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COMPARISON OF HEART RATE RECOVERY BETWEEN SEDENTARY AND PHYSICALLY ACTIVE INDIVIDUALS

Physiotherapy

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ABSTRACT

Impaired cardiovascular and respiratory functions are associated with increased mortality and morbidity. Physical activity is known to improve physical fitness and to reduce morbidity and mortality from numerous chronic conditions. The sedentary lifestyle is one of the principal risk factors in highly prevalent illnesses such as type 2 diabetes, cardiovascular disease, osteoporosis, and some cancers also it is associated with worse quality of life and increased general mortality. Heart rate recovery (HRR) is the return of heart rate from maximal intensity to pre exercise levels after cessation of a Graded exercise test. HRR has been shown to predict mortality independently of other fitness parameters and markers atherosclerosis severity. **Result:** There was significant difference in heart rate recovery between both the groups. Sedentary individuals showed significantly lower heart rate recovery than physically active individuals after 1, 3 and 6 minutes.

KEYWORDS

Heart rate recovery, physical activity, sedentary lifestyle

INTRODUCTION

The favorable effect of physical activity (PA) and improved fitness on cardiovascular disease morbidity and mortality and total mortality is well established. [1] PA is a behavior, defined as any body movement that increases energy expenditure, including leisure-time activities and sports, whereas cardio respiratory fitness is a physiologic attribute, usually measured by a maximal or submaximal exercise test. Regular physical activity (PA) and moderate to high levels of cardiorespiratory fitness (CRF) are associated with health benefits and reduced risk of mortality [3]. The protective effects of higher levels of PA or CRF on mortality are evident regardless of age, sex, fatness, smoking, alcohol consumption and other clinical factors. [4]even regular physical activity that may not be of sufficient intensity to achieve high levels of cardiorespiratory fitness can result in substantial health benefits. [5]

Heart rate (HR) recovery as a marker of prognosis has been validated in both asymptomatic person s and patients being evaluated for chest pain[6] lower heart-rate recovery after exercise testing, has been proven as a marker of decreased vagal activity, is a powerful and independent predictor of the risk of death. [7]

Heart rate recovery (HRR) is the return of heart rate from maximal intensity to pre-exercise levels after cessation of a graded exercise test. Recovery is thought to result primarily from parasympathetic reactivation, thus making HRR a useful estimate of autonomic nervous system function [8,9] with the cessation of exercise, the decrease in HR immediately after exercise is mainly thought to be a function of a reactivation of the parasympathetic nervous system. Later, the further decrease in HR to the pre-exercise value also depends on the gradual withdrawal of the sympathetic system. [9]

HRR is frequently been defined as a decreased ≤12 beats per minute at 1 minute. [6] Where as a normal heart rate recovery is a decreased of 15 to 25 beats per minute. [10] Return of heart rate to pre exercise levels is induced by changes in vagal tone and sympathetic vascular activity[11] These adjustments occur during the first 30 min after low-intensity exercise [12] it can take one hour after light or moderate exercise , four hours after long-duration aerobic exercise , and even up to 24 hours after intense or maximal exercise and has been suggested to depend on the interaction among factors like exercise intensity , cardiac autonomic modulation, and the level of physical fitness [13]Aim of the study is to compare the heart rate recovery between sedentary and physically active individuals of Ahmedabad, Gujarat

MATERIALS & METHODS

30 Individuals from age group: 20-35 years, male & female, having Normal BMI 18.5-24.99 kg/m^2, willing to participate was included in the study. Subjects having known orthopaedic, neurological, cardiovascular, respiratory system disorders that limits exercise performance, psychiatric illness, BMI <18.25 and >24.99 kg/m^2 was excluded.

Ethical approval was taken from the institutional review board. Written informed consent was taken prior to the study. Physical activity of the subjects was assed using Short physical activity questionnaire used in the European Prospective Investigation into Cancer and Nutrition (EPIC).[14] participants falling into physically active category was in group A. and sedentary lifestyle individuals taken in group B.

