

Effect of isometric hand grip exercise with respect to cardiovascular parameters in males and females

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Abstract

Background: There have been many statements in the scientific literature, popular press and in the classroom about concerning the relationship exercise and health. **Aims and Objectives:** To study Cardiovascular parameters with respect to Hand Grip exercise in Males and Females **Methodology:** The present study was carried out in 60 normal healthy males and 60 normal healthy females between the age group of 19 and 20 years. The normal subjects were selected among the students of nursing college of S.R.T.R. medical college, Ambajogai and T.B.G. college of polytechnic, Ambajogai. unpaired 't' test was used for statistical analysis. **Result:** Statistically very highly significant increase in heart rate after handgrip exercise in both males and females. statistically very highly significant increase in systolic blood pressure after handgrip exercise in males and females. Show diastolic blood pressure is increased but not significantly after handgrip exercise in both males and females. Statistically very highly significant increase in cardiac work after handgrip exercise in both males and females. Highly significant more heart rate in females than males, highly significant systolic and diastolic blood pressure in males as compared to females, females have highly significant more cardiac work after exercise. **Conclusion:** After hand grip exercise there was highly significant more heart rate in females than males, highly significant systolic and diastolic blood pressure in males as compared to females and females have highly significant more cardiac work after exercise.

Key Words: Hand Grip exercise, cardiac work, Sympathetic activity.

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INTRODUCTION

There have been many statements in the scientific literature, popular press and in the classroom about concerning the relationship exercise and health. Many persons believe that exercise is a panacea, for innumerable ailments and problems, hence a proverb "health is wealth"¹. The world health federation warned in September 2003, that failure to exercise is as bad for

one's health as smoking a pack of cigarettes everyday. Physical inactivity doubles the changes of developing cardiovascular diseases and increases the risk of high blood pressure. Researchers looked at the level of physical activity in people who died and correlated their level of physical activity with their risk of dying. The result were fascinating, 20% of all deaths of people of 35 years and older were attributed to lack of exercise. Looking at specific diseases, the risk of dying from cancer increased 45% for men and 28% for women due to lack of physical activity. Also, the risk of dying from respiratory ailments was 92% higher for men and 75% higher for women². Unfortunately, in today's world, a lot of people just sit around spending endless hours watching television, holding jobs that require them to sit behind a desk for 8 to 9 hours or 10 hours a day engaging in virtually no physical movement at all, ultimately this sedentary lifestyle leads to various diseases. These disease can be prevented and even frequently reversed through physical exercise alone.² The physical exercise is

generally grouped into various types by many researchers depending upon the overall effect they have on the human body such as flexibility exercise, aerobic exercise and anaerobic exercise.² According to some researchers exercise is also grouped as isometric exercise, isotonic exercise and isokinetic exercise. The isometric type of exercise is introduced by a scientist named Dr. Jeremy Sims. The word ‘isometric’ comes from the Greek word, ‘iso’-means ‘equal’ + ‘Metron’ means measure i.e. maintaining the same measure, dimension or length. Some researchers have proved that isometric exercise is extremely good for strengthening muscle groups around an injured joint as the joint surfaces actually distract from one another during isometric contraction^{3,4,5,6,7,8,9} Also isometric handgrip exercise is used as a screening test for diagnosis or pregnancy induced hypertension, where the handgrip exercise is known to cause a arterial pressure in healthy adults when performed at 28-32 weeks of gestation, if there occurs an increase in diastolic pressure for more than 20 pregnancy induced hypertension¹⁰. Some researchers have proved the importance of isometric handgrip exercise in indentifying patients at risk and with coronary artery disease¹¹, where the scientist compared the change in brachial artery diameter to handgrip exercise with occlusion release method. Brachial artery diameter was measured by ultrasound during and after handgrip exercise, where brachial artery diameter increased by 9.99±8.3% in average risk patients, increased by 1.84±5.7% in high risk patients and decreased by 3.9±5.6% in patients with coronary artery diseases. There was a good correlation between changes in brachial artery diameter to isometric handgrip exercise, which proved useful for indentifying risk factors, patient at risk and with preclinical coronary artery diseases and the assessment of treatment strategies. Considering the importance of isometric handgrip exercise, we have undertaken this study to compare the handgrip exercise responses in male and female. We have studied cardiovascular parameters (heart rate, systolic blood pressure, diastolic blood pressure and cardiac work) changes in response to handgrip in both male and female.

