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Effect of high intensity interval training on cardio-respiratory fitness among hypertension stage 1 patient

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Abstract
The purpose of this study was to examine the effects of high-intensity interval training (HIIT) on cardiovascular fitness among the hypertensive stage 1 patient. It was a descriptive type of intervention study. Sample size was 25 and convenient sampling was done. Study period was 6 months. HIIT was given to the participants for 22 min for 6 weeks. Statistical analysis was done using paired T test. Results showed significant improvements seen in VO_2 max in hypertensive stage 1 patient. In conclusion, high intensity interval training is highly significantly effective in increasing endurance and improving cardiorespiratory fitness among hypertension stage 1 patients.

Keywords: high intensity interval training, hypertension, cardiorespiratory fitness, VO_2 max, HIIT

1. Introduction
WHO defines high blood pressure as systolic pressure level up to or over 140mm Hg and/or diastolic pressure level up to or over 90mm Hg [1] blood pressure is defined as, the lateral pressure exerted by the blood on the walls of the arteries. There are some physiological variations of pressure level like age, gender, weight, smoking, salt consumption, genetic predisposition, etc. [2].

Increased sympathetic systema nervosum activity will increase pressure level and contributes to development and maintenance of high blood pressure [3]. The mechanisms of increased sympathetic systema nervosum activity in high blood pressure are advanced and involve alterations in baroreflex and chemoreflex pathways at each peripheral and central levels [4-6].

The prevalence of high blood pressure in urban population in Republic of India is calculable to be 40.8% and within the rural population was 17.9% [7].

There are 2 styles of hypertension: Primary and Secondary. When the reason behind high blood pressure is unknown, it's referred to as Primary (or essential) high blood pressure. {Secondary high blood pressure high blood pressure hypertension} is once there's associate underlying problem like renal disorder or secretion disorders which will cause hypertension [8].

The Sixth Joint National Committee Criteria (JNC VII) classifies high blood pressure for adults aged eighteen years and older into the following stages [9]:

Physical activity within the variety of aerobic exercise has been suggested for the prevention of high pressure level further as lowering of pressure level among hypertensive people [10].

For some people like welfare worker, professors, company staff it's a problem of finding enough time in associate full schedule to suit within the suggested activity Thus, few folks people systematically achieving suggested weekly one hundred fifty minutes or more of moderate-intensity exercise [11].

Globally, 31.1% of adult are physically inactive [12]. Prevalence of inactivity in Republic of India was calculable to be 13.4% (12.2%-14.8%) by the globe Health Organization, among adults aged eighteen years and above [13].

Cardiorespiratory fitness is expounded to the flexibility to perform large muscle, dynamic, moderate-to vigorous intensity exercise for prolonged periods of time [12].

Associate exercise educational program ideally is meant to fulfil individual health and good condition goals inside the context of individual health status, function, and also the individual physical and social environment. There's a positive dose response of health/fitness advantages that results from increasing exercise intensity.

Highest volume of oxygen consumed per unit time (VO_2 max) is accepted as criterion measure of cardiorespiratory fitness [12].

VO_2 max is that the product of the highest cardiac output (; L blood · min −1) and arterial-venous oxygen difference (mL O2 · L blood −1). VO_2 max is closely associated with the functional capability of the heart [12].

Differing from low or moderate-intensity aerobic exercise, high-intensity interval training (HIIT) consists of alternating short periods of intense exercise with recovery periods of passive or mild-intensity movement. The work intervals last from fifteen seconds to four minutes associated approach eightieth to ninety fifth of an individual's most heart rate. Recovery intervals are usually up to or slightly longer than the intense work interval and carries with it passive rest or mild activity at four-hundredth to five hundredth of the most pulse rate. The combined work/rest interval normally is incredibly effective at stimulating physiological variations that result in improved performance [11].

In untrained people, vital enhancements in highest oxygen uptake (VO_2 max) occur in response to 2–12 week of high-intensity interval training (HIIT).

