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Analysis of Variations in Selected Cardiovascular Parameters During Core Stability Exercises in Collegiate Obese Individuals

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Abstract:
Core stability exercises are the commonest exercise programme advised to patients with low back pain. Usually these exercises were performed using swiss ball in a rehabilitation setup or in the fitness arena. There are abundant literatures related with swiss ball exercises, still the relationship with the cardiovascular parameters are very less. Researcher details that application of an isometric exercise programme has produced various changes in the cardiovascular response. This study focused to find out the variations between selected cardiovascular parameters with core stability exercises using a Swiss ball for collegiate obese individuals. It is a Quasi experimental study with a total of 110 subjects were selected by a convenient sampling method with the age group range from 17—28 yrs. Subjects included are those who are obese (based on BMI), and without any cardiovascular problems. Study was conducted for a duration of 6 months. The parameters used in this study are Blood pressure (systolic), and Heart rate, which are measured using sphygmomanometer & pulse oximeter respectively. The results were calculated using student 't' test. The result found that it has a strong variation exist between the parameters. The study concludes that the core stability exercises have shown some variance in cardiovascular responses.

Key words*: Core stability exercises, Cardiovascular responses. Blood pressure changes. Swiss ball exercises*

1. Introduction

Core stability exercises are the common exercise prescribed to the individuals with low back pain, or those who wish to strengthen the abdominals. Current scenario is use of swiss ball in the strengthening has become a fashioned. Swiss ball exercises will produce an isotonic as well as isometric contraction in the muscles. Isometric contraction of the muscle will produce lot of physiological changes. These changes should be understood by the therapist before recommending the patient for a vigorous swiss ball exercise programme. Generally exercises increases blood pressure, individuals with cardiovascular disease are discouraged to participate in any of the resistance training since it increases blood pressure. In addition to it when the blood pressure increases intermittently may cause the vascular wall hypertrophy and thus decreasing the luminal area result in increase vascular resistance and an increase in blood pressure. However the research in this area is very limited. (Folkow 1982).

Static contraction for a longer duration may produce an increased pressure in the arteries and relatively increased heart rate and cardiac output. (Mitchell et al.,1974, Wang et al., 2008). Duration of the static contraction may influence the intramuscular pressure and the blood flow. (Asmussen 1981). Static muscle contraction has a strong influence on heart rate and blood pressure than that of isotonic muscle contractions performed with the same intensity. (Tremblay et al., 2004)

Few studies showed an increase or decrease or no change in blood pressure following the exercises. (Fripp et al., 1987, Gliders et al., 1991, Hurley et al., 1988, Hunter et al., 1980, 1983). The majority of the studies is carried out in male subjects only. Since there is a strong relationship on obesity and the development of hypertension this study focused to find out the potential effect of swiss ball exercises on cardiovascular parameters. Though there are extensive literatures support that static exercises produce an alteration in heart rate and blood pressure, it is not extensively studied using a set of exercise programme. The purpose of the study was to find out the variations in selected parameters of the cardiovascular region on core muscle strengthening using swiss ball exercises in obese individuals. The study hypothesized that there will not be any variations found on cardiovascular parameters following the swiss ball exercises for core muscles.

2. Methodology

Quasi experimental study with 110 subjects was selected using purposive sampling method. This study includes obese collegiate individuals with the BMI of more than 30, age group varies from 17 years to 28 years. Able to do Swiss ball exercises, No history of Blood pressure, diabetes and asthma. Both sexes were included, Blood pressure not more than 140/90 were selected, not participating in any research programmes and not involving in any exercises. All the subjects were selected using a convinient sampling method. A clear explanation was given to all the participants on swiss ball exercises and the purpose of the study. Those who signed the consent were selected for the study. Before starting the study a detailed history of every individuals were collected with their BMI , fat percentage and Pre-prandial blood glucose levels were collected. A set of Swiss ball exercises which focused on core strengthening were selected and advised the participants to do it. The exercises included abdominal crunch, prone plank, side plank, pelvic bridging, prone cobra and wall slides. Before the beginning of the exercises the participants were advised to do a warm up exercises for 10 mins using treadmill run and bicycle ergometer. Three trials of exercises were made before the beginning of the study. All the participants were advised to do the exercises for 15 repetitions. A 2 mins of break was given between each exercise. During that time the participants were advised to do simple stretches. Once the exercises set was over the individual's cardiovascular parameters like Heart rate and the Systolic blood pressure was noted using finger pulse oximeter and the sphygmomanometer, post exercise 5 mins the parameters were again noted and taken for the analysis. ANOVA and student 't' test was used for analyses of the values using SPSS 16.

