestling Game, Players

1. INTRODUCTION

An athlete or team participates in any competition to achieve the objective of achieving success and performing better. The performance of a player or team is the result of their good preparation and hard efforts. It is clear that for the preparation of a team for a personal athlete or successful sports performance, many dimensions are required for physical, psychological, physiological, training, technical and other aspects. **(Lowther, Lane & Lane, 2002).**

Play is a part of expansion in human life. From a very simple beginning it has developed a highly organized activity of human society. Where the success and failure of a player depends on the combination of different training done by him. Competition requires a high level of physical ability and strong mindset for the player to perform well. In a world where many athletes are physically, technologically and strategically similar, it is such a mind that perhaps the biggest scope for competitive advantage. But the movement is actually more than a basic physical requirement - it is also out of self and interpretation for others. As we work, we are doing and while meditation is the attribute in meditation, this is the movement that reflects the social contribution **(Singh 2008).**

The term physiology was based on Greek knowledge of physiological means, from natural decoction of discos. Physiology is related to the normal functioning of the human body. There are some branches of physiology studies, viral physiology, bacterial physiology, cell physiology, plant physiology, animal physiology, human physiology etc. Human physiology is further divided into Exercise Physiology, Nutrition Physiology etc. Health in the dictionary is defined as freedom from sickness. More research on this topic shows that health is more than that. In ancient Greek literature, health was not considered as a unit. He used it in two different words ie Hexia and Hegia, Hexia means a good habit of the body and Hegia is a good way. He also knew the intimate relationship between mind and body. Therefore, he established good habits of living for the good of his body.

As the sports competition creates an atmosphere of psychological pressure, various body capabilities such as heart rate, lung capacity, blood pressure etc. are affected, which personally affect the performance level of individual participants or teams. These factors can help prevent external psychological pressures, adversely affect these vital physical functions.

2. METHDOLOGY

2.1 Selection of Subjects

The subjects of this study were the kabaddi and wrestling players selected from different organizations either affiliated to the government body at center or in the state, to public or private sector, to different sports boards or councils who are engaged in coaching either for kabaddi and wrestling games. The total numbers of subjects for this study were 100 male kabaddi and wrestling Players (50 subjects were selected from kabaddi, while another 50 subjects was selected from wrestling game Players). The age level of subjects ranged from 20 to 25 years. All the subjects will be the residents at India.

2.2 Selection of Variables

Necessary data were collected for lung capacity between kabaddi and wrestling players, spriometer was used and blood pressure between kabaddi and wrestling players, sphygmomanometer was used.

2.3 Statistical Analysis

To find out significant difference lung capacity and blood pressure between kabaddi and wrestling game players, t-test was used. To find out relationship lung capacity and blood pressure between kabaddi and wrestling game players, Product moment correlation was computed. The level of significance was set at .05 levels.

