EFFICACY TESTING : ENDURANCE TRAINING ON VITAL PARAMETERS (HEART RATE AND RESPIRATORY RATE) IN ADULT POPULATION WITH SEDENTARY LIFESTYLE

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ABSTRACT

BACKGROUND- Aging is defined as the gradual biological impairment of normal function of the body and physiological changes in cell and structural component. These changes have a direct effect on functional ability of the organ. A sedentary lifestyle is defined as a type of lifestyle in which an individual does not receive regular amount of physical activity. According to WHO, 60-80% of the population worldwide does not engage in enough activity. Physical inactivity is the fourth leading risk factor for global mortality. For prevention of age related issues and disease physical activity is recommended. Physical activity has positive effect on several outcome in elderly population. Aerobic (endurance) exercise program in healthy adult gross major effect of overall health and outcome including Cardio Vascular Improvement in physical function. **OBJECTIVE-**To evaluate the effectiveness of endurance training on vital parameters in adult population with sedentary lifestyle. **METHODOLOGY-** Total 155 adult people were there in which 120 people fulfilled the inclusion criteria. Among 120 we have selected 60 adult people for intervention by lottery method. In total, 60 adult people were selected initially. In the end, because of certain reasons and not co-operative to the intervention 13 adults dropped out, leaving 47 for study. 47 elderly people had actively participated and co-operate to the intervention. **PROCEDURE-**endurance training (Walking) was given for 4 days in a week for total 12 weeks. Treatment duration of 1 session was 30 minutes. Pre and post treatment analysis was done as follows-

- For measuring heart rate (HR) palpation method from radial artery were used.
- For measuring respiratory rate (RR) chest wall movement were used.

RESULT- Research investigated that HR and RR found to be significantly reduced after intervention of endurance training on vital parameters.

CONCLUSION-After intervention of endurance training at post intervention sampling stage 2, the vital parameters significantly differed and improve when compare to pre intervention sampling stage 1. Outcome showed that endurance training found effective to improve vital parameters. However the endurance training consider as an effective tool to improve vital parameters among elder with sedentary lifestyle.

KEYWORDS- Aging, Endurance Training, Sedentary Lifestyle, Heart Rate(HR),Respiratory Rate(RR)

INTRODUCTION

Aging is defined as the gradual biological impairment of normal function of the body and physiological changes in cell and structural component. These changes have a direct effect on functional ability of the organ. National institute of aging believed that when older people lose their ability to do things on their own, it is due to lack of physical activity. According to Global Health And Aging (WHO) results shows that 524 Million people are comes in aging group. By 2050 this number is expected to nearly about 1.5 Billion, approximately 16% of population of world wide. The numerical search in elder people is found in world's two most popular countries: CHINA and INDIA.

According to WHO to cure chronic diseases like stroke, cardiovascular diseases and diabetes in 2006 estimated economic loss ranging from US $ 20 Million to US $ 30 Million and end up rarely US $ 1 Billion. Maximal oxygen consumption is decline by 10% in every thirty year of age, with this declined there is decrease in cardiac output, heart rate and stroke volume in elderly population. Normally aging affect all the organ & physiological process of human body. Human body shows progressive deterioration with age. Rate of aging is same as 45year old man as it is for 85 year old. Some physical changes are easily visible on the body, Other are less apparent, they internally affect the body system.

Pacemaker system of the heart that conduct electrical activity of heart, with the aging electrical activity of heart decreases due to development of fibrous tissue & fat deposition, which leads to changes in cells & may result in slightly slower HR. Normal changes in the heart include deposits of the aging fragment Lipofuscin which leads degenerative changes in heart muscle.

There is some aging related structural changes in the cardiovascular system leads to functional and adaptive capacity changes in the heart and vessels. Cardiac aging is associated with left ventricular hypertrophy, Fibrosis and diastolic dysfunction. However excessive heart demands would make hypertrophy which is a pathological condition. Aging heart were characterized by changes and thickening of wall of left ventricle due to an increase in size of cardiac myocytes and increase collagen. This alteration may reduce or increase contractile efficiency of the heart. The cardiac filling property of the heart altered with age. Relaxation of myocardial fiber, sufficient venous return, and timing of the atrial contraction is contribute in cardiac filling. Relaxation of myocardial fiber alters because of increasing in ventricular stiffness. Despite the changes in early diastolic the resting left ventricular end diastolic volume remains the same results in, an enhanced left atrial contribution to ventricular filling, this is due to enlarged left Atrium and therefore, audible fourth heart sound in most older adult.

