



Effects of Yogic Practices with Resistance Training on Health Related Physical Fitness and Selected Biochemical Variables of Obese Men

¹Dr S.Saraboji, ²Dr. G. Balasundar, ³ Dr. S. Rameshkumar

¹Principal, Aditya College of Physical Education, Affiliated to Adikavi Nannaya University Surampalem, Andhra Pradesh, India

²Head, Department of Physical Education Sri Ramakrishna Mission Vidyalaya College of Arts and Science, Affiliated to Bharathiar University Coimbatore TamilNadu, India

³Director of Physical Education Sri Ramakrishna Mission Vidyalaya College of Arts and Science, Affiliated to Bharathiar University Coimbatore Tamil Nadu India

Abstract

Background: childhood obesity is a condition where excess body composition negatively affects a child's health or wellbeing. As methods to determine body composition directly are difficult, the diagnosis of obesity is often based on BMI. Due to the rising prevalence of obesity in children and its many adverse health effects it is being recognized as a serious public health concern. The term overweight rather than obese is often used in children as it is less stigmatizing.

Objective: The purpose of the study was to find out the effects of yogic practices with resistance training on health related physical fitness and selected biochemical variables of obese men.

Methods: One hundred students were tested on weight and body mass index (BMI). Based on the BMI rating out of one hundred obese students the middle sixty obese students were taken and the data were collected 60 (N=60) obese students aged 17 -20 years. The selected subjects were randomly divided into four equal groups consisting of fifteen each. Experimental group I had yoga training (YTG), experimental group II resistance training (RTG), experimental group III combinations of yoga and resistance training (YARTG) and group IV acted as control group (CG) for a period of 12 weeks. Analysis of Covariance (ANCOVA) was used to determine the significant difference between the treatment means. Whenever the 'F' ratios were found to be significant, Scheffe's post hoc test was applied.

Results: Yogasana training group and resistance training group made significant improvement in flexibility and blood sugar. The obtained F-ratio for the post-test was 15.18 and the table F-ratio was 3.22. Hence the post-test mean flexibility F-ratio was significant at 0.05 level of confidence for the degree of freedom 2 and 42. The obtained F-ratio for the post test was 2.90 and the table F-ratio was 3.22. Hence the post test mean blood sugar F-ratio was not significant at 0.05 level of confidence for the degree of freedom 2 and 42.

Conclusions: The results of the study revealed that there is significant difference in flexibility and blood sugar between pre and post test of the Experimental groups. There is a significant difference on flexibility and blood sugar among the adjusted post test means of experimental group and control group. It is concluded that experimental groups were found to be better than control group in improving the flexibility. The result indicates that the improvement in flexibility is due to specific training. The result of the study also indicates that yoga training group had significantly improved flexibility than the combined training group. Resistance training group had significantly improved flexibility than the combined training group. It is also evident that both resistance training group and yoga training group had similar improvement in flexibility. The result of the study also indicates that yoga training group and resistance training group had similar improvement in blood sugar. Yoga training group and Combined training group had similar improvement in blood sugar. It is also evident that both resistance training group and combined training group had similar improvement in blood sugar.

Keywords : Obesity, Yoga and Resistance training, Flexibility and Blood sugar.

Introduction

Childhood obesity is a condition where excess body composition negatively affects a child's health or wellbeing. As methods to determine body composition directly are difficult, the diagnosis of obesity is often based on BMI. Due to the rising prevalence of obesity in children and its many adverse health effects it is being recognized as a serious public health concern. The term overweight rather than obese is often used in children as it is less stigmatizing.

Ganguly et al. (1962) report that effect of yoga training on endurance and flexibility. The study was conducted on 70 students of Regional police training school Khandala from which 35 students were assigned to each of the experimental and control groups. Significant lowering of the sitting pulse

