



EFFECTS OF CORE STRENGTHENING EXERCISE ON CARDIOVASCULAR ENDURANCE AND FLEXIBILITY IN YOUNG OBESE INDIVIDUALS

Manjula S. Mpt^{*1}, Dr. P. Senthil Selvam² and Bhavani³

¹Asst Prof, School of Physiotherapy, Vistas, Thalambur, Tamil Nadu- 600130, India.

²Phd, Prof, Hod, School of Physiotherapy, Vistas, Thalambur, Tamil Nadu- 600130, India.

³School of Physiotherapy, Vistas, Thalambur, Tamil Nadu- 600130, India.

***Corresponding Author: Dr. Manjula S. Mpt**

Asst Prof, School of Physiotherapy, Vistas, Thalambur, Tamil Nadu- 600130, India.

Article Received on 27/05/2022

Article Revised on 17/06/2022

Article Accepted on 07/07/2022

ABSTRACT

Background: Obesity is associated with various physiological changes which decreases the cardiovascular fitness, flexibility and slows person activity. Core muscle strengthening improves respiratory efficiency and activity of the diaphragm. **Aim:** The aim of the study is to assess the effect of core strengthening exercise on cardiovascular endurance & flexibility in young obese individuals. **Methodology:** 20 participants were recruited in the study and divided into group-A (control group) and Group-B (experimental study). Conventional exercises were given to Group -B, Core strengthening exercises were given to Group-A targeting 5 region upper & middle abs, oblique, transverse, lower abs were progressed every 2 weeks by increasing repetition. Pre and posttest values of vo2 max, modified sit & reach test were taken. **Result:** The pre and posttest values of vo2 max, modified sit & reach test proves the significant improvement in cardiovascular endurance & flexibility. **Conclusion:** The study concluded that core strengthening exercise improves cardiovascular endurance & flexibility significantly.

KEYWORDS: Cardiovascular fitness, obesity, core strengthening, Harvard step test, modified sit & reach test.

INTRODUCTION

Obesity is a major health issue currently in the overall population. WHO global estimates of 2022, more than 1 billion people were obese in that 650 million people were adult. Risk factors for obesity are: -over eating, drinking alcohol, sedentary lifestyle, lack of self-control, lack of sleep, stress. It is associated with many comorbidities as well as strongly associated with other metabolic diseases like DM, HTN, dyslipidemia, cardiovascular diseases, musculoskeletal disorders and many other forms of cancers.

The 'core' has been described as a box with the abdominals in the front; para spinals and gluteal in the back; diaphragm as the roof; pelvic floor and hip girdle musculature as the bottom. The core serves as a muscular corset that works as a unit that stabilizes the body and the spine. Weakness in any of the core muscles can affect spinal stability and pelvic balance. Core strength can be developed to help to maintain correct neutral positioning during both static and dynamic conditions. The core is central for movement and function. Flexibility is defined as the ability to move a single joint or series of joints through unrestricted and pain free ROM with ease. Studies have shown that cardiovascular fitness and flexibility decreases as the person becomes obese. In obese individuals usually strength of muscle is reduced,

fitness and overall performance is also reduced. Cardiovascular fitness is usually low in obese as ability of muscle to produce energy for movement is reduced. As a person gains weight overall activity is reduced thus leading to fat deposition in the body thus resulting in decrease in optimal flexibility.

AIM & OBJECTIVE OF THE STUDY

The aim of the study is to identify the effect of core strengthening exercise on cardiovascular endurance and flexibility in young obese individuals.

RESEARCH DESIGN AND METHODOLOGY

An experimental study design was conducted with 20 patients within the age group of 18 to 25 years who fulfilled the inclusion and exclusion criteria.

INCLUSION CRITERIA

- Age between 18 to 25
- Male & female
- BMI >25 kg/m² were selected

EXCLUSION CRITERIA

- Subjects with hypertension
- Diabetes
- Alcohol & smoking
- Pregnancy

-Unwilling to participate &

OUTCOME MEASURES

a) For cardiovascular endurance

*VO₂max was measured by the **Harvard Step Test**.

A 17 inch bench and a stopwatch were taken and the patients were asked to step up and step down on the bench for 3minute. After completion the heart rate of the patients was taken and was recorded as pulse.* Then VO₂max were calculated by a formula (Mc Ardle et al., 1972).