3. Results & Analysis

The table I shows the demographic data of the study. The age group of the participants was ranged from 17—28 years. 28% of subjects with the age group of 23—25 yrs, 25% of subjects with the age group of 26—28 yrs, 24% with the age group of 17—19 yrs and 23% with the age group of 20—22 yrs. The mean age was 22.78 with the S.D of 3.41. This was shown in the figure 1.

S. NO	Demographic	17-19	20-22	23-25	26-28	Mean	S.D
1	Age Group	27	25	31	27	22.78	3.41
2	Male	14	13	14	18	23.06	3.51
3	Female	13	12	17	9	22.45	3.30

Table 1: Demographic Data

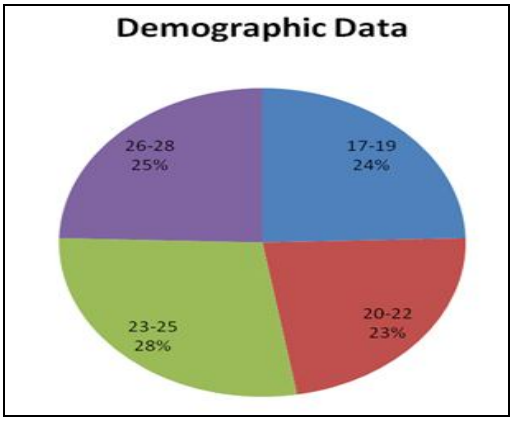

Figure 1

Table II and III, shows the results of Analysis of variance of the heart rate and systolic blood pressure for the pre test , immediate post and 5 mins of post. The result shows that there was a significant difference between the three values. It confirms that there was an elevation of heart rate following the exercises.

Source of Variation	Sum of Squares	d.f	Mean Squares	F*
Between	2.314	2	1.157	632.4
Error	5985	327	18.30	
Total	2.913	329		

*Table 2: Anova Heart Rate *F value is 3.29*

Source of Variation	Sum of Squares	d.f	Mean Squares	F*
Between	4.487	2	2.243	1569
Error	4675	327	14.30	
Total	4.954	329		

Table 3: Anova Systolic Blood Pressure
*F value is 3.29

Table IV and V, shows the results of paired 't' test analysis for the heart rate and systolic blood pressure for the pre test , immediate post and 5 mins of post. The result shows that there was a significant difference between the three values at the p value of 0.05 %. It confirms that there was an elevation of heart rate following the exercises which was figured in figure II and III.

S.No	Duration	Mean	S.D	Paired 't' value
1	Pre test	75.37	2.54	37.31 (p <0.005)
2	Immediate post test	94.35	5.17	
3	Pre test	75.37	2.54	35.95 (p <0.005)