Microscopically there is a changes in heart that is, cardiac hypertrophy is associated with a high loss of Myocytes. Number of ventricular myocytes were reduced with aging as a result of apoptosis. The age related myocyte loss can increase the mechanical load to the remaining myocytes which leads compensatory hypertrophy in the heart. The decrease in aortic elasticity increased to the mechanical load on the heart which is predisposing factor of heart failure. Hypertrophy in left ventricle is adaptive mechanism to maintain cardiac function in response to aging induced structural changes in the cardiovascular system.

With the aging there is a characterized by the proliferation of cardiac fibroblasts. This proliferation may result in the accumulation of collagen prior to atrial and ventricular fibrosis in the older people. By the aging there is increasing in elements of the cardiac extracellular Matrix such as glycoproteins, proteoglycans, glycosaminoglycans, integrins and collagen. In adult there is decrease in collagen Type III and increase in collagen Type I fibers results in higher ratio of collagen Type I fibers, may contribute to left ventricle stiffness and impair cardiac biomechanical function.

Autophagy is the natural process which played an essential role against structural and functional dysfunction in the heart during hemodynamic stress. However the Autophagy machinery become susceptible during the aging, results an inadequate performance of cardiac activity. Therefore the reduction of autophagy with advanced age can affect the capacity to recover and the great damage to intracellular components thereby leading to structural and functional changes.

Epigenetic changes occur with the age which lead cardiovascular diseases. Another cardiovascular system disorder such as atherosclerosis is common among aging people. Atherosclerosis is progressive disease in which there is accumulation of lipid and plaque formation and deposition in the arterial wall. Blood properties also change with age. Normally with aging there is slightly reduction in total body water & there is decrease in blood volume. Speed of red blood cells synthesis is reduced which induce slower healing response to anemia. White blood cells is important for immune system, so decrease in their synthesis may leads to reduced ability to resist the infection. Baro-receptors which monitor the blood pressure become less sensitive with aging. Capillary wall thicken slightly. Aorta become thick, less flexible & stiff which makes blood pressure higher and more heart work which leads to thickening of heart muscle. Physiological changes that occurs with aging are decreased in the static elastic recoil of lungs and decrease the strength of respiratory muscles.

A sedentary lifestyle is defined as a type of lifestyle in which an individual does not receive regular amount of physical activity. According to WHO, 60-80% of the population worldwide does not engage in enough activity. Physical inactivity is fourth leading risk factor for global mortality. Now a days long period of sitting work (in computer operator, truck drivers) leads more inactivity. Sitting for long period and inactivity was associated with worse health outcome which include heart disease. Sedentary lifestyle or low level of fitness in older people increase risk factor of development of obesity, myocardial infraction, type 2 diabetes mellitus, hypertension, osteoporotic fracture and depression. Sedentary lifestyle also increase mortality rate from Heart disease or other medical problem. For prevention of age related issues and disease physical activity is recommended. Physical activity has positive effect on several outcome in elderly population. Aerobic (endurance) exercise program in healthy adults have major effect on overall health and outcome including Cardio Vascular Improvement in physical function. Regular physical activity is very essential component for healthy lifestyle. To keep body fit and to increase the endurance of the body, Regular exercise is Important. It improve cardiac efficiency and it is important component for lifestyle modification and for prevention and treatment of HTN. Regular practice of Aerobic exercise is very beneficial and it prepare body for healthy aging. Regular aerobic exercise can improve cardiac fitness. It prepare body to overcome from stress by decreasing the sympathetic activities in stressful situations. The simplest way to improve a health is to start walking. It is free, easy and can be done anywhere, any place and any time. Walking Is the most commonly recommended physical activity in elderly population. Some study have found strong relation between walking and improve cardiovascular events in older adults. Walking at least 2 hour/week decreases mortality rate by 39% and cardio vascular mortality rate by 34% over 8 years of follow up.

AIM AND OBJECTIVES

Aim of Study:

The aim of the study is to assess the efficacy of endurance training on vital parameters (Heart Rate and Respiratory Rate) in adult population with sedentary lifestyle.

Objectives:

- To find the endurance and vital parameters before starting of endurance training in adult with sedentary lifestyle.
- To find the endurance and vital parameters after starting of endurance training in adult with sedentary lifestyle.
- To identify the efficacy of endurance training on vital parameters and endurance in adult with sedentary lifestyle.