rate was observed in the experimental group compared to the control group. The Cardiovascular endurance as judged by the Harvard step test improved significantly; in the experimental group. Although mean increase in the toe touch flexibility was observed in the experimental group; it did not reach the expected statistical significance. **Sharma (1973)** Asanas are physical exercises which make the body to be physically fit. These exercises in physical education play an important part in helping the pupils to maintain a slim and youthful body. Several tests and experiments have been conducted to know the values and importance of asanas. The most important point to realize before starting the practice of Yoga is that, the asanas are not just simple exercises but sustained scientific pattern of postures. **Sharma (1973)** A comparative study of the development of flexibility in three physical programmes. The sample consisted of 43 subjects participating in 3 physical programmes at Duke University, Darham during the 1977-1978 school years. Seven flexibility tests were administered before and after fourteen weeks period. It was found that the subjects controlled in the trampoline and floor exercise programme as did the subject in gymnastics apparatus programme were more flexible after 14 weeks than subjects participating in the non gymnastic programme. **Morris (1979)** Thus, considering a high prevalence of overweight and obesity students and the main role of yoga and resistance training the main purpose of this study was to investigate to find out the effects of yogic practices with resistance training on health related physical fitness and selected bio chemical variables of obese men. We also examined the association between yoga training group, resistance training group, combinations of yoga and resistance training and control group of obese men

Methods

Participation

One hundred students were tested on weight and body mass index (BMI). From Ramakrishna mission vidyalaya college among them seven department (21 classes) agreed to participate in the study. Based on the BMI rating out of one hundred obese students the middle sixty obese students were taken and the data were collected 60 (N-60) obese students aged 17 -20 years. The research sample included only the individuals without health limitations that could affect their performance on physical fitness tests. Their participation was voluntary. For each participant, written informed consent was obtained from the parents or guardians. The Ethical Committee is formed by the Ramakrishna Mission Vivekananda Educational and Research Institute (India) approved the study. All procedures were conducted in agreement with the principles expressed in the Declaration of university.

Data Collection:

Assessments of physical and bio chemical variables took place in the gymnasium and scientific laboratory. All testing was conducted by a group of trained examiners using standardized instructions. Body composition was measured by skin fold caliper. The four sites were taken namely chest, thigh, abdominal and calf muscles. The caliper was then applied 1 cm below and at right angles to the pinch, and a reading in millimeters (mm) taken two seconds later. The mean of two measurements was taken. If the two measurements differed greatly, a third was done, then the median value was taken for consideration. **Percentage Body Fat** = $(0.29288 \times \text{sum of skinfolds}) - (0.0005 \times \text{square of the sum of skinfolds}) + (0.15845 \times \text{age}) - 5.76377$, where the skinfold sites (measured in mm) are [abdominal](#), [triceps](#), [thigh](#) and [suprailiac](#) (reference: Jackson A S, Pollock, M (1985) Practical assessment of body composition. Physician Sport Med. 13: 76-90.) the blood was calculated approximately 5 ml of blood from the antecubital vein was collected into a vacutainer. The collection was completed in one minute or less. The vacuainers were put inside the ice box. The blood samples reach the laboratory within 10 minutes. The connector of the test strip was inserted into the test slot of the meter until it is firm. The machine makes a beep and display shows up to indicate the meters are ready for testing. **Scoring:** The test result appeared in the display of cobas integra blood analyser monitor and the scores were recorded in mg/dl. (Rifai, et.al. 1992).

Statistical technique: Observed data were processed using the IBM SPSS Statistics (Version 20.0; IBM, Armonk, NY, USA). The collected data were analyzed with application of 't' test to find out the individual effect from base line to post test, Further Analysis of Covariance (ANCOVA) was used to determine the significant difference between the treatment means. Whenever the 'F' ratios were found to be significant, Scheffe's post hoc test was applied to test the significant difference between the paired adjusted means 0.05 level of confidence was fixed for physical variables, physiological variables and bio chemical variables to test the level of significance.

Results and Discussion

TABLE -I

SIGNIFICANCE OF MEAN GAINS & LOSSES BETWEEN PRE AND POST TEST SCORES ON SELECTED VARIABLES OF YOGASANA TRAINING(YTG)

S. No	Variables	Pre-Test Mean	Post-Test Mean	Mean difference	Std. Dev (±)	σ DM	't' Ratio
1	Flexibility	10.53	15.4	4.86	3.35	0.86	5.61*
2	Blood Sugar	88.86	85.26	3.60	3.86	0.99	3.60*

TABLE -II

SIGNIFICANCE OF MEAN GAINS & LOSSES BETWEEN PRE AND POST TEST SCORES

ON SELECTED VARIABLES OF RESISTANCE TRAINING (RTG)