3. RESULTS

**TABLE 1
SIGNIFICANCE OF DIFFERENCES AMONG MEAN SCORES OF LUNG CAPACITY BETWEEN KABADDI AND WRESTLING GAMES PLAYERS**

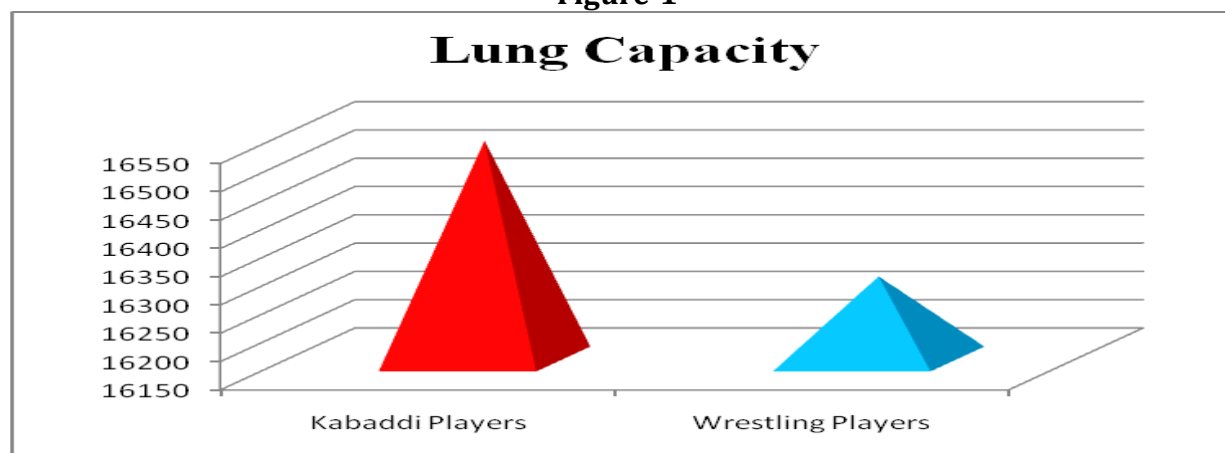
	Game		t- ratio
	Kabaddi Players	Wrestling Players	
Mean	16536	16296	0.175
S.D	8034.46	5459.35	

Insignificant at .05 level

$t_{.05 (98)} = 1.66$

It is evident from table-1 that statistically insignificant difference was found between kabaddi players and wrestling players in their lung capacity. as the obtained t-value of 0.175 was less than required $t_{.05 (98)} = 1.66$ at .05 level of significance.

Figure-1



To find lung capacity between kabaddi and wrestling games players, correlation coefficient statistics was used and presented in table-2.

**TABLE 2
CORRELATION COEFFICIENT OF LUNG CAPACITY BETWEEN KABADDI AND WRESTLING GAMES PLAYERS**

Players	Correlation of coefficient
Kabaddi	.444*
Wrestling	

*Significant at .05 level

$r_{.05(50)} = .279$

It is evident from Table-2 that significant correlation was found between kabaddi and wrestling games players in relation to lung capacity.

To find out systolic blood pressure between kabaddi and wrestling game players, t-ratio statistics was used and presented in table-3.

TABLE 3
SIGNIFICANCE OF DIFFERENCES AMONG MEAN SCORES OF SYSTOLIC BLOOD PRESSURE BETWEEN KABADDI AND WRESTLING PLAYERS

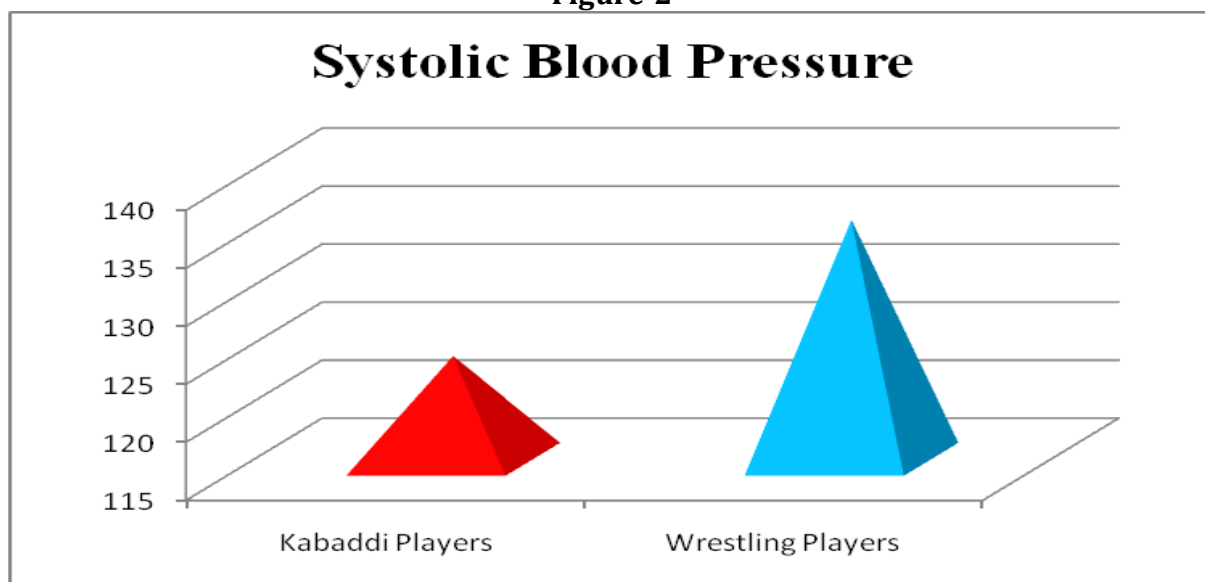
	Game		t-ratio
	Kabaddi Players	Wrestling Players	
Mean	123.90	135.64	5.056*
S.D	11.52	11.69	

