

# Effect of Lumbar Core Muscle Stability Exercises on Cardiovascular Parameters of Young Adults- A Cross Sectional Study

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## ABSTRACT

**Background:** Low back pain is experienced in 60%-80% of young adults at some point of their lifetime, affecting the daily activities of many people. Various cardiovascular changes occur during exercise- it meets the increased demand placed on the system and carries out its function with maximal efficiency. So the purpose of the study to find out effect of lumbar core muscle stability exercises on cardiovascular parameters in young adults.

**Aim:** To find out effect of lumbar core muscle stability exercises on cardiovascular parameters in young adults.

**Method:** Total 40 patients of age 20-30 were included in the study. Two groups were made. Group A with normal healthy young adults and Group B with Postural Low Back Pain. Baseline parameters like HR, RR, BP were noted as L1. Participants were asked to draw the belly inwards and hold for 10 seconds with 10 repetitions. After exercise baseline parameters were noted as L2.

**Results:** Paired t-test was used to compare in the groups and unpaired t-test was used to compare in between the two groups. There was significant increase in the cardiovascular parameters of both the groups.

**Conclusion:** The study concludes that the lumbar core muscle stability exercises exert significant effects on the cardiovascular parameters of healthy young adults as well as young adults with postural low back pain.

**Key words:** Postural low back pain, Heart Rate, Respiratory Rate, Blood Pressure.

## INTRODUCTION

The ability of cardiovascular system is impressive in responding immediately to the body's many and ever -changing needs. Numerous cardiovascular changes occur during exercise, all share a common goal- they allow system to meet the increased demand placed on it and carry out its function with maximal efficiency. [1]

Cardiovascular response to exercise depends on muscle mass involved and the intensity of the exercise. [2] The circulatory responses to static exercise differ considerably from the response to dynamic exercise. [6] In

isometric exercises the cardiovascular response are largely proportionate to the tension exerted relative to the greatest possible tension in the muscle group rather than absolute tension developed. [9]

The use of pressure biofeedback unit during abdominal exercises is beneficial for the maintenance of constant pressure under external loads. [4]

Back pain is one of the most common problems of the musculoskeletal system, affecting the daily activities of many people. Approximately 50-90% of the entire population experience back pain once

in their lifetime. [4] Low back pain has recurrence rates up to 90%. Clinical observation suggests that aberrations of posture may play a role in the development of low back pain [5] awkward posture for longer time and repetitive bending and lifting activities develops stress on the spine and disproportionate loading forces on the spine. [7] Changes in the alignment of the body parts with respect to the center of gravity may change between sitting and standing, and with the use of different chairs. [5]

Postural low back pain is common in young adults. In this condition patient complain of pain because they are mechanically deforming their spinal soft tissue due to sustaining end-range posture and position. Abnormal position of spine leads to pain; it is usually localized, has gradual onset, gets worse in static position, and lacks deformity and deviation. [3]

Failure in the muscles protective function may cause excessive loading and damage to the pain sensitive structures due to poor muscle endurance of the trunk. This leads to the strain of its passive structures, early muscle fatigue and inability to rightly respond to the demands of unexpected loads. The younger generation is more obsessed with sedentary entertainment and spending hours with high- tech gadgets such as computers, cell phone, pure audio design along it's prolonged sitting in class. [8]

Low back pain is treated by giving exercises such as stretching, posture correction, heating modality, lumbar stabilization exercises, lumbar strengthening exercises and core muscle stability exercises. [2]

Deep core muscles provide dynamic support to individual segments in the spine, they are transversus abdominis, multifidus, and quadratus lumborum. [1] So the main purpose of the study is to evaluate the cardiovascular parameters in lumbar core muscle stability exercise in young adult.

## MATERIAL AND METHODOLOGY

The study was conducted in physiotherapy OPD of Vikhe Patil Memorial Hospital in Ahmednagar. It was a cross-sectional study. 40 samples between the age of 20-30 years, with or without postural low back pain, within normal BMI (18.5-24.9) of both genders. Patients with degenerative spine, internal fixations of spine, cardio respiratory disease and neurological involvement were excluded.

