



# International Journal of Medical and Exercise Science

(Multidisciplinary, Peer Reviewed and Indexed Journal)

## ORIGINAL ARTICLE

**AN ANALYTICAL STUDY OF VO<sub>2</sub> MAX, RESTING HEART RATE, WAIST HIP RATIO AND FLEXIBILITY CHANGES ON COMBINED EFFECTS OF DYNAMIC CORE STABILITY EXERCISES AND STRETCHING IN MIDDLE AGED OVERWEIGHT MEN POPULATION IN CHENNAI**

Search engine:  
[www.ijmaes.org](http://www.ijmaes.org)

**RADHAKRISHNAN. R<sup>1</sup>, VENKATESAN. R<sup>2</sup>, KIRAN.V<sup>3</sup>, SENTHIL.P<sup>4</sup>, SHARMILA.K<sup>5</sup>**

**Corresponding Author:**

<sup>1</sup>Research scholar, Tamilnadu Physical Education and Sports University, Chennai, Tamilnadu, India.

Mail id: [rraaddss@yahoo.com](mailto:rraaddss@yahoo.com)

**Co-Authors:**

<sup>2</sup>Asst. Professor, Tamilnadu Physical Education and Sports University, Chennai, Tamilnadu, India.

<sup>3</sup>Research scholar, Tamilnadu Physical Education and Sports University, Chennai, Tamilnadu, India.

<sup>4</sup>Professor, School of Physiotherapy, VISTAS, Chennai, Tamilnadu, India.

<sup>5</sup>Physiotherapist, Tagore Medical College and Hospital, Chennai, Tamilnadu, India.

### ABSTRACT

**Purpose:** To investigate the changes that occurs in the cardiovascular system and to measure the anthropometric changes on administering combined dynamic core stability exercises and flexibility exercises in middle aged overweight men population in Chennai. **Methodology:** Overweight middle aged male subjects ( $n = 15$ ) who were desk bourne working for long hours in their office and had not been into regular exercising and lack flexibility were selected based on the BMI who scored more than 25. All were treated with dynamic core stability exercises, stretching exercises of hamstring muscles and treadmill training without elevation for four weeks. Outcomes was measured for Vo2 max, resting heart rate, sit and reach test values, and waist to hip ratio (WHR). At the end of four weeks of training again post test measurement was made and the results were compared using ttest. **Results:** The pretest and posttest mean difference of sit and reach test for flexibility is 4.6, resting heart rate is 3.73, while Vo2 max had moderate difference of 1.77 and a very minimal difference of 0.03 in waist to hip ratio. It was found that the results of flexibility, resting heart rate were more statistically significant with ( $p < 0.001$ ) whereas Vo2 max and waist to hip ratio were marginally significant. **Conclusion:** It is concluded that Dynamic core stability exercises, treadmill exercises and stretching was found to be useful in improving the muscle strength and flexibility. The training was effective in controlling the resting heart rate, however the anthropometric values of WHR and Vo2 max needs to be focused for better improvement.

**Keywords:** BMI, VO2 max, Resting Heart Rate, Flexibility, Dynamic Core Stability Exercises

Received on 3<sup>rd</sup> May 2019, Revised on 4<sup>th</sup> June 2019, Accepted on 18<sup>th</sup> June 2019

## INTRODUCTION

Overweight and obesity are defined as abnormal or excessive fat accumulation that may impair health<sup>1,2</sup>. Being overweight is having more body fat than is optimally healthy. Being overweight is especially common where food supplies are plentiful and lifestyles are sedentary<sup>3</sup>. The fundamental cause of obesity and overweight is an energy imbalance between calories consumed and calories expended<sup>4</sup>. Globally, there has been an increased intake of energy-dense foods that are high in fat; and an increase in physical inactivity due to the increasingly sedentary nature of many forms of work, changing modes of transportation increasing urbanization<sup>5,6</sup>.

Excess weight has reached epidemic proportions globally, with more than 1 billion adults being either overweight or obese in 2002<sup>11</sup>. In 2013 this increased to more than 2 billion. Increases have been observed across all age groups. A healthy body requires a minimum amount of fat for proper functioning<sup>10</sup>. But the accumulation of too much storage fat can impair movement, flexibility, and alter the appearance of the body<sup>3,8</sup>.

Overweight is a BMI greater than or equal to 25; and obesity is a BMI greater than or equal to 30<sup>7</sup>. BMI provides the most useful population-level measure of overweight and obesity as it is the same for both sexes and for all ages of adults. However, it should be considered a rough guide because it may not correspond to the same degree of fatness in different individuals<sup>4</sup>.

WHO has developed the "Global Action Plan for the Prevention and Control of Noncommunicable Diseases. mortality from

NCDs by 2025 and a halt in the rise of global overweight & obesity to match the rates of 2010<sup>11</sup>.