*Significant at .05 level

$t_{.05(98)} = 1.66$

It is evident from table-3 that significant difference was found between the mean scores of kabaddi players and wrestling players in relation to systolic blood pressure as the t-value was found -5.056. This was higher value than the required value at .05 level of significance.

Figure-2



To find systolic blood pressure between kabaddi and wrestling games players, correlation coefficient statistics was used and presented in table-4.

TABLE 4
CORRELATION COEFFICIENT OF SYSTOLIC BLOOD PRESSURE BETWEEN KABADDI AND WRESTLING GAMES PLAYERS

Players	Correlation of coefficient
Kabaddi	.001*
Wrestling	

*Insignificant at .05 level

$r_{.05(50)} = .279$

It is evident from table-4 that insignificant correlation was found between kabaddi and wrestling games players in relation to systolic blood pressure.

To find out diastolic blood pressure between kabaddi and wrestling game players, t-ratio statistics was used and presented in table-5.

TABLE 5
SIGNIFICANCE OF DIFFERENCES AMONG MEAN SCORES OF DIASTOLIC BLOOD PRESSURE BETWEEN KABADDI AND WRESTLING GAMES PLAYERS

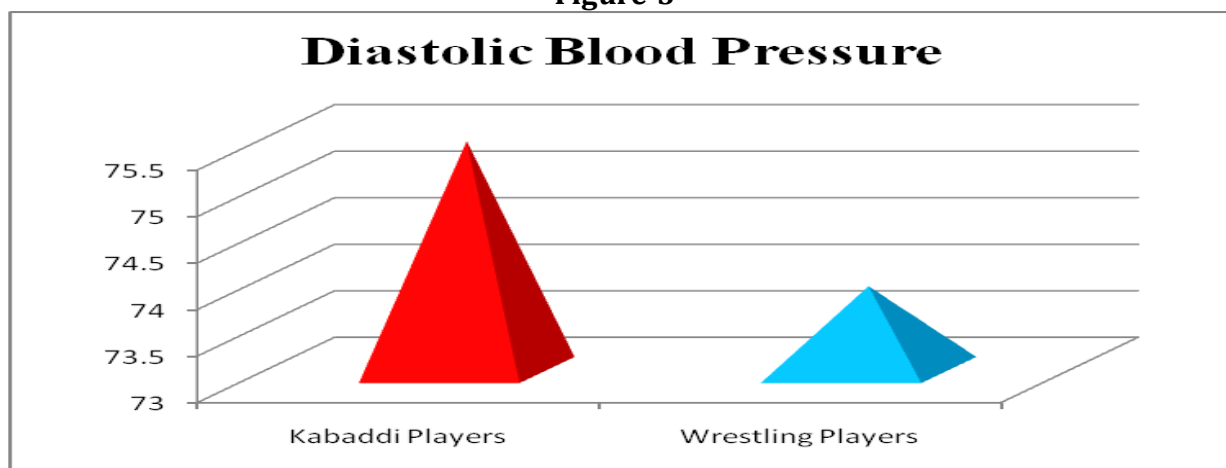
	Game		t.ratio
	Kabaddi Players	Wrestling Players	
Mean	75.46	73.90	.929*
S.D	8.61	8.17	

*Insignificant at .05 level

t.05 (98)= 1.66

It is evident from table-5 that insignificant difference was found between the mean scores of kabaddi players and wrestling players in relation to diastolic blood pressure as the t-value was found .929. This was lower value than the required value at .05 level of significance.