S. No	Variables	Pre-Test Mean	Post-Test Mean	Mean difference	Std. Dev (±)	σ DM	't' Ratio
1	Flexibility	10.66	13.33	2.66	3.19	0.82	3.22*
2	Blood Sugar	88.80	85.60	3.20	4.98	1.28	2.48*

TABLE -III**SIGNIFICANCE OF MEAN GAINS & LOSSES BETWEEN PRE AND POST TEST SCORES ON SELECTED VARIABLES OF COMBINED YOGA AND RESISTANCE TRAINING (CYRTG)**

S. No	Variables	Pre-Test Mean	Post-Test Mean	Mean difference	Std. Dev (±)	σ DM	't' Ratio
1	Flexibility	10.60	16.66	6.06	3.39	0.87	6.93*
2	Blood Sugar	89.53	85.60	3.93	3.71	0,95	4.10*

TABLE -IV**SIGNIFICANCE OF MEAN GAINS & LOSSES BETWEEN PRE AND POST TEST SCORES ON SELECTED VARIABLES OF CONTROL GROUP(CG)**

S.No	Variables	Pre-Test Mean	Post-Test Mean	Mean difference	Std. Dev (±)	σ DM	't' Ratio
1	Flexibility	10.26	11.06	0.80	2.17	0.56	1.42
2	Blood Sugar	85.66	85.53	0.13	1.55	0.40	0.33

TABLE -V**COMPUTATION OF ANALYSIS OF COVARIANCE OF MEANS OF YOGA TRAINING RESISTANCE TRAINING COMBINED YOGA AND RESISTANCE TRAINING AND CONTROL GROUPS ON PERCENTAGE OF FLEXIBILITY**

Test	Yoga Training (YT \mathbf{G})	Resistance Training (RT \mathbf{G})	Resistance Training Training (CYRT \mathbf{G})	Control Group (CG)	Source of Variance	Sum of Squares	df	Means Squares	F-ratio
Pre-Test Means	10.53	10.66	10.60	10.26	BG	1.38	2	0.46	0.11
					WG	225.60	42	4.02	
Post-Test Means	15.40	13.33	16.66	11.06	BG	271.00	2	9.03	15.18*
					WG	333.20	42	5.95	
Adjusted Post-Test Means	15.39	13.32	16.66	11.08	BG	268.45	2	89.48	14.81*
					WG	332.17	41	6.03	

FIGURE -1**BAR DIAGRAM SHOWING THE MEAN VALUES OF PRE TEST AND POST TEST ON FLEXIBILITY YOGA TRAINING RESISTANCE TRAINING COMBINED YOGA AND RESISTANCE TRAINING AND CONTROL GROUP**

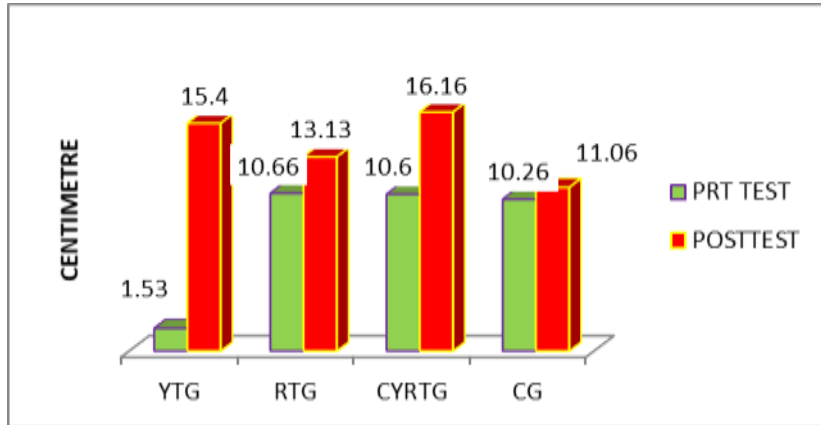


TABLE -VI

THE SCHEFFE’S TEST FOR THE DIFFERENCES BETWEEN THE ADJUSTED POST TEST PAIRED MEANS ON PERCENTAGE OF FLEXIBILITY

Adjusted Post-test means				Mean Difference	Confidence Interval
Yoga Training (YTG)	Resistance Training (RTG)	Combined yoga and resistance (CYRTG)	Control Group (CG)		
15.39	13.32	---	---	2.07*	1.86
15.39	---	16.66	---	1.27	
15.39	---	---	11.08	4.31*	
---	13.32	16.66	---	3.34*	
---	13.32	---	11.08	2.24*	
---	---	16.66	11.08	5.58*	