Even as India battles malnutrition, the country has developed another nutritional problem obesity. In past 10 years, the number of obese and overweight people has doubled in the country, according to the National Family Health Survey (NFHS-4). As per the survey conducted by Ministry of Health and Family Welfare (MoHFW), people having Body Mass Index (BMI) more than 25 kilogram per metre square have been considered as overweight.

The survey highlights that urban population is more prone to obesity as compared to their rural counterparts. In Tamilnadu, 30.6 per cent urban men suffered from overweight and obesity, while the percentage in rural parts was 25.6 per cent. Similarly, 36.2 per cent of the urban women in the state were obese against the 25.4 per cent women in rural Tamilnadu. In Bihar, around 20 per cent urban and 11 per cent rural men were overweight and obese<sup>11</sup>.

NFHS-4 is fourth in a series of national surveys. Previously, National Family Health Surveys have been carried out in 1992-93 (NFHS-1), 1998-99 (NFHS-2) and 2005-06 (NFHS-3). NFHS-4 is the first of these to collect data from each of India's 29 States and all seven Union Territories.

**Objectives:** To investigate the changes that occurs in the cardiovascular system and to measure the anthropometric changes, on administering the dynamic core stability exercises and flexibility exercises by stretching in the middle aged overweight men population in Chennai.

**Research Design:** A non probability sampling method with purposive sampling technique was used to identify the samples. Overweight middle aged male subjects (N = 15) who had not been into regular exercising and lack flexibility were selected based on the BMI who scored more than 25.

All the subjects who were desk borne working for long hours in their office were selected in Chennai based region. They were all initially made a general screening of their lifestyle and work related factors. The study was a quasi experimental study with a pretest and post test measurement.

## METHODOLOGY

All the samples were pretested for their flexibility by using modified sit and reach test and scores was recorded. Body Mass Index (BMI) and Waist Hip Ratio (WHR) was recorded pretest for all the samples. Resting Heart Rate (RHR) and Vo2 max was recorded as pretest measurement. All the samples were given a common designed protocol of exercises. Initially hamstring stretching was given for five minutes with single stretch lasting for 30 seconds and 10 seconds of break between each stretch.

Dynamic core stability exercises for fifteen minutes; plank, side plank, bridged, quadruped, sidelying hip abduction, oblique crunch, straight leg raise and swiss ball exercises was given. All the exercises were given for ten repetitions with a break between each set of exercises. Followed by treadmill exercises were given for fifteen minutes without inclination with a speed of 2.5 – 5 mph.

The training was given for four weeks as a pilot study programme, with each session lasting for

about 45 minutes of training and three sessions per week. The outcome was measured at the end of four weeks of training for the physical variable of Vo2 max, resting heart rate, sit and reach test values, and anthropometric values of waist to hip ratio (WHR). Pretest measurement and post test measurement at the end of four weeks training session were noted.

## RESULTS

The outcome was measured for Vo2 max, resting heart rate and waist to hip ratio (WHR) as pretest before the training session and as post test at the end of four weeks of training. It was found that there was a greater mean difference of 4.6 between the pre test and post test mean values in sit and reach test for flexibility.

Resting heart rate had got a mean difference of 3.73, while Vo2 max had got a moderate mean difference of 1.77 and a very minimal mean difference of 0.03 in waist to hip ratio (WHR). It was found that the results of flexibility, resting heart rate were more statistically significant with ( $P < 0.001$ ) whereas Vo2 max and waist to hip ratio were marginally significant.

## DISCUSSION

Persons who are middle aged and having prone to desk borne jobs have the tendency to develop overweight and obesity besides having lack of flexibility and other such complications<sup>9,10,11</sup>. This study had aimed to identify those problems and to find a possible solution to avert those complications of the desk borne prone jobs.

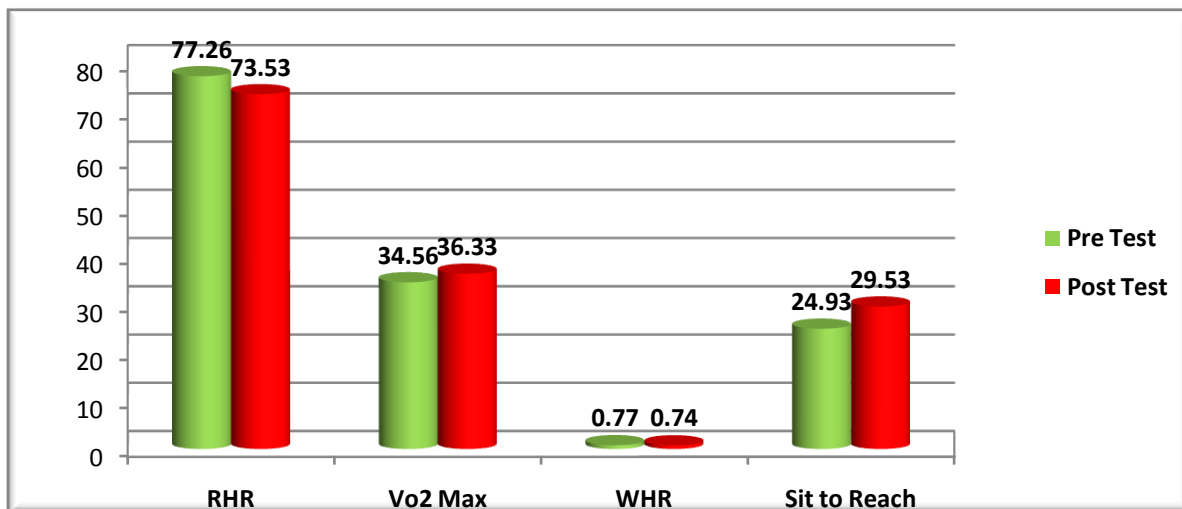
Accordingly the results of Resting Heart Rate (RHR) and flexibility had shown a significant improvement, whereas Vo2 max and Waist Hip Ratio (WHR) had shown a considerable improvement. The study