Figure-3



To find diastolic blood pressure between kabaddi and wrestling games players, correlation coefficient statistics was used and presented in table-6.

TABLE 6
CORRELATION COEFFICIENT OF DIASTOLIC BLOOD PRESSURE BETWEEN KABADDI AND WRESTLING GAMES PLAYERS

Players	Correlation of coefficient
Kabaddi	.466*
Wrestling	

*Significant at .05 level

Correlation required to be significant at 50 df = .279*

It is evident from table-6 that significant correlation was found between kabaddi and wrestling games players in relation to diastolic blood pressure.

4. DISCUSSION

The result of the study revealed insignificant difference between the mean scores of kabaddi and wrestling players in relation to lung capacity. The mean score of kabaddi game players were found higher than the wrestling game players. It seems that the players of kabaddi game had higher lung capacity level than the wrestling game players. All the

players selected for the current study were from kabaddi and wrestling games. The fact that the kabaddi player plays on the field for longer than the wrestling player is quite reasonable. The requirements, temperament and working conditions of kabaddi and wrestling games differ from each other, the kabaddi player plays with the team while the wrestling player alone fights on the field. The result of present study is also on the line of the studies conducted **Yadav and Yadav (2017)**, There was significant difference between the Kabaddi and Kho-Kho players in case of vital capacity and breath holding capacity and insignificant difference between the Kabaddi and Kho-Kho players in case of lung capacity.

The result of the study also revealed insignificant difference between the mean scores of kabaddi and wrestling players in relation to systolic blood pressure. **Chaudhary and Kumar (2017)**, also found there was insignificant ($p>.05$) the effect of different geographical conditions on selected physiological variables (systolic blood pressure and respiratory rate) of badminton players.

Significant relationship was revealed between the mean scores of kabaddi and wrestling players in relation to diastolic blood pressure. **Kumar (2018)** also found there is no significant difference in blood pressure.

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CORRELATION BETWEEN BODY MASS INDEX AND HEART RATE IN MALES AND FEMALES OF DIFFERENT AGE GROUP

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ABSTRACT

The present study was under taken in the Yashwantrao Chavan Institute of Science, Satara ,to find out relationship between the body mass index, age, sex on the resting heart rate of different stakeholders in the college campus. The observation shows that there is correlation between the body mass index on heart rate. In addition, this value is important from exercise point of view and the duration for which it could be carried out as it will affect the maximum heart rate of the individual. The value will also help in reducing obesity and improving the cardiac performance.

Key words: BMI, maximum heart rate, obese, under weight.

1. INTRODUCTION

The body weight is highly correlated to the high risk of non-communicable diseases, both the under and overweight individuals are at equal risk (**WHO., 1995 & 2000**). Body Mass Index is measure of body weight relative to height that is associated with body fat and health risk. It was developed in the mid 1800's by a Belgian mathematician named Adolphe Quetelet. It is equal to weight, divided by the square of height. The equation is: BMI=body weight in kg /height in meters squared (**Himes & Dietz, 1994; Mei, et.al., 2002; Whitlock, et.al., 2005**). The following are common definitions of BIM thresholds.

The Body Mass Index in Indians standard Indian values Underweight: Less than 18.5 Healthy and Low risk :<or =to 18.5 but >than 25 Overweight: Greater <or =to 25 but less than 30 Obese class I(considered high risk):<or =to 30 , Obese Class II(considered obese morbidly and very high risk) :<or= to 35, Obese class III (considered morbidity obese):< or = to 40.

Obesity is being recognized as potential threat to health and must be treated as the right time. With obesity increasing, the risk for developing several diseases like, hypertension diabetes , heart ailments ,stroke , osteoarthritis, etc, also increases .