### Procedure:

A cross sectional study was conducted at Physiotherapy OPD of VikhePatil Memorial Hospital. A total of 40 subjects of age 20–30 years with and without postural low back pain were included in the study. Informed written consent was taken from each patient. Two groups A and B were made. Group A included 20 normal young adults and group B included 20 subjects with postural low back pain. Subjects with postural low back pain were evaluated. Numerical Pain Rating Score was noted down. Baseline parameters such as blood pressure, heart rate, respiratory rate of subjects in both the groups were recorded as L1. The outcome measures used were blood pressure, heart rate, and respiratory rate. The patients were asked to maintain hook-lying position (with knees 70°–90° bent and feet resting on the mat). A pressure bio-feedback unit (Stabilizer; Encore Medical) was placed horizontally under the lower back region of the participants and was inflated to 40 mm Hg. The subjects were instructed to breathe in, breathe out, and gently draw the belly button in toward the spine to hollow out the abdominal region. They were asked to hold 10 repetitions for 10 seconds were performed. After exercise, parameters (blood pressure, pulse rate, respiratory rate) were measured again and recorded as L2 in both the groups. The difference between L1 and L2 will be noted of each group. After that the difference between L1 of group A and group B, and difference between L2 of group A and group B were noted.

**Statistical Analysis:** Paired T test was used to compare pre and post exercise cardiovascular parameters within the group. Unpaired T test was used to compare cardiovascular parameter between the two groups. SPSS software was used 20.0.

## RESULTS

Table 1 showed the mean age of both the groups and the mean NPRS score of group B. Table 2 shows that there is increase in the HR, RR and BP of Group A with the p value of <0.0001. Similarly table 3 shows that there is increase in the HR, RR and the systolic BP but drop in the Diastolic BP. Table 4.1 shows the pre-pre and post-post exercise Heart Rate parameters mean Group A and Group B which indicates that there is slight fall in the pre HR of group B

whereas the post HR shows hike in group B. Table 4.2 shows the pre-pre and post-post exercise Respiratory Rate parameter mean Group A and Group B which indicate the rise in the RR of group B in both pre and post exercise parameters. Table 4.3 shows the pre-pre and post-post exercise Systolic BP mean Group A and Group B. It indicates that the systolic BP of pre and post of Group B falls as compared to Group A. Table 4.4 shows the pre-pre and post-post exercise Diastolic BP mean Group A and Group B and indicates that there is decrease in the diastolic BP of pre and post of Group B as compared to Group A.

**Table 1:**

Age (in years)	Age group A		Age group B		NPRS group B	
20-30	Mean	SD	Mean	SD	Mean	SD
	21.5	1.04	21.8	1.00	3.15	1.13

**Result table 2 : pre and post exercise parameters Group A**

Parameters	L1(pre) A	L2 (post) A	t- value	p- value
Heart Rate	74.55±10.80	86.850±10.728	9.803	<0.0001
Respiratory Rate	16.30±1.174	24.20±3.189		<0.0001
Systolic BP	113.40±5.35	122.80±4.69	17.899	<0.0001
Diastolic BP	73.40±7.05	76.20±.98	12.457	<0.0001

**Result table 3 : pre and post exercise parameters Group B**

Parameters	L1 (pre) B	L2(post) B	t- value	p- value
Heart Rate	73.80±11.25	89.00±12.70	18.47	<0.0001
Respiratory Rate	17.10±1.65	27.60±1.78		<0.0001
Systolic BP	111.50±6.11	121.30±6.36		<0.0001
Diastolic BP	70.40±7.52	75.40±7.45	10.16	<0.0001

**Result table 4.1 : pre-pre and post-post exercise Heart Rate parameters mean Group A and Group B**

Heart R			
Group A		Group B	
Pre	Post	Pre	Post
74.55±10.86	73.80±11.25	86.85±10.72	89.0±12.70

**Result table 4.2: pre-pre and post-post exercise Respiratory Rate parameter mean Group A and Group B**

Respiratory Rate			
Group A		Group B	
PRE	POST	POST	POST
16.30±1.17	17.10±1.65	24.20±3.18	27.60±1.79

**Result table 4.3: pre-pre and post-post exercise Systolic BP mean Group A and Group B**

Systolic BP			
GROUP A		GROUP B	
PRE	POST	POST	POST
113.40±5.35	111.50±6.11	122.80±4.69	121.30±6.36

**Result table 4.4: pre-pre and post-post exercise Diastolic BP mean Group A and Group B**

DIASTOLIC BP			
GROUP A		GROUP B	
PRE	POST	POST	POST
73.40±7.05	70.40±7.52	76.20±6.98	75.40±7.45

## DISCUSSION

The purpose of this study was to evaluate cardiovascular responses in normal young adults and people with low back pain. The results of the study shows that there is significant increase in all the cardiovascular parameters in normal young adults and young adults with low back pain, but there is no significant difference in cardiovascular parameters in between both the groups.