MATERIALS AND METHODS

HYPOTHESIS

Null hypothesis [H^0]:

There will be no significant effects of endurance training on vital parameters in adult population with sedentary lifestyle.

Alternative hypothesis [H^1]:

There will be significant effects of endurance training on vital parameters in adult population with sedentary lifestyle.

STUDY RESEARCH DESIGN: The design of study is Pre-experimental 1 group pre-test post-test design.

SAMPLING METHOD: Random sampling technique was used for the study. However, simple random sampling technique was employed by utilizing the lottery method to select the desired samples from the population of adults with sedentary lifestyle selected from Astha old age home and who reported to OPD of Department of Physiotherapy, late. Rajendra Dharker OPD, Maharaja Yashwant Rao Hospital. Indore

PREPARATION AND ORGANIZATION OF DATA: Adult population with sedentary lifestyle of both the sexes had aged of more than 40 years and observed with blood pressure less than 160/100 mmHg that further met the inclusion-exclusion criteria recruited for the present pre-experimental research design during specified schedule.

A total of 155 adults with sedentary lifestyle was screened for the present study and out of them 120 had fulfilled the inclusion criteria and were found to be deemed fit as sample and consented to participate in the present study.

Over all, sixty adults with sedentary lifestyle selected randomly by using simple random sampling technique (Lottery method) from a total of 120 adults with sedentary lifestyle for the present study. However, thirteen adults with sedentary lifestyle weren't responded due to various relevant reasons and further not available for study.

Finally, 47 adults with sedentary lifestyle were available and acted as a sample for the present study. The adults with sedentary lifestyle treated with endurance training.

The main aim of present study was to analyse the effectiveness of endurance training on vital parameters among adults with sedentary lifestyle.

The assessments of vital parameters such as heart rate and respiratory rate among adults with sedentary lifestyle were carried out at baseline (pretreatment) stage.

At sampling stage one, the data for vital parameters had obtained prior to intervention as baseline

At sampling stage two, the data was re-collected at 12th week after intervention of endurance training on vital parameters and for further statistical analysis was done for post-intervention observations.

Pre and post intervention analysis of vital parameters (heart rate and respiratory rate) was carried out among adults with sedentary lifestyle. After necessary instructions and information about the study, the subject were explained about the complete study procedure in their own language and his/her willingness to participate in the study had recorded in a consent form signed by them.

Nevertheless, the vital parameters (heart rate and respiratory rate) of adults with sedentary lifestyle was compared between before (baseline) and after intervention of endurance training.

Finally, the adults with sedentary lifestyle were analyzed before and after intervention to evaluate the effectiveness of endurance training on vital parameters (heart rate and respiratory rate).

STUDY SETUP: The study was conducted at Astha old age home and M.Y. Hospital, MGM Allied Health Sciences Institute, Indore (M.P.)

STUDY DURATION: Study duration was around 10 months.

SUBJECT SELECTION CRITERIA-

Inclusion Criteria:

1. Adults with sedentary lifestyle of age more than 40 years.
2. Male and female adults with sedentary lifestyle.
3. No exercise intervention was performed previously with sedentary lifestyle.
4. Blood pressure of adults with sedentary lifestyle was less than 160/100 mmHg
5. Those who had given their consent.

Exclusion Criteria:

1. All adults with physical activity.
2. Adults suffering from asthma, chronic bronchitis, tuberculosis.
3. Recent MI.
4. Complete heart block.
5. Acute congestive heart failure.
6. Unstable angina.
7. Uncontrolled hypertension.
8. High risk adult people.
9. Neurological problem.
10. Psychological unstable.

STUDY TOOLS

1. Sphygmomanometer.
2. Stop Watch.
3. Stethoscope.
4. Wrist watch.
5. Couch.

OUTCOME MEASURES:

Heart Rate :- For measuring heart rate we used Palpation method (3 finger method). Heart rate can be taken at any spot on the body (temporal, carotid, brachial, radial, femoral, popliteal, dorsalis pedis) at which the artery is close to the surface and a pulse can be felt. The most common place to measure heart rate using palpation method is at wrist (radial artery). Therapist place index, middle and ring finger together on the wrist, over the distal radius at base of the thumb, lateral to tendon of the flexor carpi radialis. Note the rate (number of beats per minute) when strongest pulsation felt, count for 30 secs and multiply by 2. Note the rhythm (time intervals between pulse beats) and quality (force) along with the rate of the pulse.

