

Effect of Isometric Exercise on Haemodynamic Parameters in Young Healthy Individuals

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ABSTRACT

Background and objectives: Vital signs are used in urgent care or emergency departments to determine a patient's priority since they indicate to the doctor the extent of their baseline abnormality. The severity of vital sign anomalies may also be a predictor of the patient's long-term health, recurrent ER visits, frequency of readmissions to hospitals, and resource consumption for healthcare. Sedentary lifestyles are the primary cause of obesity in general. In addition to having a good impact on body weight and adiposity, physical activity and exercise lower the risk of cardiovascular disease (CVD), and some malignancies. Purpose of the study was to compare hemodynamic response between normal and overweight individuals by performing isometric exercise.

Methodology: Fifty patients having age group between 18 and 59 made to perform the isometric exercise and pre and post vitals were taken.

Result: there were no significant differences in hemodynamic responses after an isometric exercise.

Keywords: Isometric exercise, Hemodynamic responses, vitals, normal healthy individuals, overweight individuals.

INTRODUCTION

Vital signs such as temperature, blood pressure, pulse, oxygen saturation, and respiration rate are considered to be crucial indicators to keep an eye on when a patient is in the hospital.^[1] The severity of vital sign anomalies may also be a predictor of the patient's long-term health, recurrent ER visits, frequency of readmissions to hospitals, and resource consumption for healthcare.^[2]

The process of aging is complex and involves several factors that affect the amount and quality of skeletal muscle as well as lower levels of muscle strength. Consuming a lot of fat may hinder the absorption of calcium in the intestines, reducing the amount of

calcium available for the production of bones. Deciphering the connection between bone and fat.^[3] This makes it possible to put into practice weight management techniques that focus on the prevention and treatment of these associated illnesses.^[4]

Obesity and overweightness place a heavy cost on society's well-being. For those who are overweight or obese, strength exercise improves body composition and metabolic health.^[5] Overweight central fat accumulation is linked to a higher risk of illness and death.^[6]

Individuals who suffer from overweight and obesity are additionally susceptible to discrimination in their personal and professional lives, low self-esteem, and

depression due to the psychological and social stigmas associated with these disorders.^[7] physical activity can be just as effective as standard pharmaceutical therapies. Exercise aimed at strengthening muscles (also known as resistance training) can be done independently of aerobic exercise and has significant health benefits, one of which is a delay in death.^[5] Isometric exercise is a static form of exercise in which a muscle contracts and produces force without an appreciable change in the length of the muscle and without visible joint motion. Breath-holding commonly occurs during isometric exercise, particularly when performed against substantial resistance. This is likely to cause a pressor response as the result of the Valsalva maneuver, causing a rapid increase in blood pressure purpose of the study was to find out the effect of isometric exercise on haemodynamic parameters in young healthy individuals.^[8]

MATERIALS & METHODS

The study was conducted in the Physiotherapy outpatient department (OPD) of Matrusri Davalba Ayurveda Hospital,

Krishana edu campus, Vadodara for 2 months. 50 healthy individuals (age >18 to <60) were selected by convenient sampling methods. There were 32 females and 18 males who participated in this study. Inclusion criteria was: Subjects willing to participate, Both gender males and females, Age group (18-60) yrs, Individual with Normal BMI (18.5-24.9), Individual with Overweight BMI (25.0-29.9) Exclusion criteria: Individual with Cardiorespiratory, Vascular and metabolic disorder, Age < 18 to > 60, Carcinoma, Patient with auditory, visual and cognitive deficits. Patient with psychiatric disorder.

STATISTICAL ANALYSIS & RESULT

TABLE 1: BMI DISTRIBUTION

	MEAN ± SD
Individuals normal BMI (n=25)	21.78 ±1.92
Overweight Individuals (n=25)	27.16 ± 1.57

To compare the pre and post hemodynamic responses paired T test was used, for all haemodynamic parameters found p value is >0.05, there wasn't significant change in pre and post vitals after isometric exercise.

TABLE 2 : HAEMODYNAMIC RESPONSE AFTER EXERCISE (n=50)

Hemodynamic parameter	Mean ± SD		P value
	pre	Post	
SYSTOLIC BP (mmHg)	114.06 + 11.59	114.48+ 10.76	0.35
DIASTOLIC BP (mmHg)	73.04±6.61	71.08±7.11	0.11
PULSE (BPM)	84.3±9.42	83.2±9.84	0.08

There was no noticeable difference in the pre and post parameters, with the t-values for systolic blood pressure, diastolic blood

pressure, and pulse rate being 0.38, -1.61, and -1.38, respectively. The p value is more than 0.05.

