A Prospective Study to Evaluate the Cardio Vascular effects in the Normal Population

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Abstract

Objective: Purpose of this study was to examine the cardio vascular effects of stability exercises in normal population.

Methodology: Study was conducted on 40 healthy males and females volunteers, After considering the inclusion and exclusion criteria subjects were taken for both the exercise sessions. The selected core stability exercises were demonstrated, Exercise protocol was divided in two sessions. First session was held on the first week and second session was on second week. Same subjects participated in both the sessions.

Results: There was a significant increase in the cardiovascular parameters (heart rate, systolic blood pressure, rate pressure product) after the 4A and 4B exercises were performed. And significant increase in the cardiovascular parameters (heart rate, systolic blood pressure, rate pressure product) after the 2A, 2B, 2C and 2D exercises were performed.

Conclusion: There was a significant increase in the cardiovascular parameters (systolic blood pressure, heart rate and   rate pressure product) following core stability exercises.

Keywords: cardiovascular, flexion exercises, heart rate.

Introduction

Low back pain is considered to be a major health problem world wide.It is the seen most commonly in working age population. Individual experiences an episode of pain, stiffness, or discomfort with lower back pain[1].

Low back pain has high rates of incidence and prevalence[2]affecting approximately 60–80% of the common population once in their lives.[3] The lifetime prevalence of low back pain is estimated to be 60% to 85%, while the annual prevalence in the general population is estimated to be from 15% to 45%. The annual incidence of back pain in the general population is estimated between 10% and 15%. In majority of population low back pain is a self-limiting condition, from which 90% of the affected individuals recovers in about 6 weeks

Physiotherapy is considered to play vital role in the management of patients with low back pain. Therapeutic exercises helps in achieving muscle strength and length, and improving range of motion. Which indirectly reduces pain and improves quality of life. Patients with low back pain are adviced to perform, exercises for the area of pain (e.g., flexion exercises for low back pain) and general exercises (bicycling, walking, swimming) etc. In the starting stage of the condition low-stress aerobic activities especially walking, proved better than bed rest.[4]

From the past few years, lumbar spine exercises advocated by McKenzie for treating low back pain have been used for the individuals with spinal disorders. These exercises consists of repeated flexion and extension movements

performed indifferent body positions as part of a routine lumbar spinal assessment and exercise program.[5] In reducing pain and disability McKenzie therapy was proved to be statistically more effective than other treatments.

Out of many studies conducted to rule out mechanism behind the low back pain the lack of core stability has been identified as the main factor in developing chronic and recurrent low back ache[6] .So best technique in preventing secondary occurrence of low back pain is core stabilization exercise targeting the deep abdominal and trunk musculature[7].Core stability is defined as the ability to control the position and motion of the trunk over the pelvis to allow the optimum production, transfer and control of force and integrated physical activity.

Core strengthening programme is considered to be effective training programs for athletes of all levels. Primary prevention would be most effective in reducing disability from low back ache[8] The core muscles act as a bridge between upper and lower limbs which transfers the force from core.

Some of the risk factors of back pain are similar to those associated with cardiovascular disease (eg. lack of physical conditioning, obesity, and smoking). Several researchers noted high incidence of chest pain, breathlessness, coughing, and high blood pressure (BP) in patients with backpain.

Some risk factors of low back pain like increased serum lipid concentration and arteriosclerosis have found to have a strong correlation for developing cardio vascular disease.[9]It has been found that people who smokes reported back pain than non smokers.[10]Overweight, obesity and smoking are considered to be risk factors for cardiovascular diseases.

McKenzie exercises for the lumbar spine elicit hemodynamic stress .They increase the work of the heart in people with no known spinal impairments and no cardiovascular or cardiopulmonary insufficiencies. These effects were greater with increased numbers of repetitions.[5]

Acute exercises places a major stress on the cardiovascular system and the physiological responses to it are varied and interdependent..[11] The increased myocardial work, reflects increases in both HR and BP while performing McKenzie exercises.

So there is a need to rule out that, core stability exercises which plays major role in decreasing low back ache will increases cardiovascular stress or not .Direct measurement of myocardial work involves invasive techniques and is not feasible for routine clinical examination. Simple noninvasive measures of cardiovascular responses, can also be obtained by measuring HR, systolic BP, and the rate-pressure product (RPP). The RPP is the product of HR and systolic BP multiplied by 10^{-2}.The RPP is considered an excellent index of myocardial oxygen demand and, therefore, work of the heart.

There are no studies conducted regarding the acute effects of core stability exercise on cardiovascular system. The normal exercise response in a healthy population must be studied prior only to interpret the response of patients with various cardiovascular disorders. [12]That's the main reason we conducted the study on young age population**.** So, The main purpose of this study was to examine the cardio vascular effects of stability exercises in normal population. Which helps to treat the individuals with cardiovascular disorders.