* Significant at 0.05 level of confidence

Table shows that the mean difference between yoga training group , resistance training group , combined of yoga and resistance training group and control groups and between yoga training, resistance training, control group were 2.07 and 4.31 respectively on flexibility are greater than the confidence interval value 1.86, which shows significant difference at 0.05 level of confidence. The mean difference between yoga training group and combinations of yoga and resistance training group were 1.27, on flexibility is lesser than the confidence interval value 1.86, which shows insignificant difference at 0.05 level of confidence. The mean difference between resistance training group and combined of yoga and resistance training group were 3.34, on flexibility is greater than the confidence interval value 1.86, which shows significant difference at 0.05 level of confidence. The mean difference between resistance training group and control group and between yoga training, resistance training group and control group were 2.24 and 5.58 respectively on flexibility are greater than the confidence interval value 1.86, which shows significant difference at 0.05 level of confidence.

FIGURE -2

BAR DIAGRAM SHOWING THE PRE POST AND ADJUSTED MEANS OF THE YOGA TRAINING RESISTANCE TRAINING COMBINED YOGA AND RESISTANCE TRAINING AND CONTROL GROUP ON FLEXIBILITY

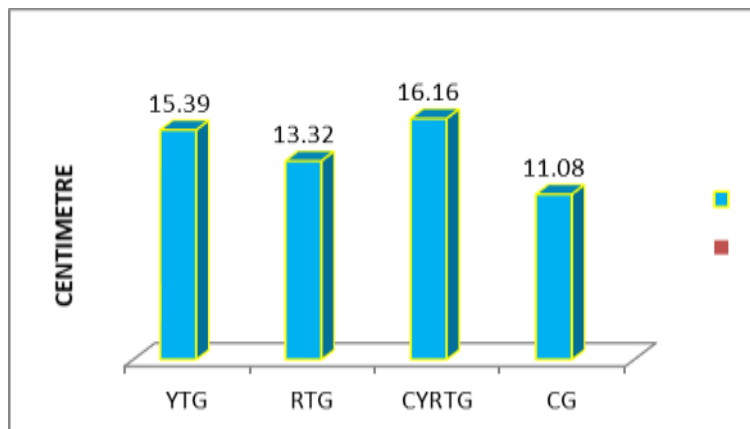


TABLE -VII

COMPUTATION OF ANALYSIS OF COVARIANCE OF MEANS OF YOGA TRAINING RESISTANCE TRAINING COMBINED YOGA AND RESISTANCE TRAINING AND CONTROL GROUPS ON BLOOD SUGAR

Test	Yoga Training (YT \mathbf{G})	Resistance Training (RT \mathbf{G})	Combined yoga and resistance Training (CYRT \mathbf{G})	Control Group (CG)	Source of Variance	Sum of Squares	df	Means Squares	F-ratio
Pre-test means	85.26	85.60	85.6	85.66	BG	0.05	2	0.01	0.00
					WG	356.1	42	6.35	
Post-test means	88.86	88.80	89.58	85.53	BG	140.4	2	46.8	2.90
					WG	901.2	42	16.09	
Adjusted Post-test means	88.94	88.77	89.51	85.49	BG	149.13	2	49.71	4.40*
					WG	621.19	41	11.29	

FIGURE -3

BAR DIAGRAM SHOWING THE MEAN VALUES OF PRE TEST AND POST TEST ON BLOOD SUGAR YOGA TRAINING RESISTANCE TRAINING COMBINED YOGA AND RESISTANCE TRAINING AND CONTROL GROUP