As per research statistics, India will become the global diabetes capital by 2050. The current load of diabetes in India is 41 million, which is expected to rise by 170% in the next years . Every today , India has the largest population of diabetes in the world

2. MATERIAL AND METHODS

2.1 Selection of Subjects

This study was done on 50 males & 50 females (18-69 yr) volunteers during 2014-15. The data was collection class wise ,students of junior college , B.Sc, M.Sc, non teaching staff, staff of junior college, staff of senior college, office employees etc. were considered for the study purpose.

2.2 Selection of Subjects

The height, weight, pulse rate were recorded. The BMI was calculated using the formula. The visitors were informed that the data will be used for research purpose and verbal consent was obtained. Age, sex, height and weight were considered.

2.3 Inclusion and Exclusion Criteria

The 50 male individuals and 50 female originally selected fulfilling the inclusion criteria were included. Children below 18 yr, people with fever, body builders/ highly trained athletes, patients undergoing dialysis, patient with osteoporosis, people having weight loss problems, weight loss associated with cancer, tuberculosis, hemophilia and other severe coagulation disorders were excluded.

2.4 Criterion Measure

Age, sex height and the weight were recorded on data sheet. BMI was calculated from the recorded data of all the volunteers by the subjects. Body weight was measured to the nearest 0.1 kg in light indoor clothing without shoes, using a digital scale. Height was measured in meters.