Physical activity questionnaire was translated into Guajarati language and intra and inter rater reliability was measured using Inter Class Correlation coefficient. (ICC = 0.98) The reliability found was excellent and that version was used in this study.5 minutes rest was given prior to taking the resting vitals to assess the hemodynamic stability. Exercise heart rate was calculated using karvonens formula. [15] Before starting the test all large muscle group stretching was given. The subjects were made to walk on treadmill for 20 mints at their Target heart rate. Subjects were asked to stop the test if they have any uncomfortable sensations, dizziness, fatigue, leg cramps, and dyspnea chest pain. After completing the test, subjects were allowed to walk slowly for 3-5 minutes and all large joint muscles stretching was given as a cool down.

Peak HR was measured at 20 min. Heart rate after 1 min, 3 min and 6 min was also measured and HRR in 1 min, 3 min and 6 min was calculated[9]

Statistical Analysis & Result

Kolmogorov Smirnov test was used for distribution of the data and data was not distributed normally so non parametric test Mann Whitney was applied for between group comparison of the heart rate recovery at 1min, 3min and at 6 minutes between group A and group B.

Table:1 Demographic Data.

VARIABLES	GROUP A (n=15)	GROUP B (n=15)
AGE (years)	25.13±4.38	24.46 ±2.82
HEIGHT (m)	1.682 ±7.664	1.602± 6.27
WEIGHT (kg)	61.266± 7.999	53.8 ±4.378
BMI (kg/m^2)	21.48 ± 1.49	20.81± 1.82

Table:2 Comparison Of Mean Heart Rate Recovery And Test Results.

HRR	Mean ± SD		Mann Whitney U value	P value
	GROUP A	GROUP B		
1 min	10.33 ±3.73	25.46 ±7.37	2.00	<0.001
3 min	17.73 ±4.77	39.6 ± 5.11	0.000	<0.001
6 min	22.8 ±3.40	47.46 ±12.00	0.000	<0.001

Significant difference in Heart rate recovery after 1 min, after 3 min and after 6min (p<0.001) between both the groups.

DISCUSSION

In present study we found that there was significant difference in Heart rate recovery at 1min, 3 min and 6 min in both the groups. The physically active group showed a significantly faster decrease in heart rate to pre exercise value than the age matched sedentary controls.

Hagberg et al [16] showed that the plasma norepinephrine levels trained

subjects had a significantly lower HR than detrained subjects. This finding supports training or aerobic capacity mainly affects PNS reactivation, but the authors also suggested that Training could decrease the sensitivity of the norepinephrine receptors on the heart, reducing the cardio-excitatory effect norepinephrine has on the heart. However, PNS reactivation seems to be the main factor that affects HRR in those with higher aerobic capacity. Buch AN et al. has also suggested that, Angiotensin II is known to exert powerful inhibitory effects upon the cardiac vagus and he has shown that athletes have lower levels of plasma rennin activity compared to sedentary subjects. Thus suppression of the inhibitory effects of angiotensin II might account in part for the increase in cardiac vagal activity with physical training. [17]

Previous research has suggested that highly fit individuals present more effective autonomic activity than sedentary ones [2] Studies suggest that not only athletes participating in endurance but also in strength exercise training improves cardiac regulation. Thus enhanced vagal nerve reactivation and physiological adaptation to prevent an excessive cardiac workload may be a primary factor for the rapid recovery of HR immediately after exercise in physically active individuals. [18]

Watanabe J et al. has concluded in his study that an attenuated heart rate recovery was a powerful and independent predictor of risk of death, even when measured in the absence of a cool-down period and even when taking into account a systematic measure of left ventricular systolic dysfunction [19] During recovery, the patients' mean heart rate decreased progressively. Heart rates at one, two, three, and four minutes after the cessation of exercise are all associated with death from any cause and particularly with sudden death, but not with non sudden death from myocardial infarction. [20] In the present study heart rate recovery after 3 min and after 6 min is also taken, and there is significant difference in heart rate recovery after 3 min and after 6 minutes between both the groups.

CONCLUSIONS

This study concludes that life style of an individual definitely has an impact on heart rate recovery which is one of the potential markers of the cardiovascular fitness. Heart rate recovery should be taken as an important vital measurement in routine check-up.

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