results showed considerable effects in improvement by administering Dynamic core stability exercises and stretching exercises.

Outcome Measure	Pre Test mean	Post Test mean	Mean difference	Standard Deviation	T Value	P Value
RHR	77.26	73.53	3.73	6.93	20.546	<0.001*
Vo2 Max	34.56	36.33	1.77	2.03	17.968	<0.001*
WHR	0.77	0.74	0.03	0	18.5	<0.001*
Sit to Reach test	24.93	29.53	4.6	33.6	11.5	<0.001*

(P<0.001)\* - Statistically significant

**Table 1:** Table showing mean value, t value and p value of the outcome measures



**Graph 1:** Graph showing mean differences of RHR, Vo2max, WHR, Sit to Reach test

**CONCLUSION**

This study showed that person who was identified as overweight based on BMI, were found to be lacking of their body flexibility mainly of back muscles and hamstring muscles. It is concluded that Dynamic core stability exercises, treadmill exercises and stretching was found to be useful in improving the muscle

strength and flexibility. The training was effective in controlling the resting heart rate, however the anthropometric values of WHR and Vo2 max needs to be focused for better improvement. It was also recommended to carry the study with larger sample size and to include aquatic training for better results.

## REFERENCES

1. Sarah P Garnett (2007). "Body mass index and waist circumference in mid childhood and adverse cardiovascular disease risk clustering in adolescence" *Am J Clin Nutr*; 86:549 -55.
2. Kwang Yong Park (2014). "The effects on the pain index and lumbar flexibility of obese patients with back pain" *J.Phys.Ther.Sci* 26:1571-1574.
3. Shumei Sun Guo (2002). Predicting overweight and obesity in adulthood from body mass index values in childhood and adolescence" *Am J Clin Nutr*;76:653-8.
4. Lila You (2012). "Physiotherapists' Perceptions of Their Role in the Rehabilitation Management of Individuals with Obesity" *Physiotherapy Canada*; 64(2);168-175.
5. Venu Akuthota (2008). "Core stability exercise principles" *Curr. Sports. Med. Rep.*Vol.7 No.1, pp.39-44.
6. Bo-Ae Lee (2014). "The effects of aquatic exercise on body composition, physical fitness and vascular compliance of obese elementary students" *J. Ex. Rehab.* Vol.10 (3), pp.184-190.
7. Koen A.P.M., Lemmink, (2003). "The Validity of the Sit-and-Reach Test and the Modified Sit-and-Reach Test in Middle-Aged to Older Men and Women" *Research quarterly for exercise and sport* 74(3):331-6.
8. Sharin Minkler & Patricia Patterson PhD (1994). "The Validity of the Modified Sit-and-Reach Test in College-Age Students" *Research Quarterly for Exercise and Sport*, 65:2, 189-192.
9. Lim KI, Nam HC, Jung KS. (2014). "Effects on hamstring muscle extensibility, muscle activity, and balance of different stretching techniques" *J Phys Ther Sci.*; 26(2):209-13.
10. Fasen, Jo M "A (2009). Randomized Controlled Trial of Hamstring Stretching: Comparison of Four Techniques" *Journal of Strength and Conditioning Research: March* Volume 23 - Issue 2 - pp 660-667.
11. Obesity: (1999). Preventing and managing the global epidemic. Report of a WHO convention". World Health Organization technical report series. Geneva: World Health Organization. 894: I–XII, 1–253.

**Citation:**

**Radhakrishnan. R, Venkatesan. R, Kiran.V, Senthil.P, Sharmila.K (2019).** An analytical study of  $VO_2$  Max, resting heart rate, waist hip ratio and flexibility changes on combined effects of dynamic core stability exercises and stretching in middle aged overweight men population in chennai, *ijmaes*, 5(2), 581-585.