This increase in VO_2 max is vital as a result of it will increase exercise tolerance and long health status the precise length, intensity, and recovery length differed across HIIT regimes [14].

2. Methods and Materials

Pre and Post study was conducted at Dr. Abdul Kalam College of Physiotherapy, PIMS, Loni on 25 healthcare professional. Samples were included via convenient sampling. Among these 40% were male and 60% were female and consisted of teaching and non-teaching staff of the hospital.

2.1 Selection criteria

Participants between ages of 35-55 year old with systolic blood pressure between 140mmHg to 159mmHg and diastolic blood pressure between 90mmHg to 99mmHg were included with consent. Participants with lower limb injury, any psychiatric illness. neurological, cardiovascular or musculoskeletal disorder were excluded.

2.2 Tools and materials

The Queen College Step test was used to evaluate the VO_2 max before and after the intervention. High Intensity Interval Training using a protocol formed by reference ACSM guideline was given on treadmill. Oxygen saturation and heart rate were monitored both before and after intervention using pulse oximeter and heart rate monitor.

Table 1: ACSM'S guidelines for exercise testing and prescription.

Time in (min)	Components	Intensity
5	Warm up	
2	MIIT	40%-59% HRR
1	HIIT	60%-89% HRR
2	MIIT	40%-59% HRR
1	HIIT	60%-89% HRR
2	MIIT	40%-59% HRR
1	HIIT	60%-89% HRR
2	MIIT	40%-59% HRR
1	HIIT	60%-89% HRR
5	Cool down	

The above protocol is designed with the reference from ACSM'S guidelines for exercise testing and prescription.

Twenty-five (25) participants were evaluate using physical activity readiness questionnaire (PAR-Q+) and step test was performed. Data for each subject was collected and recorded by the principal investigator. Demographic data was collected and analysed for effect of high intensity interval training on cardiorespiratory fitness among hypertensive stage 1 patient. Data was coded and entered Microsoft Excel spread sheet. Analysis was done using Microsoft Excel. Data was collected and presented in tabular form and analysed by using the paired "t" test to compare mean values.

3. Results

Table 2: Comparison of mean pre and post VO_2 max in step test high intensity interval training (VO_2 max)

	Pre	Post	P value	T value	Result
Mean ± SD	48.99	50.79	0.00	8.88	Reject the null hypothesis

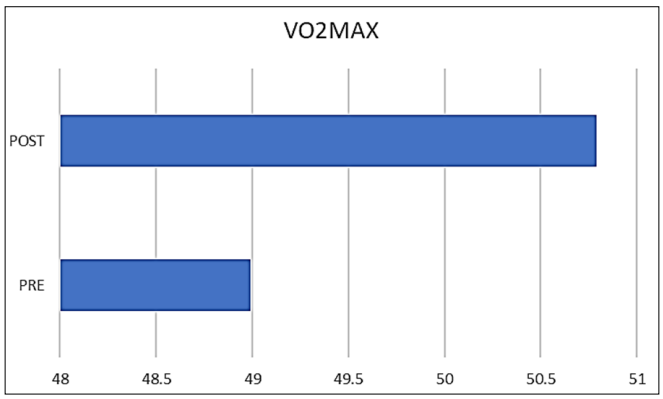

Fig 1: Comparison of mean pre and post VO_2 max

Result No 1: Comparison of mean pre- and post-heart rate in HIIT where t value is 15.25 and p value 0.00 which is extremely statistically significant.