Respiratory Rate :- To monitor respiratory rate, preferably supine position is advised (sitting position could be adapted). Ask the patient to expose the chest area, if area cannot be exposed place patient's forearm across the chest. Observe the rise and fall of the chest, as patient starts the breathing after few minutes of normal resting. Count the respirations (either inspirations or expirations) for 30 seconds and multiply by 2.

VARIABLES:

Dependent variable- Heart Rate, Respiratory Rate

Independent variable- Endurance Training (walking)

INTERVENTION-

Duration of intervention-12 weeks, 4 sessions per week for 30 min.

Pre & post treatment analysis is done by using

- For measuring heart rate (HR) palpation method from radial artery were used.
- For measuring respiratory rate (RR), chest wall movement were used.

Procedure -Pre intervention data was taken prior the intervention. For pre intervention data subject's blood pressure, heart rate and respiratory rate were measured after that 6 minute walk test performed for endurance. After taking pre intervention data subject were instructed that if they face any problem during this procedure they have to stop procedure and inform the therapist. After this explanation 5-10 minutes of warm-up session was conducted followed by 20 minutes walking. For initiation of training stronger verbal command was used by the therapist, in order to stimulate and reinforce to encourage or facilitate elderly people for walking. After endurance training cool-down session also performed. In that cool-down session breathing exercise was conducted. After all this 12 week intervention, post intervention data heart rate and respiratory rate was collected again.

DATA ANALYSIS

Assessment of selected parameters was carried out before (baseline) and after (post) intervention to know the effect of endurance training among adults with sedentary lifestyle in improving vital parameters (heart rate and respiratory rate)

The measurement of the heart rate and respiratory rate of adults with sedentary lifestyle were done by using stop watch, palpation and counting method and that carried out at two sampling stages in order to ensure the management of selected vital parameters.

The heart rate and respiratory rate of adults with sedentary lifestyle was measured at baseline (before) stage and after endurance training on vital parameters by using stop watch, palpation and counting method in order to identify the improvements in selected vital parameters.

Significance of mean differences of the heart rate and respiratory rate of adults with sedentary lifestyle were measured between baseline and post intervention stages and that analyzed
statistically.

The table-1 summarize the assessment and comparison of the heart rate and respiratory rate of adults with
sedentary lifestyle.

TABLE-1

COMPARISION OF HEART RATE AND RESPIRATORY RATE BETWEEN BASELINE AND POST INTERVENTION STAGES

Variable	Sampling Stage	Scatter (per minute) Mean ± SD	Mean Diff	Z-statistic	p-value (LOS)
Heart Rate (per minute)	*Baseline*	79.13±5.21	1.70 per minute	3.46	p<0.001[#]
	Post Intervention	77.43±3.33			
Respiratory Rate (per minute)	*Baseline*	16.89±1.59	0.70 per minute	3.61	p<0.001[#]
	Post Intervention	16.19±1.26			

The mean differences are highly significant at the 0.001 level of significance. The degrees of freedom are 46. [SD-Standard Deviation; Mean Diff-Mean Difference; LOS-Level of Significance]

The table-1 reports the comparison in heart rate and respiratory rate among adult with sedentary lifestyle was done between baseline (before) and post (after) intervention stages to judge the significance of differences in the selected vital parameters.

Heart rate and respiratory rate of adult with sedentary lifestyle were found to be significantly differed and improved at post-intervention stage after intervention of endurance training on vital parameters when compared to baseline (pre-intervention) stage.

Adults with sedentary lifestyle had experienced significantly differed and better heart rate and respiratory rate after intervention of endurance training on vital parameters than pre-intervention stage.

Nevertheless, outcome intervention indicated the effectiveness of endurance training on vital parameters among adults with sedentary lifestyle suffered from compromised vital parameters such as heart rate and respiratory rate impacted by sedentary lifestyle.

The mean (Mean ± Standard Deviation) heart rate (77.43±3.33per minute) of adult with sedentary lifestyle found to be significantly smaller after intervention of endurance training on vital parameters at post intervention stage as compared to mean heart rate (79.13±5.21per minute) at baseline sampling stage. However, this mean difference of 1.70per minute in heart rate found to be statistically strongly significant (p<0.001) between baseline and post intervention stages among adult with sedentary lifestyle.

This was also noted after intervention of endurance training on vital parameters that the mean (Mean ± Standard Deviation) respiratory rate (16.19±1.26 per minute) among adult with sedentary lifestyle found to be significantly smaller at post intervention stage as compared to mean respiratory rate (16.89±1.59 per minute) at baseline sampling stage. However, the mean difference of 0.70per minute in respiratory rate between baseline and post intervention stages among adult with sedentary lifestyle found to be statistically strongly significant (p<0.001).

