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EFFECT OF ACUTE LUMBAR MCKENZIE EXTENSION EXERCISE AND CORE STABILITY EXERCISE ON CARDIOVASCULAR AND ORAL TEMPERATURE RESPONSE – A RANDOMIZED CONTROL TRIAL

M. Premkumar[1], K. Manivannan[2], Sneha Patel[1]

[1]Department of Cardio Respiratory Physiotherapy, Dhiraj General Hospital, Sumandeep Vidyapeeth, Piparia, Waghodia taluk, Vadodara, Gujarat
[2]Deparatment of Sports Physiotherapy, Dhiraj General Hospital, Sumandeep Vidyapeeth, Piparia, Waghodia taluk, Vadodara

E-mail of corresponding author: drprem80@yahoo.co.in

ABSTRACT

Objective: To find the effect of acute lumber Mckenzie extension exercise and core stability exercise on cardiovascular and temperature response **Method:** 30 undergraduate female students from various institutions of Sumaneep Vidyapeeth, Vadodara were recruited through random sampling method. Subjects were divided into control group, lumbar Mckenzie extension exercise group and core stability exercise group. Subjects were tested for temperature and RPP before and after the intervention. **Results:** There is statistically significant difference between pre and post values of variables of interest in both groups with p value ≤ 0.03 except temperature in control group with p≤ 0.19. Post intervention value of temperature shows no significant difference between groups with p≤ 0.218, 0.545 & 0.600 respectively. **Conclusion:** Both core stability exercises and Mckenzie extension exercises are very effective to improve cardiovascular fitness but regarding metabolic activity these exercises are not showing great changes particularly the body temperature.

Key words: core stability exercise, lumbar Mckenzie extension exercise, heart rate, blood pressure, temperature.

INTRODUCTION

Metabolic processes in the cell are temperature regulated and there is a 13% increase in the metabolic rate for each degree of temperature increase. Core temperature normally increases during exercise. The relative stress of exercise determines the magnitude of the increase.[1]

Simple non invasive measures of cardiovascular responses, however, can be obtained with HR, systolic BP and the rate-pressure product (RPP). [2, 3] 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.[4,5]

You sweat more after you finish exercising than you do while you exercise. More than 70 percent of the energy that powers your muscles is lost as heat, causing your body temperature to rise during exercise. To keep your body temperature from raising too high, your heart pumps the heat in your blood from your muscles to your skin, you sweat and it evaporates to cools your body[5].

For 2 decades, lumbar spine exercises advocated by McKenzie for low back pain have been used for the management of patients with spinal disorders[6-9]. These exercises include repeated flexion and extension movements performed in different body positions as part of a routine

lumbar spinal assessment and exercise program.[10, 11]

The McKenzie exercises involve muscle co-contraction to stabilize the trunk and arm exercise, both of which are associated with disproportionate cardiovascular demand to a given load compared with leg work.[12,13] Patients with cardiac conditions or high BP are routinely cautioned about exercises requiring isometric muscle contractions and arm work, because these exercises are associated with increased cardiovascular stress as manifested by increased work of the heart, which is reflected by increased heart rate (HR) and BP.[14]

The role of the "core" muscles is to protect the Spine from potentially injurious forces. For athletes, the core muscles serve the role of transferring forces to and from the extremities. Injuries to the spine may result when an athlete has insufficient endurance capacity to stabilize the spine or incorrectly uses the spine muscles to generate power. [15]

Oral temperature responses to active and passive warm up were statically significant suggested that care should be taken when including active warm up in treatment programmed of patient with or without of having cardiovascular problem.[16]

There was less accumulation of blood and muscle lactate during intense dynamic exercises preceded by active warm up, which could not be accounted for by differences in muscle temperature between trials immediately before the onset of exercises.[17]

This study is designed to evaluate and compare the temperature and cardiovascular responses to core stability and Lumbar Mckenzie exercise in normal subjects.

METHODOLOGY

A randomized controlled trail was done with experimental group 1 receiving Core stability Exercise with back extension exercise and experimental group 2 receiving Lumbar McKenzie Extension Exercise with back extension exercise while control group receiving back extension exercise alone. 30 female subjects in the age group of 19-25 with BMI of 18.5 to 24.9 from different institutes of Sumandeep Vidyapeeth, Vadodara were assigned randomly by lottery method into experimental 1 and experimental 2 and control group 10 each after signing informed consent form. Study was approved by local institutional ethical committee.

PROCEDURE

The students of Sumandeep Vidyapeeth University were included by using stratified random sampling method. Height and Weight of subject were checked. And BMI was calculated.