Figure: I

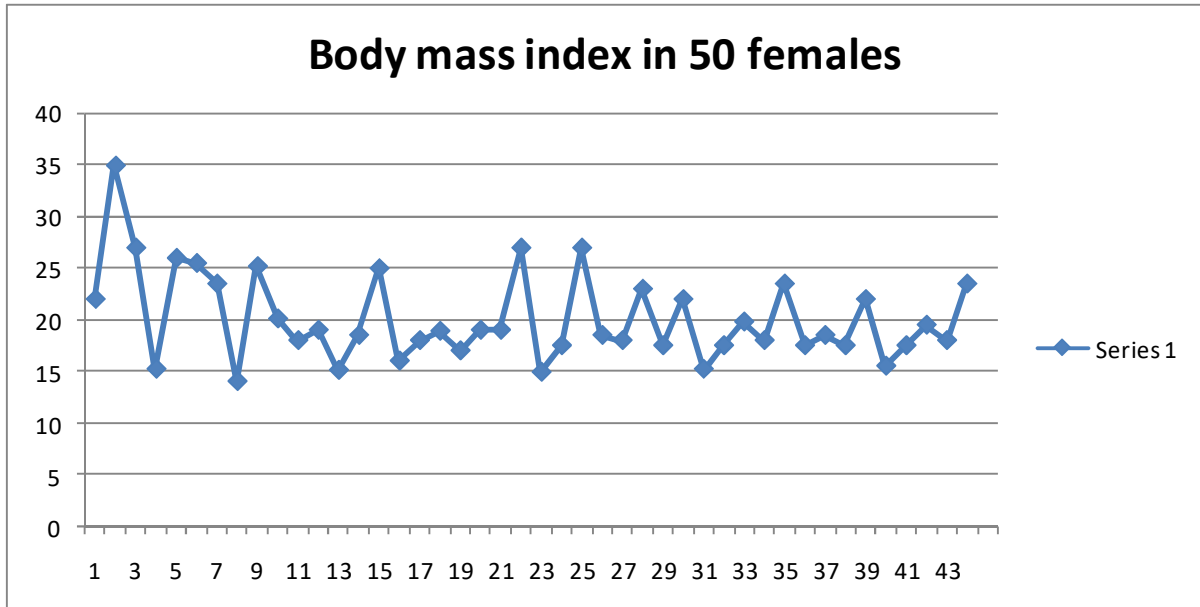


Figure:2

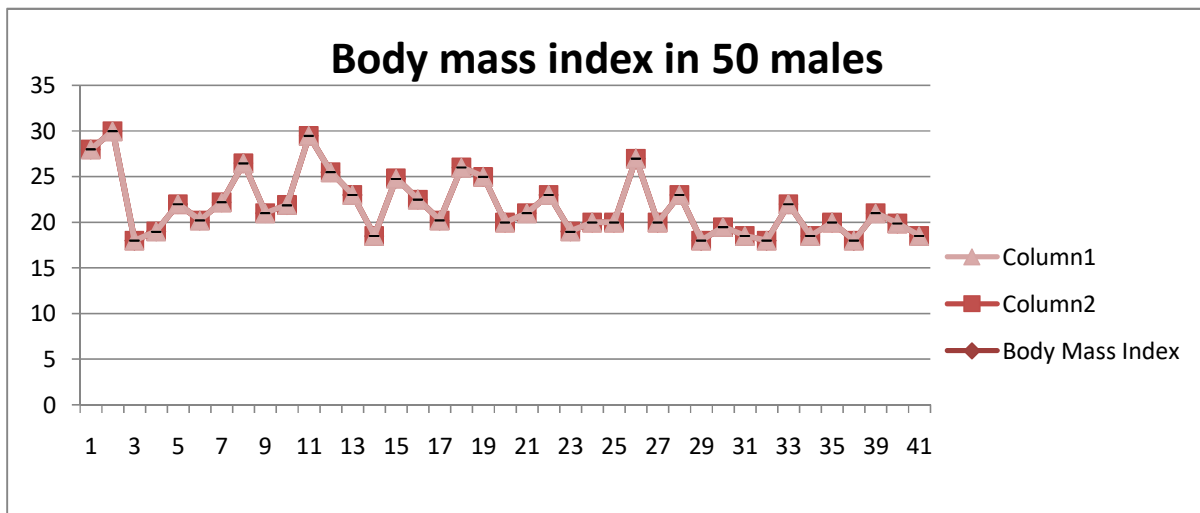


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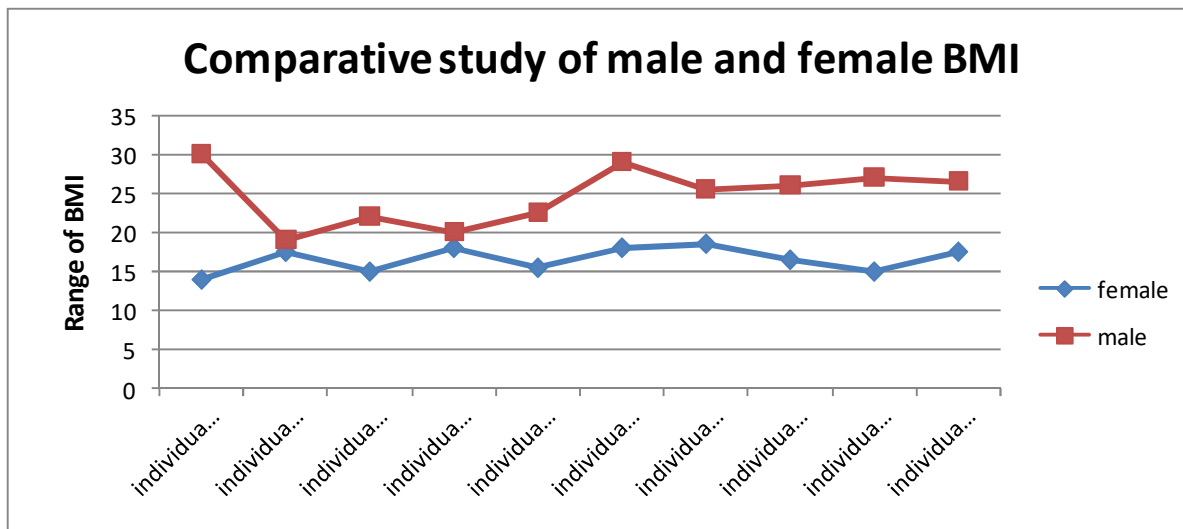
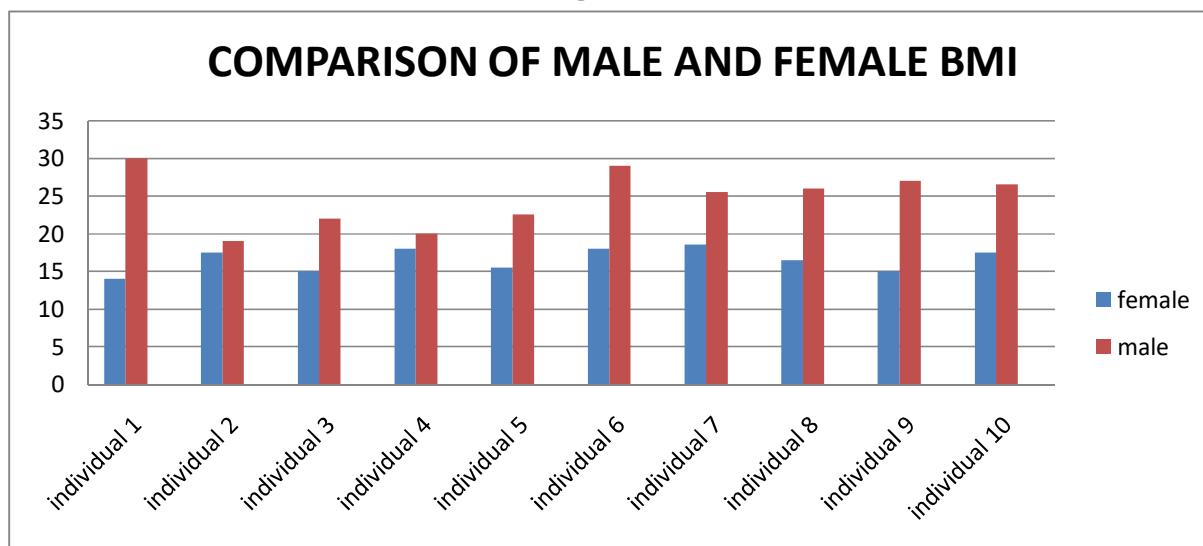