There is increase in the arterial pressure due to skeletal muscle contractions due to exercise, because when the skeletal muscles contract they usually tend to compress the blood vessels in the whole body. The effect of exercise also tightens the muscles which lead to compression of the vessels. This is usually to translocate large quantities of blood from peripheral

vessels into the heart and lungs to increase in cardiac output, leading to increase in the arterial pressure during exercise. The systolic pressure significantly increases but the diastolic pressure does not show much difference. The slight difference in diastolic blood pressure is primarily due to vasodilation of the arteries from the exercise bout.

Lellamo et al. evaluated the autonomic control of HR in young subjects through the analysis of rate domain during 4 minutes of isometric contractions of knee extension. The authors observed a reduction on vagal modulation and an increase on cardiac sympathetic modulation, which suggests the participation of the sympathetic component on HR regulation during low intensity and long duration exercise.

Efferent sympathetic fibers increase heart rate and myocardial contractility and dilate coronary arteries. Researcher studied heart rate response to isometric exercise. Twelve subjects were used to determine the effect of the isotonic and isometric exercise on heart rate using a military press in sitting position. Isometric exercises were performed for 45 sec with one half, two third and maximal resistance. The results indicated that isometric exercise performed for 45 seconds with one half of maximum resistance could stimulate heart rate. The results showed that increasing the load in isometric contraction resulted in a proportional increase in heart rate and that increasing the load to maximum isometric resulted in a near twofold increase in heart rate.

Brain transmits collateral impulses into brain stem to excite the respiratory center. Isometric contractions of skeletal muscles cause marked increase of ventilation, though changes in oxygen consumption are more modest. As a consequence alveolar PCO<sub>2</sub> is decreased. Some experiments suggest that hypoxia developing in muscles during exercise elicits efferent nerve signals to the respiratory centers to excite respiration.

The present study shows that there is significant difference in the pre and post cardiovascular parameters after isometric exercise (drawing in maneuver) in healthy young adults and the young adults with postural low back pain. But there is no difference seen in the parameters in between both the groups.

## CONCLUSION

The study concludes that the lumbar core muscle stability exercises exert significant effects on the cardiovascular parameters of healthy young adults as well as young adults with postural low back pain. i.e. they give similar responses to lumbar core muscle stability exercises.

## Clinical Implications

Thus it implies that the lumbar core stability exercises produces significant effect on cardiovascular parameters of both the normal and young adults with postural low back pain, so it should be given with the caution in patients with cardiac problems.

## REFERENCES

1. Vyas.H.P et al. Cardiovascular responses to lumbar core muscle stability exercise.DOI: 10.5455/njppp.2015.5.130920141 <http://www.njppp.com/>.
2. Kisner C, Colby LA, Therapeutic exercise: Foundations & Techniques, 5th edn, F.A. Davis Company, 2007.
3. Jung DE, Kim K, Lee SK. Comparison of Muscle Activities Using a Pressure Biofeedback Unit during Abdominal Muscle Training Performed by Normal Adults in the Standing and Supine Positions. J PhysTherSci 2014;26(2):191-3. doi: 10.1589/jpts.26.191
4. Elkayamm U, Roth A, Weber L, Hsueh W, Nanna M, Freidenberger L, Chandraratna PA, Rahimtoola SH. Isometric exercise in patient with chronic advance heart failure: hemodynamic and neurohumoral evaluation. Circulation 1985; 72(5):975-81.
5. Christie HJ, Kumar S, Warren SA: Postural aberrations in low back pain. Arch Phys Med Rehabil , 1995, 76: 218-224. [Medline]

6. Ewing DJ, Irwing JB, Kerr F, Kirby BJ: static exercise in untreated hypertension. *Br Heart J* 35: 413, 1973.
7. Mazloun A, Nozad H, Kumashiro M. Occupational low back pain among workers in some small sized factories in Adrabil, Iran. *Ind Health* 2006;44:135–9.
8. Meman.S.H, Pais.V, Kalal.B.S: Physical Risk Factors For Low Back Pain Among Young Sedentary Individuals- A Prospective Study. Friday, March!, 2019, IP: 157.33.178.193.
9. Goodwin FM, McCloskey DI, Mitchell JH. Cardiovascular response to change in central command during isometric exercise at constant muscle tension. *J Physiol* 1972; 226(1): 173–190

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