Table 3: Comparison of mean pre and post heart rate in step test high intensity interval training (Heart rate)

	Pre	Post	P value	T value	Result
Mean ± SD	124.4	117.92	0.00	15.25	Reject the null hypothesis

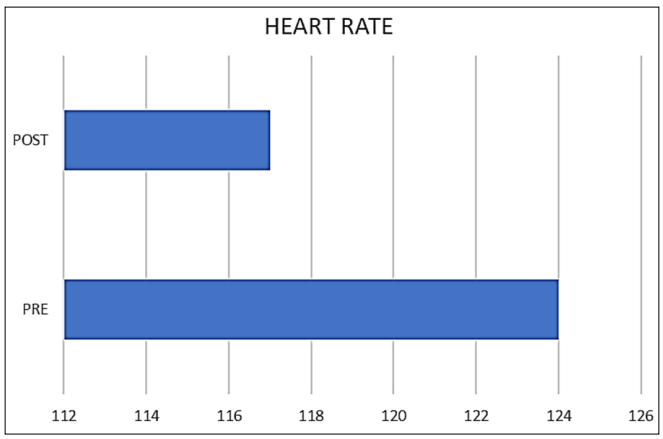

Fig 2: Comparison of mean pre and post heart rate

Result No 2: Comparison of mean in pre and post VO_2 max in HIIT where t value is 8.88 and p value 0.00 which is extremely significant.

4. Discussion

The study evaluated the result of high intensity interval training on cardiorespiratory fitness. The experimental study of six weeks gave a result that high intensity interval training had vital result on cardiorespiratory fitness in step with the rules for exercise testing and prescription of the ACSM, individual should perform exercise between 60-89% of HR max to boost cardiovascular fitness. Among the numerous reasons for not exertion may be a "perceived lack of time", that is one in every of the foremost frequently cited barriers. Recent analysis on the advantages and effectuality of high intensity interval training (HIIT) could facilitate to beat that barrier.

HIIT could facilitate insufficiently active people overcome a significant barrier to keep up a physical active manner, that of a perceived lack of your time. One more bonus is that from a time: profit perspective, HIIT could convince be an honest example where less where more. HIIT training will simply be changed for individuals of all fitness levels and special conditions, like high blood pressure stage one. HIIT workouts are performed on all exercise modes, as well as sport, walking, swimming, aqua training, elliptical cross-training and in several group exercises classes. HIIT workouts give fitness advantages in shorter periods of your time. This is often as a result of HIIT physical exertion tends to burn additional calories than ancient workouts, particularly once the physical exertion. The post-exercise exercise amount known as "EPOC" that stands for excess post exercise oxygen consumption. This is often generally about a 2-hour after once an exercise bout wherever the body is restoring itself to pre-exercise levels, and so using additional energy. Thanks to the vigorous contractile nature of HIIT physical exertion, the EPOC tend to be with modesty greater, adding regarding six to fifteen additional calories to the physical exertion energy expenditure [15] high intensity uses in various field like in cardiac rehab-HIIT seems safe and higher tolerated patient. HIIT provides rise to several short and long term central and peripheral adaptations. In stable and chosen patients, it induces substantial clinical improvement, as well as useful effects on many vital prognostic issue (VO_2 max, ventricular perform, endothelial function) similarly as rising quality of life [16]. Regular exercise results in improved CRF, which means that exercise capability is related to lower mortality risk in older people with HTN. Regular exercise is usually recommended as prevention, treatment, and management of primary and secondary HTN. Through its various mechanisms, as well as improvement in endothelial function, reduction in blood vessel stiffness, and reduce in sympathetic neural activity; exercise is effective within the vessel protection [17].

After the HIIT, VO_2 peak, and maximal heart rate increased along with exercise time. Also, there have been no vital changes in body fat proportion, weight, and body mass index once six weeks of training intervention. Intensity of exercise training is that the most vital cause of raising the cardiorespiratory fitness. There are limitations for cardiorespiratory fitness, with stroke volume being the most one. HIIT workouts accommodate alternating short work periods of high-intensity aerobic exercise with low-intensity exercise periods. The blood flow in patients fluctuates between high and low intensities that include a bigger challenge for the heart, improved cardiorespiratory fitness by high-pumping ability-induced intervals. Additionally, will increase in cardiac output and peripheral O_2 uptake-induced HIIT improved the metastasis fitness [17].