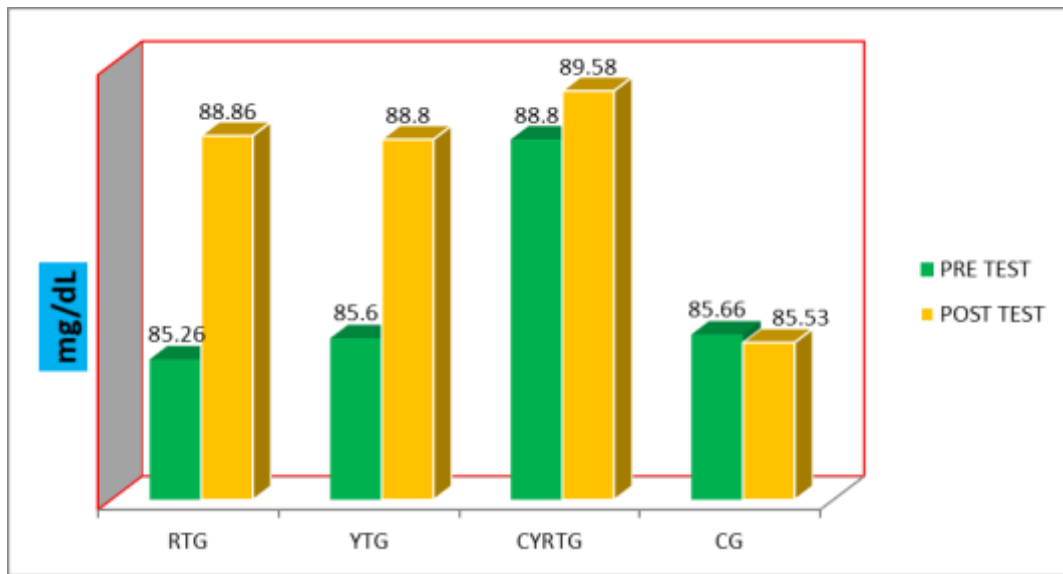


TABLE -VIII

THE SCHEFFE'S TEST FOR THE DIFFERENCES BETWEEN THE ADJUSTED POST TEST PAIRED MEANS ON BLOOD SUGAR

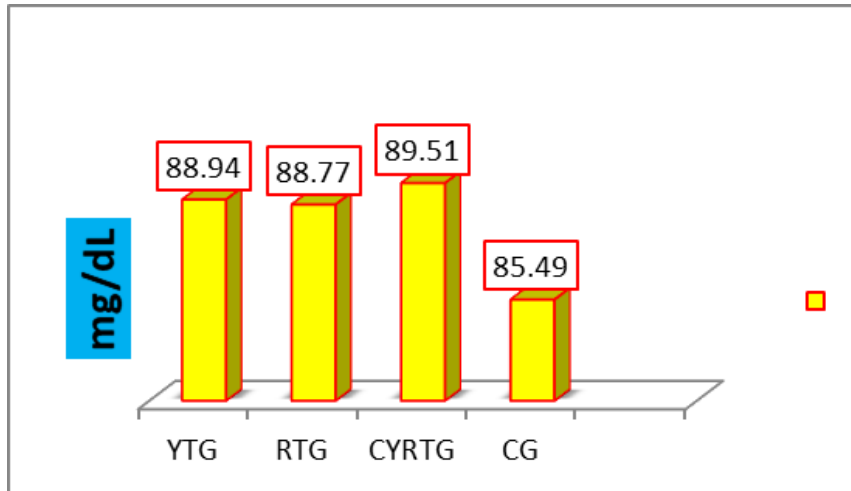
Adjusted Post-test means					Mean Difference	Confidence Interval
Yoga Training (YT \mathbf{G})	Resistance Training (RT \mathbf{G})	Combined yoga and resistance training (CYRT \mathbf{G})	Control Group (CG)			
88.94	88.77	---	---	0.17	2.51	
88.94	---	89.51	---	0.57		
88.94	---	---	85.49	3.45*		
---	88.77	89.51	---	0.74		
---	88.77	---	85.49	3.28*		
---	---	89.51	85.49	4.02*		

* Significant at 0.05 level of confidence

Table shows that the mean difference between yoga training group and resistance training group and between yoga training group and combined yoga and resistance training group and between resistance training group and combined yoga and resistance training group were 0.17, 0.57 and 0.74 respectively on blood sugar are lesser than the confidence interval value 2.51, which shows insignificant difference at 0.05 level of confidence. The mean difference between yoga training group and control group was 3.45 on blood sugar is greater than the confidence interval value 2.51, which shows significant difference at 0.05 level of confidence. The mean difference between resistance training group and control group and between combined yoga and resistance training group were 3.28 and 4.02 respectively on percentage of body fat are greater than the confidence interval value 2.54, which shows significant difference at 0.05 level of confidence.