Men: VO₂max (ml/kg/min) = 111.33 - (0.42 x heart rate (bpm))

Women: VO₂max (ml/kg/min) = 65.81 - (0.1847 x heart rate (bpm)).

b). Flexibility: it was assessed by using a modified sit & reach test :-Sit on floor with back and head against wall, legs fully extended, with bottom of feet against stepper or reach box. Place hands on top of each other, This represents the zero or starting position then stretching the arms forward. Measure the distance from starting position to ending position

PROCEDURE:

The total 20 samples, who fulfilled the inclusion and exclusion criteria were recruited for the study. Written

informed consent was obtained from the samples. The procedures were explained to the samples, they were divided into two groups namely group A -10 samples (experimental group) and group B -10 samples (control group). The core strengthening exercises were given for the 10 samples of experimental group (group A) and conventional exercises were given for the 10 samples of control group (group B).

INTERVENTION

GROUP-A(EXPERIMENTAL GROUP)

*3 sessions per week on alternate days were given (6 weeks×3 days=18 sessions).

* Duration of each session was 30-45 minutes.

* 2 sets of each exercise were given.

* Warm up was given which included major stretches & active movements which were followed by exercise protocol.

* Cool down was given for preventing domes & promoting relaxation.

*Holds were increased in every set for isometric exercises while repetitions were increased in every week.

GROUP-B (CONTROL GROUP)

For control group conventional exercises including rest and relax, knee to chest, cat and camel and quadrupeds were given for 6 weeks.

EXERCISE PROTOCOL

WEEKS	2 SETS OF EACH	EXERCISE	REPETITION	
			1 st week	2 nd week
1-2	Upper abs	Normal crunch	10-reps	15 reps
	Lower abs	Leg raise	10-reps	15 reps
	Oblique's	Oblique crunch	10-reps	15 reps
	Back extensors	Prone on elbows	10-reps	15 reps
	Transverse	Negative crunch 90 –90	10-reps	15 reps
		Plank on elbow		
	Plank	Side planks each side	20 secs-hold	30 secs- hold
3-4	Upper abs	Normal crunch	3rd week	4th week
		Leg raise with toe touch	15-reps	20-reps
	Lower abs	Flutter kicks	15-reps	20-reps
		Knee to chest in supine	10 secs hold each 3-reps	10 secs hold each 3-reps
	Oblique's	Crunch side bend combo	15-reps	20-reps
		Heel touch	15-reps	20-reps
	Back extensors	Prone back extension		
		Negative crunch 90-90	20-reps	30-reps
	Transverse	Plank hold	10-reps	15-reps
	Plank	Side planks each side	35-secs	40-secs
5-6		Shoulder taps	15-reps	20-reps
	Upper abs	Toe touch	5th week	6th week
		Normal crunch	10-reps	15-reps
	Lower abs	Leg raise circling 30 degree	15-reps	20-reps
			10-reps each direction	15-reps each direction
		Leg raise with hip lift	15-reps	20-reps
		Flutter kick	15-reps	20-reps
	Oblique's	Twisting crunch	10-reps each side	15-reps each side
		Heel touch	15-reps	

	Back extensors	V plank with toe touch	15-reps	20-reps
	Transverse	Negative crunch	10-reps	20-reps
		Planks with dips	15-reps	15-reps
	Plank	Mountain climber	10-reps	15-reps
		Plank with jacks		20-reps

STATISTICAL ANALYSIS

DATA ANALYSIS AND INTERPRETATION

GROUP A: (Experimental group)

Table 1: Pre test and Post test values.

GROUP-A	MEAN		STANDARD DEVIATION		T-VALUE	P-VALUE
	PRE	POST	PRE	POST		
VO2max	34.241	45.759	1.677	5.886	5.950	P<0.0001
sit & reach test	19.9	29.3	1.595	1.888	12.025	P<0.0001

GROUP B: (CONTROL group)

Table 2: Pre test and Post test values.

GROUP-B	MEAN		STANDARD DEVIATION		T-VALUE	P-VALUE
	PRE	POST	PRE	POST		
VO2max	35.073	38.379	2.045	2.204	3.476	P=0.0027
sit & reach test	19.9	23.3	1.286	1.091	10.589	P<0.0001

GROUP A & B

Table 3: Comparison of group A & B for vo2max.