5. References

1. World Health Organization. A global brief on hypertension: Silent Killer, Global public health rises: World Health Day 2013.
2. Siyad AR. Hypertension. Hygeia, J. D. Med 2011;3(1):1-16.
3. Mark AL. The sympathetic nervous system in hypertension: A potential long term regulator of arterial pressure. J Hypertense Suppl 1996;14: S159-65.
4. Chapleau MW, Hajduczok G, Abboud FM. Mechanisms of resetting of arterial baroreceptors: An overview. Am J Med Sci 1988:295:327-34.
5. Guo GB, Thames MD, Abboud FM. Arterial baroreflexes in renal hypertensive rabbits. Selectivity and redundancy of baroreceptor influence on heart rate, vascular resistance, and lumbar sympathetic nerve activity. Circ. Res 1983:53:223-34.
6. Xie PL, Chapleau MW, McDowell TS, Hajduczok G, Abboud FM. Mechanism of decreased baroreceptor activity in chronic hypertensive rabbits. Role of endogenous prostanoids. J Clin Invest 1990:86:625-30.
7. Tanu Midha, Bhola Nath, Ranjeeta Kumari, Yashwant Kumar Rao, Umeshwar Pandey. Prevalence of hypertension in India: A meta-analysis. World J Meta-Anal 2013;1(2): 83-89.
8. Sembulingam K. Essentials of medical physiology. 4th edn; Cardiovascular system arterial blood pressure P562-63.
9. PJ_Mehta's_Practical_Medicine. 20th edn; Chapter 2 general examination P48.
10. Guilherme Veiga Guimara~es, Emmanuel Gomes Ciolac, Vitor Oliveira Carvalho, Veridiana Moraes D'Avila, Luiz Aparecido Bortolotto, Edimar Alcides Bocchil. Effect of continuous vs. interval exercise training on blood pressure and arterial stiffness in treated hypertension; Hypertension Research 2010;33:627-632.
11. Brad Roy A. Ph.D., FACSM, FACHE. High-Intensity Interval Training: Efficient, Effective, and a Fun Way to exercise brought to you by the American college of sports medicine. ACSM health and fitness journal (Page No. 3, Paragraph 1ST).
12. Deborah Riebe, PhD, FACSM, Senior Editor, Jonathan Ehrman K, PhD, FACSM, FAACVPR, Associate Editor, Gary Linguori, PhD, FACSM, Associate Editor, Meir Magal, PhD, FACSM, Associate Editor. ACSM's Guidelines for Exercise Testing and Prescription (10th edition, Chapter 1).
13. Carol Susan Devamani MD 1, Anu Mary Oommen MD 1 *et al*. Levels of physical inactivity in rural and urban Tamil Nadu, India: A cross-sectional study 2019;8(1):13-17.
14. Astorino TA, Edmunds RM, Clark A, King L, Gallant RA, Namm S *et al*. High-intensity interval training increases cardiac output and VO2max. Med Sci Sports Exerc 2017;49(2):265-73.
15. The role of lifestyle in health: the epidemiology and consequences of inactivity by William H. Dietz proceedings of the nutrition society 1996;55:829-840.
16. Guiraud T, Nigam A, Gremeaux V, Meyer P, Juneau M, Bosquet L. High-intensity interval training in cardiac rehabilitation. Sports medicine 2012;42(7):587-605.
17. Izadi MR, Afousi AG, Fard MA, Bigi MA. High-intensity interval training lowers blood pressure and improves apelin and NOx plasma levels in older treated hypertensive individuals. Journal of physiology and

biochemistry 2018;74(1):47-55.
18. Hall EE, Ekkekakis P, Petruzzello SJ. The affective beneficence of vigorous exercise revisited. British journal of health psychology 2002;7(1):47-66.