Methodology

The study included 40 healthy male and female volunteers between age group of 18-25 yrs. Prior to the participation, all subjects were explained briefly about the aims and objectives of the study along with health benefits of the core stability exercises and about the procedure of

measuring heart rate, blood pressure .All subjects were screened and a detail medical history was taken to exclude any serious illness. Informed consent was signed by the subjects for their voluntary participation.

Inclusion criteria:-Healthy males and female, Age between 18 to 25 years.

Exclusion criteria: Subjects with recent episode of back pain, History of any cardiovascular problem, Recent musculoskeletal injury, History of smoking, Subjects with regular participation in any athletic activity. . After considering the inclusion and exclusion criteria 40 subjects were taken for both the exercise sessions.

Training protocol: The selected core stability exercises were demonstrated to the subjects and they were instructed not to eat an hour before.

Exercise protocol: Following core stability exercises were used, 1.Sitting on a stool with bracing of abdomen,2.Sitting on a gym ball, leg supported, maintaining the neutral position, 3.Abdominal curl, 4.Back bridging, 5.Back bridging with one leg extension, 6.Right side bridge, 7.Four point kneeling with alternate arm and leg extension, 8.Four point kneeling with one leg extension

Exercise protocol was divided in two sessions. First session was held on the first week and second session was on second week.

Same subjects participated in both the sessions.

First Session: Exercises were given in the set of four in 1st week.

Set 4A consists of 1, 2, 3, 4 exercises, Set 4B consists of 5, 6, 7, 8 exercises,

Second Session: Exercises were given in the set of two in 2ndweek.

Set 2A consists of 1, 2 exercises, Set 2B consists of 3, 4 exercises, Set 2C consists of 5, 6 exercises, Set 2D consists of 7, 8 exercises

blood pressure and heart rate values were measured pre and post exercise session.

Measurement procedure: Subjects were made to relax for 15- 20 minutes before starting the exercise session, then the initial parameters BP and HR of cardiovascular performance were measured.

1st week 1st session Subjects were asked to do 10 repetitions of 4A exercise with out any rest period. HR and BP were recorded post exercise immediately after they finish the 4A exercise. Patients were allowed to take rest now till resting heart rate was achieved .After acquiring resting heart rate the subjects were made to do second set of four exercises (4B) with the same procedure. Post session HR and BP were measured.

2nd week 2nd session In this session subjects were asked to practice 2nd set of exercises with the same procedure followed previously .After every set BP and HR were measured.

Results

Table 1: Mean age

n	N	Minimum	Maximum	Mean	Std. Deviation
AGE	40	19.00	24.00	21.12	1.042

Interpretation: The above table shows the mean age of subjects i.e. 21.12 ± 1.042 (SD) taken for the study.

Table 2: Descriptive Characteristics of Different Heart Rate Values

	N	Minimum	Maximum	Mean	Std. Deviation
Baseline HR	40	63.00	97.00	79.95	9.027

	N	Minimum	Maximum	Mean	Std. Deviation
Post ex 4A HR	40	73.00	111.00	93.95	8.620
Post ex 4B HR	40	87.00	125.00	101.72	9.131
Post ex 2A HR	40	78.00	106.00	87.32	7.072
Post ex 2B HR	40	81.00	119.00	92.37	8.002
Post ex 2C HR	40	83.00	114.00	96.85	7.116
Post ex 2D HR	40	84.00	121.00	101.77	7.550

Interpretation: The above table shows the mean heart rate, standard deviation of different set of core stability exercises.

Table 3: Descriptive Characteristics of Different Systolic Blood Pressure Values

	N	Minimum	Maximum	Mean	Std. Deviation
Baseline SBP	40	92.00	136.00	110.3000	11.00629
Post ex 4A SBP	40	103.00	151.00	126.4500	11.84072
Post ex 4A SBP	40	99.00	162.00	129.5500	14.29174
Post ex 4A SBP	40	101.00	147.00	118.9500	10.45614
Post ex 4A SBP	40	107.00	152.00	125.4500	10.73922
Post ex 4A SBP	40	104.00	150.00	128.7250	11.48240
Post ex 4A SBP	40	110.00	156.00	131.9000	12.10171

Interpretation: the above table shows the mean heart rate, standard deviation of differentset of core stability exercises.

Table 4: Descriptive characteristics of different rate pressure product value

	N	Minimum	Maximum	Mean	Std. Deviation
Baseline RPP	40	6270.00	12784.00	8797.15	1419.022
Post ex 4A RPP	40	8249.00	15553.00	11930.41	1788.131
Post ex 4A RPP	40	9108.00	17375.00	13188.95	1893.077
Post ex 4A RPP	40	8080.00	13671.00	10377.49	1292.095
Post ex 4A RPP	40	9047.00	14592.00	11543.20	1357.465
Post ex 4A RPP	40	9672.00	15645.00	12449.05	1459.122
Post ex 4A RPP	40	10416.00	17248.00	13328.28	1653.630

Interpretation: the above table shows the mean rate pressure productand standarddeviation of different core stability exercises.