VO2max	MEAN		STANDARD DEVIATION		T-VALUE	P-VALUE
	PRE	POST	PRE	POST		
GROUP-A	34.241	45.759	1.677	5.886	5.950	P<0.0001
GROUP-B	35.073	38.379	2.045	2.204	3.476	P=0.0027

CARDIOVASCULAR ENDURANCE (VO2max)

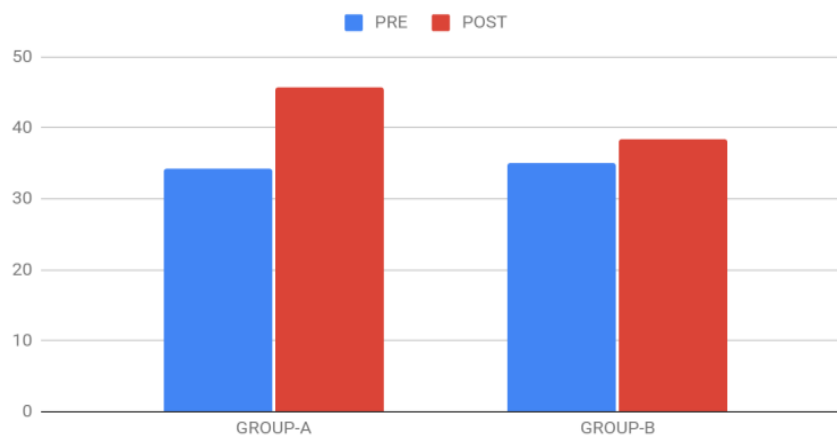
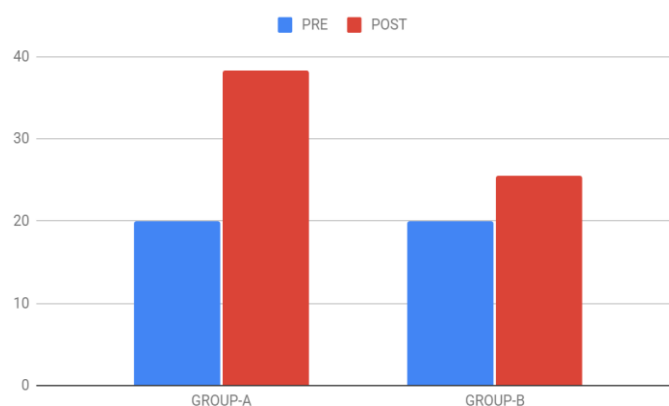


Table 4: Comparison of group A & B for sit & reach test.

MODIFIED SIT & REACH TEST	MEAN		STANDARD DEVIATION		T-VALUE	P-VALUE
	PRE	POST	PRE	POST		
GROUP-A	19.9	29.3	1.595	1.888	12.025	P<0.0001
GROUP-B	19.9	23.3	1.286	1.091	10.589	P<0.0001

MODIFIED SIT& REACH TEST



RESULT

*The statistical values of the experimental group and control group for cardiovascular endurance are $t=5.950, p<0.0001$ and $t=3.476, p<0.0027$ respectively.

*The statistical values of the experimental group and control group for flexibility are $t=12.025, p<0.0001$ and $t=10.589, p<0.0027$ respectively.

*Hence, result showed statistical significant improvement in cardiovascular endurance & flexibility in both experimental group and control group. But there is a statistically greater improvement in the experimental group.

DISCUSSION

This study was designed to determine effect of core strengthening exercise on cardiovascular endurance and flexibility in obese individuals. In this study 20 participants were selected from 18-25 years and were divided into 2 groups. The pre assessment was taken for the subjects and core strengthening exercises were given for 6 weeks. Cardiovascular endurance improved after core strengthening. Core muscle strengthening is associated with increasing blood flow to working muscles during any activity. With regular exercise cardiac output increases, thus VO_{2max} increases. When we perform core strengthening exercises the co-contraction of various core muscles along with pressure changes by diaphragm help in supplying blood and meet O_2 consumption required during that movements..In my study the mean of 1st week were 34.241 which significantly improved in 6th week with mean of 45.759 ($p<0.0001$) which showed that Cardiovascular endurance improves after core strengthening exercise. Core strengthening enhances muscle function as well as leads to improved flexibility. Usually due to obesity overall activity reduces thus leading to shortening of muscles and increased fat deposition. While performing exercises like reverse crunch, V plank, plank with oblique tuck, back extension etc. there is lengthening of muscle (hamstrings, rhomboids, abdominals, gluteus, etc) thus leading to improvement in flexibility. In this study, there was significant difference in the means from 1st week to 6th week, whereas it was 19.9 which significantly

increased upto 29.3 ($p<0.0001$) for modified sit and reach test.