For experimental group 1, first measured the Axillary temperature by Thermometer and also measured the Blood Pressure and Heart rate. Then in prone position, both the hands were placed at the level of the shoulders. Gradually the upper body was pushed off the ground by straightening the arms. The hip should be placed firmly on the ground during this exercise. Exercise was performed for 15 minutes, 10 repetitions per minute. After exercise temperature with Thermometer (PHOENIX), Blood Pressure and Heart rate with Sphygmomanometer (HARSONS, mercurial sphygmomanometer IS: 3390 CM/L - 8262373) were measured.

For experimental group 2, first measured the Axillary temperature by Thermometer and also measured the Blood Pressure and Heart rate. Then Lie on back, hands resting on pelvis bones, finds the neutral position of pelvis. Tighten pelvic floor and lower abdominal muscles, tightened muscles up and are breathing normally, slide leg down along the bed or floor. Leg was out straight, have a short rest, then repeat the exercise drawing your leg back up towards you. Exercises were performed for 15 minutes, 10 repetitions per minute. After

intervention temperature, Blood Pressure and Heart rate were measured.

For control group, first measured the Axillary temperature by Thermometer and also measured the Blood Pressure and Heart rate. Then Back extension exercise alone was given for 15 minutes, after that post intervention values were measured. In all these three group temperature measurement was done immediately after exercise.

DATA ANALYSIS AND RESULTS

Data were analyzed by paired't' test for within group and independent't' test for between group analyses with SPSS version 16.0 for windows and $p \leq 0.05$ was kept as highly significant.

Table 1: Comparison of pre and post intervention values of variables of interest

Variable	Groups	Pre Test	Post Test	t	p
RPP Rate Pressure Product	**Mckenzie extension**	94.69 ±13.49	112.14±16.98	-8.792	.000
	Core stability	98.42±5.63	111.58±4.73	-14.129	.000
	Control	94.24±8.66	97.34±10.17	-3.888	.004
Temperature	**Mckenzie extension**	96.47±1.75	94.75±2.73	3.730	.005
	Core stability	95.30±1.01	94.23±1.26	2.517	.033
	Control	95.02±1.58	95.23±1.54	-1.392	.197

Table-1 shows comparison of pre and post intervention score of values of all variables of interest by paired t test. There is statistically significant difference between pre and post values of variables of interest in both groups with p value ≤ 0.03 except temperature in control group with $p \leq 0.19$.

Table-2: Comparison of baseline and post intervention values of RPP(Rate Pressure Product) between groups

Groups	Baseline values		Post intervention values	
	t	p	t	p
Control vs core stabilty	-1.145	.282	-4.326	.002
Core stability vs Mckenzie extension	.978	.354	-.121	.906
Control vs Mckenzie extension	-.107	.917	-3.364	.008

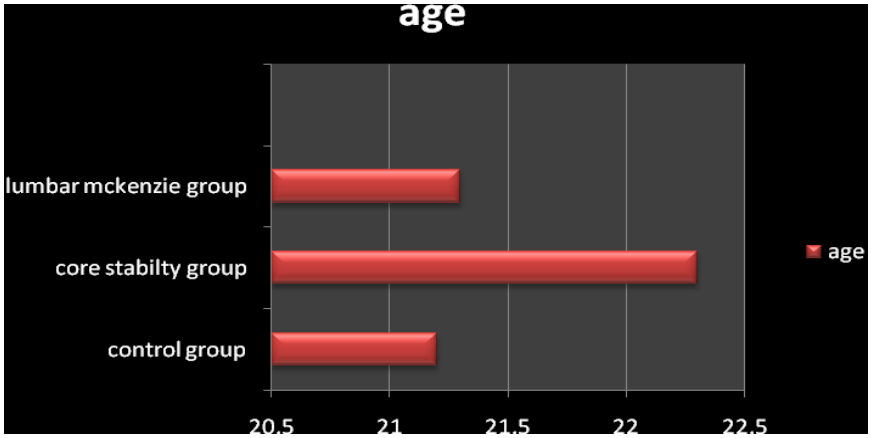
Table-2 shows comparison of baseline and post intervention values of variables of interest by independent t test. There is no statistically significant difference in baseline values which proves homogeneity of groups before intervention. Post intervention value of RPP (Rate Pressure Product) shows significant difference between control and core stability group & control and Mckenzie extension group with $p \leq 0.002$ & .008 respectively. Post intervention value of RPP (Rate Pressure Product) shows no significant difference between core stability and Mckenzie extension group with $p \leq 0.906$

Table-3: Comparison of baseline and post intervention values of Temperature between groups