Table 5: Repeated measures of ANOVA analysis of systolic blood pressure

Base line systolic BP (I)	Post exercise systolic BP(J)	Mean difference (I-J)	Std. error	Sig .
Baseline SBP	Post 4A exercise SBP	-16.150	1.211	.000
	Post 4B exercise SBP	-19.250	1.615	.000
	Post 2A exercise SBP	-8.650	.775	.000
	Post 2B exercise SBP	-15.150	.918	.000

	Post 2C exercise SBP	-18.425	1.300	.000
	Post 2D exercise SBP	-21.600	1.336	.000

Interpretation: Above table shows the comparison between the baseline systolic blood pressure with post exercise systolic blood pressure at different sessions of exercise. The result shows there was significant difference after all set of exercises. (p =.000)

Table 6: Repeated measures of ANOVA analysis of heart rate

Baseline heart rate (I)	Post exercise heart rate (J)	Mean difference (I-J)	Std. error	Sig.
Baseline HR	Post 4A exercise HR	-14.000*	1.033	.000
	Post 4B exercise HR	-21.775*	1.253	.000
	Post 2A exercise HR	-7.375*	.836	.000
	Post 2B exercise HR	-12.425*	.970	.000
	Post 2C exercise HR	-16.900*	1.026	.000
	Post 2D exercise HR	-21.825*	1.201	.000

Interpretation : : above table shows the comparison between the baseline heart rate with post exercise heart rate at different sessions of exercise. The result shows there was a significant difference after all the set of exercises. (p=.000)

Table 7: Repeated measures of ANOVA analysis of Rate pressure product

Baseline rate pressure	Post exercise rate pressure	Mean difference (I-J)	Std. error	Sig .

product (I)	product (J)			
Baseline RPP	Post 4A exercise RPP	-3133.256*	185.786	.000
	Post 4B exercise HR	-4391.795*	224.038	.000
	Post 2A exercise HR	-1580.333*	123.017	.000
	Post 2B exercise HR	-2746.051*	143.020	.000
	Post 2C exercise HR	-3651.897*	179.711	.000
	Post 2D exercise HR	-4531.128*	211.087	.000

Interpretation: Above table shows the comparison between the baseline rate pressure product with post exercise rate pressure product at different sessions of exercise. The result shows there was a significant difference after all the set of exercises. (p=.000)

Discussion

Core stability is defined as the ability to control the position and motion of the trunk over the pelvis, to allow the optimum production, transfer and control of force and motion.In recent types these exercises have been extensively used for the treatment of low back ache.These techniques, when performed, place the cardiovascular system at a greater stress than normal exercises.

The study was done on 40 healthy subjects. It was aimed to measure the acute cardiovascular responses to the core stability exercises. ANOVA was used as the statistical tool.Subjects were asked to perform the exercises in different sets which were held in two sessions during two successive weeks, pre and post cardiovascular parameters (heart rate and blood pressure) were measured after every set of exercise performed.The result of the present study showed that there was a significant increase in the cardiovascular parameters (systolic blood pressure, heart

rate and rate pressure product) following core stability exercises.

The results of our studysupportsthe results of the study done by **SaudAl-Qbaidi (2001) et al** which stated that McKenzie exercises which are done repetitively for the lumbar spine in managing low back pain have cardiovascular effects in people with no cardiovascular or cardiopulmonary conditions and showed the significant increase in heart rate and systolic blood pressure.

Results of this study strongly support the study which indicated that the the patients with spinal problems should be monitored for their cardiovascular status by the physical therapists for whomcore stability exercises are prescribed. This should be done especially for the people with risk factors and who may have asymptomatic or symptomatic cardiovascular disease, cardiopulmonary disease, or hypertension.Therefore, low back ache assessment should include a cardiac and pulmonary risk factor to ruleout any cardiovascular and pulmonary related disorders. Which may be done by recording baseline HR and BP. [7]

Cardiovascular responseshould also be considered when core stability exercises are prescribed as home regimen for treating low back. Because these exercisesincreases the cardiovascular stressby increased work of the heart, thereforeincreases heart rate and blood pressure.Routine monitoring of HR and BP should be done. Patients with cardiovascular disease, cardiopulmonary disease, hypertensionshould be screened carefully.

There are no studies conducted to rule out the adverse cardiovascular effects of core stability exercises, awareness of these effects is important for avoiding development of the risk factors.Limitations of the study are low Sample size.Measurement of Only few cardiovascular parameters were like HR, SBP and RPP. The study was only conducted on the younger healthy and asymptomatic adults of age group between 18-25 so it can not be generalized for individuals less then 18 and more then 25.

Conclusion

There was a significant increase in the cardiovascular parameters (systolic blood pressure, heart rate and rate pressure product) following core stability exercises.

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