TABLE 3: CORELATION OF AGE WITH HEMODYNAMIC PARAMETERS

Hemodynamic parameter		Young individuals (18-39) (n=25)	Middle-aged (40-59) (n=25)	R-VALUE
		MEAN		
SYSTOLIC BP (mmHg)	PRE	110.25	118.39	0.025
	POST	111.48	118	
DIASTOLIC BP (mmHg)	PRE	72.29	73.91	0.033
	POST	70.62	73.39	
PULSE (BPM)	PRE	84.70	83.82	0.30
	POST	83.07	83.34	

For correlation of age and hemodynamic responses, Pierson's correlation test was applied, which shows the R-value of systolic, diastolic and pulse rate are 0.025, 0.033 and

0.30 respectively and found that there was no significant correlation of age with the hemodynamic response to isometric exercise .

TABLE 4: CORELATION OF BMI WITH HEMODYNAMIC PARAMETERS

		PRE	POST	R-VALUE
SYSTOLIC (mmHg)	NORMAL	112.04±13.38±13.38	112.04±±13.38	0.09
	OVERWEIGHT	115.9 ± 8.75	115.96±±8.75	
DIASTOLIC (mmHg)	NORMAL	71.56 ± 7.60	71.56±±7.60	0.06
	OVERWEIGHT	74.52 ± 4.48	74.56±±4.84	
PULSE (BPM)	NORMAL	82.0 ± 10.07	82.04±10.07±10.07	0.28
	OVERWEIGHT	86.56 ± 7.89	86.56±7.89±7.89	

The correlation of vitals for the normal and overweight individuals Pierson's test was applied shows that r value of systolic blood pressure, diastolic blood pressure and pulse rate are 0.09, 0.06 and 0.28 respectively. And no significant correlation of BMI with the hemodynamic response to isometric exercise.

DISCUSSION

50 subjects were enrolled in the study according to the inclusion and exclusion criteria. According to table 1, 50 participants were divided into two groups, Group A (n=25) individuals with normal BMI and Group B (n=25) overweight individuals and therefore the mean BMI of normal subjects was 21.78 and that of overweight subjects was 27.16.

Due to the availability, there were 32 females and 18 males participated in this study and the ratio was 70% females and 30% males so that correlation of gender with the hemodynamic parameters was not obtained. The study comprised 37 working subjects and 13 non-working subjects, with a 70% working and 30% non-working participant ratio based on the availability.

As shown in table 2, there was no significant difference found in the mean difference of the post vitals after performing the isometric

exercise in all 50 subjects : Group A(n=25 normal subjects) and Group B(n=25 overweight subjects) which include the systolic blood pressure (p=0.35), diastolic blood pressure (p=0.11) and the pulse rate(p=0.08).). It was difficult for the young healthy individuals to lower their blood pressure with a single isometric exercise session, which was claimed by Luiz Humberto Rodrigues Souza and Washington Mariano Silva while the Older people with normotension demonstrated an evidence of post-isometric induced hypotension and improvements in autonomic modulation after just one session of isometric exercise.^[9]

According to Table 3, after the isometric exercise session, there was no correlation found in the vitals between young healthy individuals (18–39) and middle-aged individuals (40–59) for systolic blood pressure (r=0.02), diastolic blood pressure (r=0.03), and for pulse rate (r=0.30) mild positive correlation was noted. Which was found to be insignificant. Emil Wolsk et al. also stated in their article, during rest, all the hemodynamic measurements-including the blood pressure-were similar across the age groups. Blood pressure did not change during isometric exercise despite normal filling pressure and cardiac output. All indexed

hemodynamic parameters were close to normal throughout the age groups.^[10]

The results shown in Table 4 suggested that, there was no correlation found in the mean difference of the post vitals after doing the isometric exercise between normal BMI individuals and overweight individuals: Group A (n=25 normal subjects) and Group B (n=25 overweight subjects) which include the systolic blood pressure (r=0.09), diastolic blood pressure (r=0.06) and the pulse rate(r=0.28).

CONCLUSION

The study concludes that isometric exercise, if given with proper rest intervals and taught to avoid Valsalva maneuver cannot induce any hemodynamic changes in normal young healthy individuals as well as overweight individuals. Hemodynamic responses such as systolic blood pressure, diastolic blood pressure and pulse were not affected by isometric exercises if taught in proper techniques with supervision.

Declaration by Authors

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