FIGURE -4

BAR DIAGRAM SHOWING THE PRE POST AND ADJUSTED MEANS OF THE YOGA TRAINING RESISTANCE TRAINING COMBINED YOGA AND RESISTANCE TRAINING AND CONTROL GROUP ON PERCENTAGE OF BLOOD SUGAR



Discussion on Findings

The results of the study revealed that there is significant difference in flexibility among the pre and post of the experimental group. There is a significant difference on flexibility among the adjusted post test means of experimental group and control group.

It is concluded that experimental groups are found to be better than the control group in improving the flexibility. The result indicates that the improvement in flexibility is due to specific training. The result of the study also indicates that yoga training group had significantly improved flexibility than the resistance training group. Combined training group had significantly improved flexibility than the resistance training group. It is also evident that both yoga training group and combined training group had similar improvement in flexibility.

The result of the study is in line with the studies of Kosalaraman (1998) who had conducted a study on effect of selected yogasanas on flexibility in high school obese boys, for this he selected 40 boys randomly, selected by lot system. Without any disabilities that may have influence in assessment of the critical variable, the selected boys were randomly grouped in to two equal groups and experimental group A (n = 20) and a control group B (n = 20), the age of the subject range from 13 to 14 years. The control group was not permitted to participate in the experimental training program, the experimental group was subjected to undergo a set of five asanas for a might of five repetitions per day. Final test was taken for both the group after fifteen days. From that he absorded that there was a significant improvement on the flexibility of the experimental group through the selected asana exercises.

The result of the study proved that there was significant change due to the 12 weeks of strength and plyometric training on speed and the findings of this study are in agreement with the studies of Gabbett TJ Domrow N who found that speed can be beneficially altered with strength and plyometric training. Therefore the present data indicates the improvement in flexibility that was observed mostly due to yogic practices, resistance training and combined yoga and resistance training.

BLOOD SUGAR

The results of the study revealed that there is significant difference in blood sugar between pre and post test of the Experimental groups. There is a significant difference on blood sugar among the adjusted post test means of experimental group and control group. It is concluded that experimental groups are found to be better than the control group in improving the blood sugar. The result indicates that the improvement in blood sugar is due to specific training.

The result of the study also indicates that yoga training group and resistance training group had similar improvement in blood sugar. Yoga training group and Combined training group had similar improvement in blood sugar. It is also evident that both resistance training group and combined training group had similar improvement in blood sugar.

The result of the study is in line with the studies of Katoh (1993) who studied that effects of physical training on obesity, hypertension, hyperlipidemia and disorders of glucose metabolism were investigated in 359 males, 30-59 years of age. Body mass index (BMI), systolic and diastolic blood pressure (SBP and DBP), high density lipoprotein cholesterol (HDL-C), total cholesterol (TC) and fructosamine (FA) were measured before and after the 2 month period of physical training at intensities of about 50% of maximal O₂ uptake. Results are summarized as follows; 1. Means of BMI, SBP, DBP, TC and FA after the training were significantly lower than before the training. Mean of HDL-C was significantly higher than before the training. 2. In subjects with high BMI (n = 124), high SBP (n = 129) and high DBP (n = 128), means of BMI, SBP and DBP decreased with increase of training time per week. In subjects with low HDL-C (n = 104), high TC (n = 135) and high FA (n = 66), changes in means of TC, HDL-C and FA after the training did not show a relationship to training time per week. 3. Differences observed for measured values before and after the training of 2-3 hours per week were 0.4 kg/m²

in BMI, 15 mmHg in SBP and 10 mmHg in DBP, suggesting that training of 2-3 hours per week was effective in intervention of obesity and hypertension. Therefore the present data indicate the changes in yogic practices and resistance training and combined yoga resistance training

Conclusions:

The present study showed significantly improved results of overweight/obese men than the control group it means the obese men without doing any physical activity. Moreover, the present findings point to the higher prevalence of yoga and resistance training in college level with overweight and obesity. The study reinforces the idea that excessive body weight provides a constraint for other girls students. This study proved that there was significant improvement in yogasana training and resistance training for the obesity students. Hence it was recommended that Physical Educationists, Special Education teachers and Physiotherapists to include yogasana and resistance training to improve the total body flexibility and blood sugar level

Further studies could be done still more elaborately with the following recommendations in mind. The present study can be carried out for a long period to achieve better physical and psychological result. Similar study with other age groups can be done to find out the efficiency of this training. Similar study with female groups can be done to find out the efficiency of this training. An in-depth analysis can be carried out in the field of teaching and learning where the efficiency of the yogic and strength could be found out. Yogic programme should be included in the training for all school and college students which is essential for better playing to avoid many diseases for students to live long.