MATERIAL AND METHODS

The present study was carried out in 60 normal healthy males and 60 normal healthy females between the age group of 19 and 20 years. The normal subjects were selected among the students of nursing college of S.R.T.R. medical college, Ambajogai and T.B.G. college of polytechnic, Ambajogai, with no special reference to their physical training. The mean age of all the selected males is 19.5 years and of the females subjects is also 19.5 years. The mean height of all the selected males is 165.57 cms and mean height of all the selected females is

151.4cms. the mean body weight of all the selected males is 55.11 kg and the selected female subjects is 44.08 kg. Physical examination of all the subjects before the start of the procedure was done with the help of proforma. We have excluded the cases with pulmonary, cardiovascular disorders or other illness. All the selected female subjects were studied in the provulatory phase of the menstrual cycle. All the subjects were studied between timing of 11 am to 2 pm. Once the volunteer was found to be acceptable by the above criteria, the experimental protocol was carefully explained to the subjects and the subjects was asked to take part in the experiment and on agreeing was required to sign a form or informed consent. Only one individual declined to participate at that point.

Apparatus: Handgrip dynamometer, well calliberated ECG machine, weight machine, sphygmomanometer, stethoscope, measuring tape. With the help of handgrip exercise we have studied the following parameters in all selected subjects-Systolic blood pressure (mmHg), Diastolic blood pressure (mmHg), Cardiac work (Arbitrary units).

Cardiac work¹²: Cardiac work is calculated as the product of heart rate and mean blood pressure as follows-
 Cardiac work= heart rate X MeanBlood pressure
 = Heart rate X (DBP+1/3 (pulse pressure)
 = Heart rate X [DBP+1/3 (Syst.BP-Diast. BP)]

Similarly, cardiac work was calculated immediately after the exercise by taking values of after the handgrip exercise.

All the above parameters, heart rate, blood pressure and cardiac work were measured before and immediately after the handgrip exercise and were compared in the males and female volunteer group by applying the two tests i.e. unpaired ‘t’ test¹⁶ for the parameters which were compared in males and females. Parameters which were compared in same sex (Such as females or males) for before and after the exercise, the paired ‘t’ test is applied¹⁶.

RESULT

Table 1: Comparison of heart rate before and immediately after handgrip exercise in male and females

	Heart rate (beats/min)		‘t’ value	‘p’ value
	Before	After exercise		
Male (n=60)	65.27	70.35	11.68	P<0.001
Female (n=60)	75.81	84.16	13.76	P<0.001

Show statistically very highly significant increase in heart rate after handgrip exercise in both males and females.

Table 2: Comparison of systolic blood pressure before and immediately after handgrip exercise in male and females

	Systolic blood pressure (mmHg)		't' value	'p' value
	before	After exercise		
Male (n=60)	119.03	124.66	4.44	P<0.001
Female (n=60)	107.53	109.4	4.26	P<0.001

Show statistically very highly significant increase in systolic blood pressure after handgrip exercise in males and females.

Table 3: Comparison of diastolic blood pressure before and immediately after handgrip exercise in males and females

	Diastolic blood pressure (mmHg)		't' value	'p' value
	before	After exercise		
Male	79.9	80.01	0.138	p>0.05
Female	75.43	76.03	1.76	P>0.05

Show diastolic blood pressure is increased but not significantly after handgrip exercise in both males and females.

Table 4: Comparison of cardiac work before and immediately after handgrip exercise in males and females

	Cardiac work (Arbitrary units)		't' value	'p' value
	Before	After exercise		
Male (n=60)	6058.24	6656.47	6.99	P<0.001
Female(n=60)	651.61	7321.80	12.97	P<0.001

Shows statistically very highly significant increase in cardiac work after handgrip exercise in both males and females.