Table 4: Paired T Value For Heart Rate

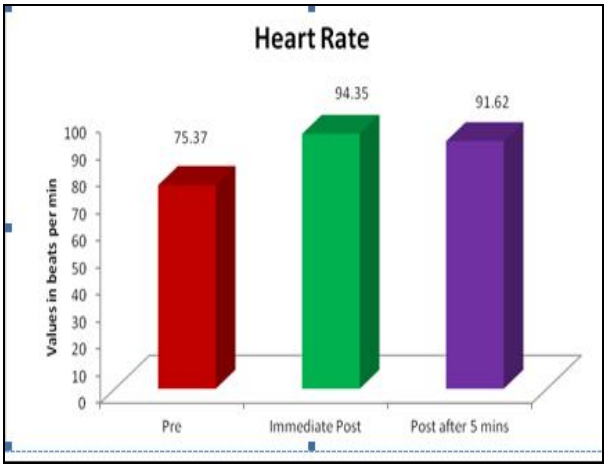

Figure 2

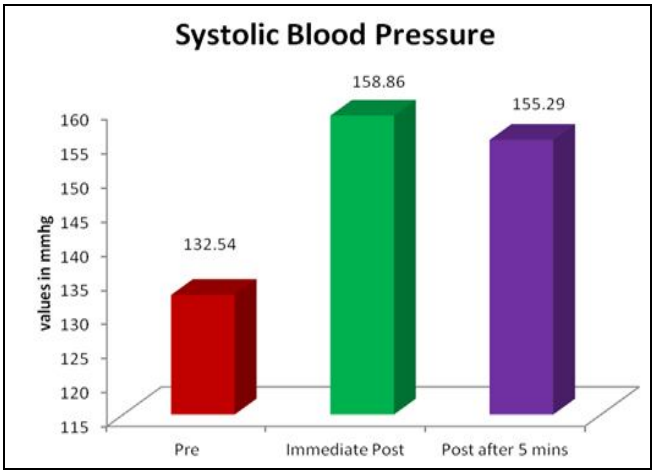

Figure 3

4. Discussion

The purpose of the study was to find out the variations in selected parameters of the cardiovascular region on core muscle strengthening using swiss ball exercises in obese individuals. 110 obese individuals were selected for the study and their cardiovascular parameters were measured before and after the swiss ball exercises.

The result of the study shows that there was a significant elevation in the heart rate and the systolic blood pressure when compared with the pre test values. The heart rate was increased in the mean of 75.37 to immediate post to the mean of 94.35 with the t value of 37.31 at 0.05% level of significance. When compared with the 5 minutes after post it was 91.62 with the t value of 35.95 at 0.05% level of significance. This shows there was a significant level of increase of heart rate following an exercise program. For the blood pressure (systolic) the pre mean value was 132.54 where as the immediate post mean value was 158.86 with t value of 47.59 at the 0.05% level of significance. Whereas 5 minutes of the post value shows 155.29 which was at 0.05% of level of significance shows that there is an increase blood pressure is seen following the exercises.

ANOVA analysis showed that there was a significant difference exists between the three values pre value, immediate post value and the 5 mins of post value. The value for the heart rate is 632.4 whereas the Blood pressure is 1569 at the f ratio of 3.29. this shows there was a statistically significant elevation on both the parameters following the swiss ball exercises.

There was a marked change in the blood pressure following isometric hand grip exercises which may occur due to activation of the sympathetic adrenergic system, which was indicated by a rise in plasma catecholamine level. (Krzeminski et al.,2012)

During exercises there was an increase of motor unit activation as well as stimulation of newer motor unit's increases the excitatory sate of the central nervous system which possibly increases sympathetic outflow and a decrease in the parasympathetic outflow cause increase in blood pressure. (Hietanen , 1984)

Static muscle contractions may stimulate the reflexes which increase the perfusion pressure to the active muscles, in which the blood flow is impeded by the sustained muscular contraction. This may be the cause of increase in peripheral resistance and which increases the blood pressure. (McDonald et al., 1966)

During the static muscle contraction there is an increased motor output in the cardiovascular system and the respiratory system which has been stimulated by the Central nervous system. This produces an increased heart rate following the static contraction of the muscles for a longer duration.

Heart rate variations are found as soon as the exercises begin, this increased intake of more oxygen, and with this, the blood pressure increases immediately and gradually. The cardiovascular response occurs due to local, chemical, mechanical and thermal factors. (Shepherd et al., 1981). There were a biochemical changes taking place and stimulates the anaerobic metabolism and produces a neruogenic response on cardiovascular parameters.

This study concludes that the differences exist in the cardiovascular parameters following application of core exercises using a swiss ball. The individuals who have elevated blood pressure or unknown hypertension the intensity of the exercises should be tailored. The therapist should not prescribe a set of exercise protocols for all individual rather they should prescribe the exercises in a tailor made. The limitations of the study include the study is not focused on any of the patient group, only obese individuals were selected for the study, the subjects other activities like lifestyle medications and food are not controlled. Need a wider analysis using a wider group of the population will yield a better result.

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