References

- Alberga AS (2013)** Resistance training may concomitantly benefit body composition, blood pressure and muscle MMP-2 activity on the left ventricle of high-fat fed diet rats. *National library of medicine Oct;62(10):1477-84*
- Balachandran (2013)** Effect of long-term resistance exercise on body composition, blood lipid factors, and vascular compliance in the hypertensive elderly men. *Journal exercise rehabilitation Apr;9(2):271-7*
- Bakris (2007)** Current perspectives on hypertension and metabolic syndrome. *J Manag Care Pharm. 2007;13:S3-5.*
- Battagin (2010)** Pressure response after resistance exercise for different body segments in hypertensive people. *Arq Bras Cardiol. 2010;95:405-411.*
- Bjarnason (2004)** Recommendations for resistance exercise in cardiac rehabilitation. Recommendations of the German Federation for Cardiovascular Prevention and Rehabilitation. *Eur J Cardiovasc Prev Rehabil. 2004;11:352-361.*
- Blacher (1999)** Impact of aortic stiffness on survival in end-stage renal disease. *Circulation. 1999;19:2434-2439.*
- Cornelissen (2005)** Effect of resistance training on resting blood pressure: a meta-analysis of randomized controlled trials. *J Hypertens. 2005;23:251-259.*
- Cien Saude Colet (2014)** Blood pressure and its association with physical activity and obesity in adolescents: A systematic review *Mar;19(3):797-818.*
- Cottell (2011)** The effects of diet education plus light resistance training on coronary heart disease risk factors in community-dwelling older adults. *J Nutr Health Aging. 2011;15:762-767.*
- Cui J, Bai Y, (2014)** Effect of long-term physical exercise program and/or diet on metabolic syndrome in obese boys. *Jul 1;30(1):94-103 National library of medicine . doi: 10.3305/nh.2014.30.1.7448 Jan;40(1):17-28.*
- Taehan Kanho Hakhoe Chi (2006)** The effect of an exercise program on body composition and physical fitness in obese female college students *Feb;36(1):5-14.*
- Kumagai S.(1994)** The effect of endurance training on the relationships between sex hormone binding globulin, high density lipoprotein cholesterol, apoprotein A1 and physical fitness in pre-menopausal women with mild obesity. *Apr;18(4):249-54.*
- Nihon Koshu Eisei Zasshi. (1993)** Effect of training fitness on obesity, hypertension, hyperlipidemia and disorders in glucose metabolism *National library of medicine Dec;40(12):1129-*
- Katoh M (1993)** Effect of therapeutic exercise on physical fitness in a school health program for obese children *National library of medicine Dec;40(12):1129-38.*
- Suzuki M (1987)** Insulin and blood pressure during weight loss in obese adolescents. *National library of medicine Sep;10(3):267-73.*
- Rocchini AP(2005)** The beneficial effect of yoga in diabetes. *National library of medicine Dec;7(2):145-7.*
- Kim HS (2013)** The effects of resistance exercise training on body composition and strength in obese prepubertal children. *National library of medicine Sep;41(3):103-9*
- Leite RD (2012)** Yoga training improves metabolic parameters in obese boys. *National library of medicine Jun;16(3):175-80*
- Seo DY (2009)** The effect of duration of resistance training interventions in children who are overweight or obese. *National library of medicine Jul;23(4):1263-70*

Sgro M (2009) Eight weeks of resistance training can significantly alter body composition in children who are overweight or obese. *National library of medicine Jan;23(1):80-5.*

McGuigan MR (2012) The effect of 12 weeks of aerobic, resistance or combination exercise training on cardiovascular risk factors in the overweight and obese in a randomized trial. *National library of medicine Aug 28;12:704*

Wei Sheng Yan Jiu. (2014) Effects of different intensity exercise on blood glucose, adolescent obesity rats insulin sensitivity and RBP4. *Jul;43(4):35-40.National library of medicine*