Table 5: Comparison of heart rate, systolic blood pressure, diastolic blood pressure and cardiac work in males and females before handgrip exercise

Parameter	Male (n=60)	Female (n=60)	't' value	'p' value
Heart rate (beats/min)	65.27	75.81	1.98	P<0.05
Systolic blood pressure (mmHg)	119.03	107.53	6.61	P<0.001
Diastolic blood pressure (mmHg)	79.9	75.43	2.66	P<0.01
Cardiac work (Arbitrary units)	6058.24	6515.61	2.30	P<0.05

Shows significantly increased in heart rate in females than males. Systolic and diastolic blood pressures are very highly significantly more in males than females. Cardiac work is significantly more in females than males.

Table 6: Comparison of heart rate, systolic blood pressure, diastolic blood pressure and cardiac work in males in and females immediately after handgrip exercise

Parameter	Male (n=60)	Female (n=60)	't' value	'p' value
Heart rate (beats/min)	70.35	84.16	6.17	P<0.001
Systolic blood pressure (mmHg)	124.66	109.4	7.41	P<0.001
Diastolic blood pressure (mmHg)	80.01	76.03	2.72	P<0.01
Cardiac work (Arbitrary units)	6656.47	7321.81	2.98	P<0.01

Shows very highly significant more heart rate in females than males. Very highly and highly significant systolic and diastolic blood pressure in males as compared to females. As compared to males, females have highly significant more cardiac work.

DISCUSSION

In the present study, it has been found that heart rate when compared before and immediately after handgrip exercise in males and also in females is statistically very highly significant (p<0.001). It is increased just after exercise highly significant (p<0.001). It is increased just after exercise similar findings were observed by Goodwin *et al* (1972), Brita Eklund *et al* (1974), Jerrold S. petrofsky *et al* (1975), sanchez J.M. *et al* (1980), Duncan G *et al* (1981), Barbara j morgan *et al* (1982), Thomas J. Ebert *et al* (1986), kamiya *et al* (2000) and saito M *et al* (2000). In the present study, the systolic blood pressure when compared before handgrip exercise and immediately after handgrip exercise in males and females is statistically very highly significant (p<0.001). It is more after exercise. Present findings matches with Humphrey P. W. *et al* (1963), Goodwin *et al* (1972), Jerrold s, Petrofsky *et al* (1975), Sanchez J. *et al* (1980), Thomas J. Ebert *et al* (1986), Koltyn *et al* (2001), Sandra *et al* (2001), James Fisher *et al* (2004), D.S. Jaju *et al* (2004). Cardiac work is increased statistically very highly significantly after exercise as compared to before exercise in both males and females. Similar findings were observed by Jerrold S.petrofsky *et al* (1975) and sanchez J. *et al* (1980). Comparison of cardiovascular parameters in males and female immediately after handgrip exercise the cardiovascular parameter for such as heart rate immediately after handgrip exercise when compared in between males and females. Statistically very highly significantly more in females. The present finding correlate with Goodwin *et al* (1972), Brita Eklund *et al* (1974), Jerrold S. petrofsky *et al* (1975), sanchez J.M. *et al* (2000) and Kamiya *et al* (2000). Difference in males and females about cardiovascular parameters (heart rate, systolic blood pressure, diastolic blood pressure and cardiac work) and handgrip exercise (maximum voluntary

contraction and Endurance time) are due to hormonal differences. In response to handgrip exercise which is a type of isometric exercise, cardiovascular parameters (heart rate, systolic blood pressure, diastolic blood pressure and cardiac work) are increased. Effects on cardiovascular parameters of handgrip exercise are similar in both males and females. These effects are due to cardio acceleration caused by increased sympathetic activity.

CONCLUSION

In conclusion, sympathetic activity is accelerated during isometric type of exercise. Thus, which advising isometric type of exercise to patients of heart diseases we have to consider this effect.

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