During core strengthening exercises each muscle fiber extends to the full length of the muscle and performing certain core exercises also reduces regional fat in that area. Apart from its role in improving cardiovascular endurance, it also reduces facet joint compressive forces and provides stretch to the lumbar muscles, ligaments, and myofascial structures. It also improves flexibility and enhanced flexibility has a greater effect on the range of motion and musculoskeletal injury prevention. Due to eccentric muscle contraction there is an overall increase in muscle length thus improving flexibility of trunk, shoulder, wrist and lower limb musculature. Thus response from cardiovascular system, pulmonary system and eccentric muscle contraction could be the reason for improvement in cardiovascular endurance and flexibility in obese individuals. This response lead to significant change in mean readings of vo_{2max} , modified sit and reach test at interval reading of 1st week, 3 week and 6 weeks.

CONCLUSION

The study was conducted to assess the effects of core strengthening exercise on cardiovascular endurance and flexibility. The study concluded that both the groups were effective in improving cardiovascular endurance and flexibility. However, group A (experimental group) was more effective than group-B(control group).

REFERENCES

1. Guru Dutt P. Effect of 5week core strengthening on shoulder strength in young Obese individual. J Med Sci Clin Res., 2014; 05: 19144-53.
2. Datta A, Sen S, Shivpriya. Effect of core strengthening on cardiovascular fitness, flexibility and strength on patients with low back pain. J Nov Physiother, 2014; 4(2): 202.
3. International Journal of Physical Education, Fitness and Sports Journal homepage: www.ijpefs.nonolympictimes.org ISSN: 2277: 5447, March, 2014; 3(1): 65. Investigation of Core

Strength Training Induced Adaptations On Selected Physical And Physiological Parameters Of Cricket Players.

4. Core Muscle Strengthening's Improvement of Balance Performance in Community-Dwelling Older Adults: A Pilot Study Nicole Kahle and Michael A.Tevald Journal of Aging and Physical Activity, 2014; 22: 65-73. <http://dx.doi.org/10.1123/JAPA:2012-0132>© 2014 Human Kinetics, Inc.
5. TJPRC: International Journal of Physiotherapy & Occupational Therapy (TJPRC: IJPOT) ISSN(P): Applied; ISSN(E): 2455 -1996 Vol. 2, Issue 1, Jun 2016, 27-32 © TJPRC Pvt. Ltd.A STUDY TO ANALYZE THE EFFECTIVENESS OF CORE STRENGTHENING EXERCISES AND STRETCHING PROGRAM FOR YOUNG FEMALE PHYSIOTHERAPY STUDENTS WITH PRIMARY DYSMENORRHEA.
6. Uva B, Aliverti A, Kayser B. The “abdominal circulatory pump”: an Auxiliary heart during exercise? Front Physiol, 2016; 6: 411.
7. Uzogara SG. Assessment of Obesity, Presumed and Proven Causes and Prevention Strategies: A Review. Adv Obes Weight Manag Control, 2016; 5(1): 00121. DOI: 10.15406/aowmc.2016.05.00121.
8. Indian Journal of Physiotherapy and Occupational Therapy. April-June, 2016; 10(2). Immediate Effect of Exercises on Haemodynamic Responses in Healthy Young Adults- An Experimental Study Swanandi Mujumdar, Ganesh B Rs.
9. Peeyoosha Gurudut et al JMSCR Volume 05 Issue 03 March,-2017A Clinical Trial to Study the Effect of 5 Week Core Strengthening Protocol on Shoulder Strength in Young Obese Individuals.
10. Jabbar Taresh Ahmed Al-Ali/Life Science Archives (LSA), 2018; 4(3): 1339 to 1351, EFFECT OF EXERCISE SPORT AND NUTRITION LEVEL ON THE BODY MASS INDEX
11. Dr Shradha Sawant Deshpande et al JMSCR Volume 06 Issue 06 June 2018 Comparison between the Effects of Superficial Abdominal and Core Muscle Strengthening on Hemodynamic Parameters in Females with Body Mass Index more than Twenty Five.
12. INTERNATIONAL JOURNAL OF RESEARCH IN PHARMACEUTICAL SCIENCES-2018 Abdominal muscle strengthening and cardiovascular responses.
13. Pinckard K, Baskin KK and Stanford KI (2019) Effects of Exercise to Improve Cardiovascular Health. Front. Cardiovasc. Med. 6:69. doi: 10.3389/fcvm.2019.00069.
14. Hung K-C, Chung H-W, Yu CC-W, Lai H- C, Sun F-H (2019) Effects of 8-week core training on core endurance and running economy. PLoS ONE 14(3): e0213158. <https://doi.org/10.1371/journal.pone.0213158>.
15. Indian Journal of Physiotherapy and Occupational Therapy, July-September, 2019; 13(3). Correlation

between Body Mass Index and Core Muscular Strength among School Children between 11 and 14 Years of Age: A Cross Sectional Study.