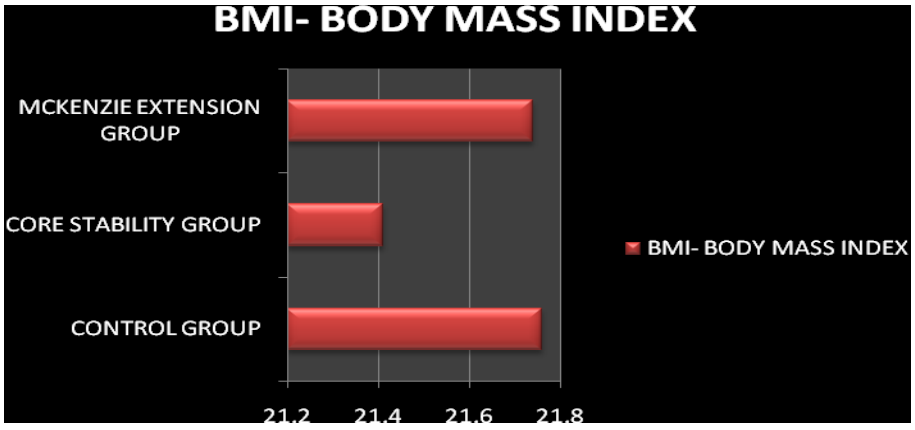
groups	Baseline values		Post intervention values	
	t	p	t	p
Control vs core stabilty	-.374	.717	1.323	.218
Core stability vs Mckenzie extension	-1.954	.082	-.629	.545
Control vs Mckenzie extension	-1.872	.094	.544	.600

Table-3 shows comparison of baseline and post intervention values of variables of interest by independent t test. There is no statistically significant difference in baseline values which proves homogeneity of groups before intervention. Post intervention value of temperature shows no significant difference between control and core stability group & control and Mckenzie extension group & core stability and Mckenzie extension group with p≤ 0.218, 0.545 & 0.600 respectively.

Graph 1: Mean age differences in Control, Core stability & Mckenzie extension group



Graph 2: Mean BMI(Body Mass Index) differences in Control, Core stability & Mckenzie extension group



DISCUSSION

The primary objective of this study was to evaluate and to compare the temperature and cardiovascular responses in apparently healthy Females between Core stability exercise and Lumbar Mckenzie exercise.

While experimentation of this concept we got the results like this that follows, there is significant increment in RPP (Rate Pressure Product) and temperature in all the groups except temperature in control group after intervention (see table 1).

Statistical results suggest that there is definite improvement in RPP (Rate Pressure Product) in all the groups but for temperature there is no significant improvement in control group for the variables of interest with $p \leq 0.197$. This improvement in RPP (Rate Pressure Product) is mainly due to improvement in cardiovascular response by increased blood pressure and heart rate after exercise particularly low back exercises. But the temperature was not increased significantly in control group where subjects were given only back extension exercise rather core stability or Mckenzie extension exercise. It may suggest core stability and Mckenzie extension exercise exerts more metabolic burnout than simple extension exercise alone in control group.

Then core stability and Mckenzie extension group exhibits significant improvement in RPP (Rate Pressure Product) against the control group. But between core stability and Mckenzie extension group there is no significant difference in statistical analysis with $p \leq 0.906$. For temperature there is no statistically significant difference between any of these three groups. This is suggesting that cardiovascular changes after exercises are evident but not metabolic changes. (See table 2, 3)

This results also supporting the study of Susanc.Gray ,Giuseppe Devito, Myra a. Nimmo et al., in which they stated that there was less accumulation of blood and muscle lactate during intense dynamic exercises preceded by active warm up, which could not be accounted for by a differences in muscle temperature between trial immediately before the onset of exercises.[17]

Regarding cardiovascular effect Core stability exercise as well as Lumbar Mckenzie extension exercise are generating considerable changes in blood pressure and heart rate ultimately RPP (Rate Pressure Product). Thus there is nothing to choose either core stability exercise or Mckenzie extension exercise but both can be use for burnout calories in domiciliary setup.

This study can be elaborated by extending the duration and changing the variables in the form of maximal oxygen consumption ($Vo_{2\ max}$) and METs (Metabolic equivalents). It can be carried out in different age groups and in males. This study concept can be applied in LBA (Low Back Ache) and obese individuals. But anyway this study is accomplishing to get cardiovascular fitness modern concepts of back extension exercises like core stability and Mckenzie extension exercises are very useful. These exercises are time consuming cost effective and also very effective to burnout calories.

CONCLUSION

Both core stability exercises and Mckenzie extension exercises are very effective to improve cardiovascular fitness but regarding metabolic activity these exercises are not showing great changes particularly the body temperature.

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