Figure:4



3. RESULT & DISCUSSION

During the assessment of BMI effect would vary according to the data collected hence a cumulative data was collected this would be lead to accuracy (Stevens et. al., 2002). The epigenetic factors play a key role in the BMI values according to populations and other factors (Luke, et.al., 2001). The increased BMI also leads to heart problems (Misra and Vikram , 2004).

There is a significant effect of globalization on the BMI of most men and women (Leavy, 2004). less work is done on the comparative MBI of both sexes (Tamim and Dummit, 2001). The females due to lack of energy are inefficient these results are contradictory to previous studies (Singh, Sikri & Garg, 2008). There should be some correlation studies on body fat content or BMI risk of diseases and its prevalence (Rucker and Cash, 1992).

4. CONCLUSION

It can be concluded that the ratio of BMI was different where Females compared to the males were under weight. Due to excess BMI which exceeds normal level the MHR is less in obese males resulting in to lack of efficiency in exercise and work.

5. PRACTICAL APPLICATION

This should briefly state the practical application in sport and physical Education for the coaches, sport Scientists and physical Educationists etc.

6. RECOMMENDATIONS:

The BMI indicates accurately the obesity indices and its relation to overweight condition (**Must & Anderson, 2006**). the obesity may lead to long lasting consequences (**Must& Strauss, 1999**). The studies indicate food with low and high calories diet according to the BMI (**National Heart Lung and Blood Institute, 1998**). The quality of food is key factor leading to malnourishment. The study strongly indicates that the BMI of males is higher as compared to the females. In conclusion, the tradeoff between sensitivity and specificity should be analyzed in detail before making general recommendations about classification systems for overweight.

For overweight individuals: It is recommended to consult the physician/ doctor/ dietician to plan a daily exercise schedule involving moderate and vigorous intensity activities to reduce your weight. Your calorie intake must be less than that required for your daily activities.

For underweight individuals: It is recommended to gain weight by including energy dense food, which are rich in calories and less in volume, like , raisins, nuts, etc. Muscles and bone strengthening activities prevent loss of bone density at old age.

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