Moreover, the statistical agreement demonstrated that the adults with sedentary lifestyle intervened with endurance training on vital parameters had more improved and better heart rate and respiratory rate.

Henceforth, endurance training on vital parameters among adult with sedentary lifestyle may be preferred as an effective conservative program for improving heart rate and respiratory rate in cases of sedentary lifestyle.

Furthermore, endurance training on vital parameters may consider as a tool to combat the compromised heart rate and respiratory rate in sedentary lifestyle.
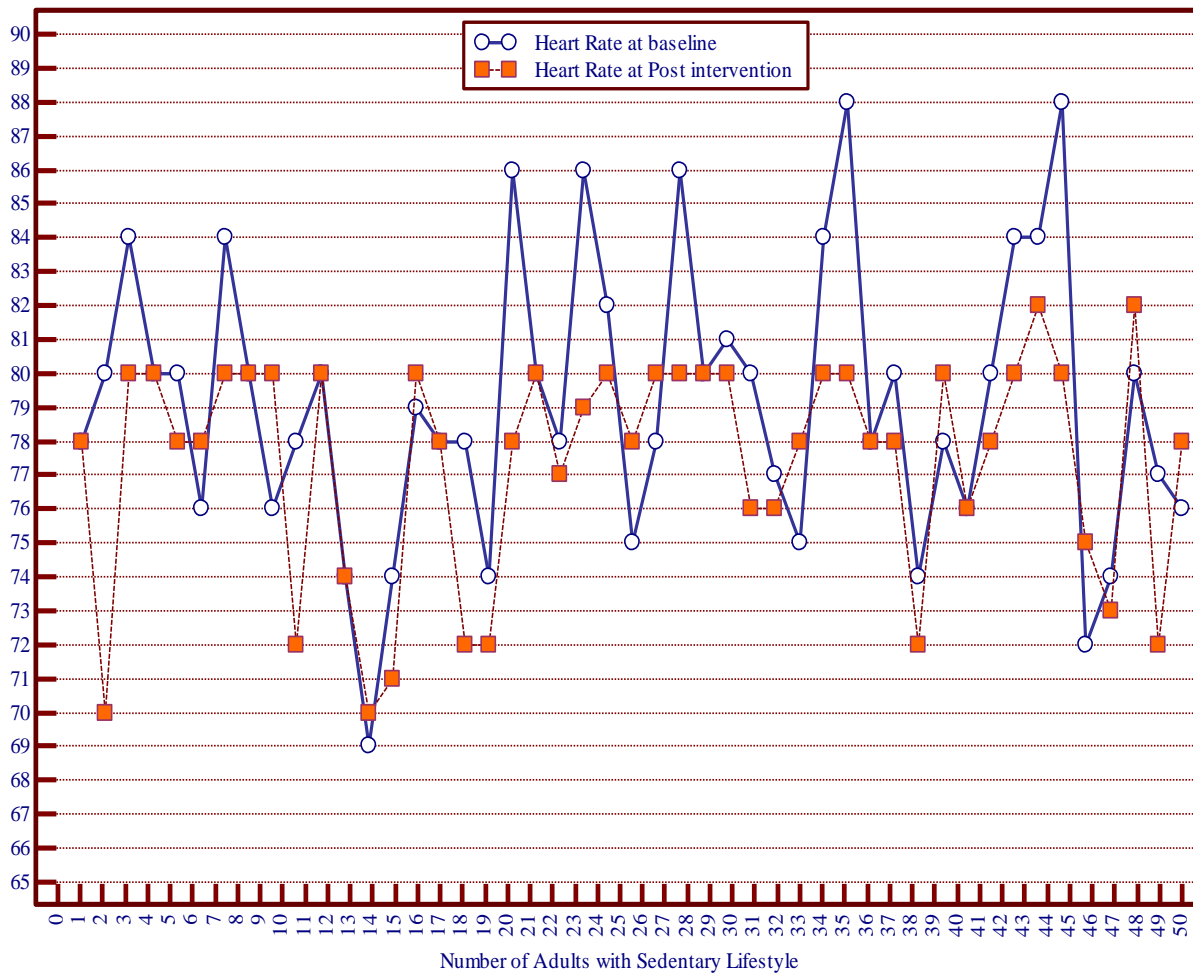
Line diagram showing the assessment and comparison of heart rate between baseline and post intervention stages
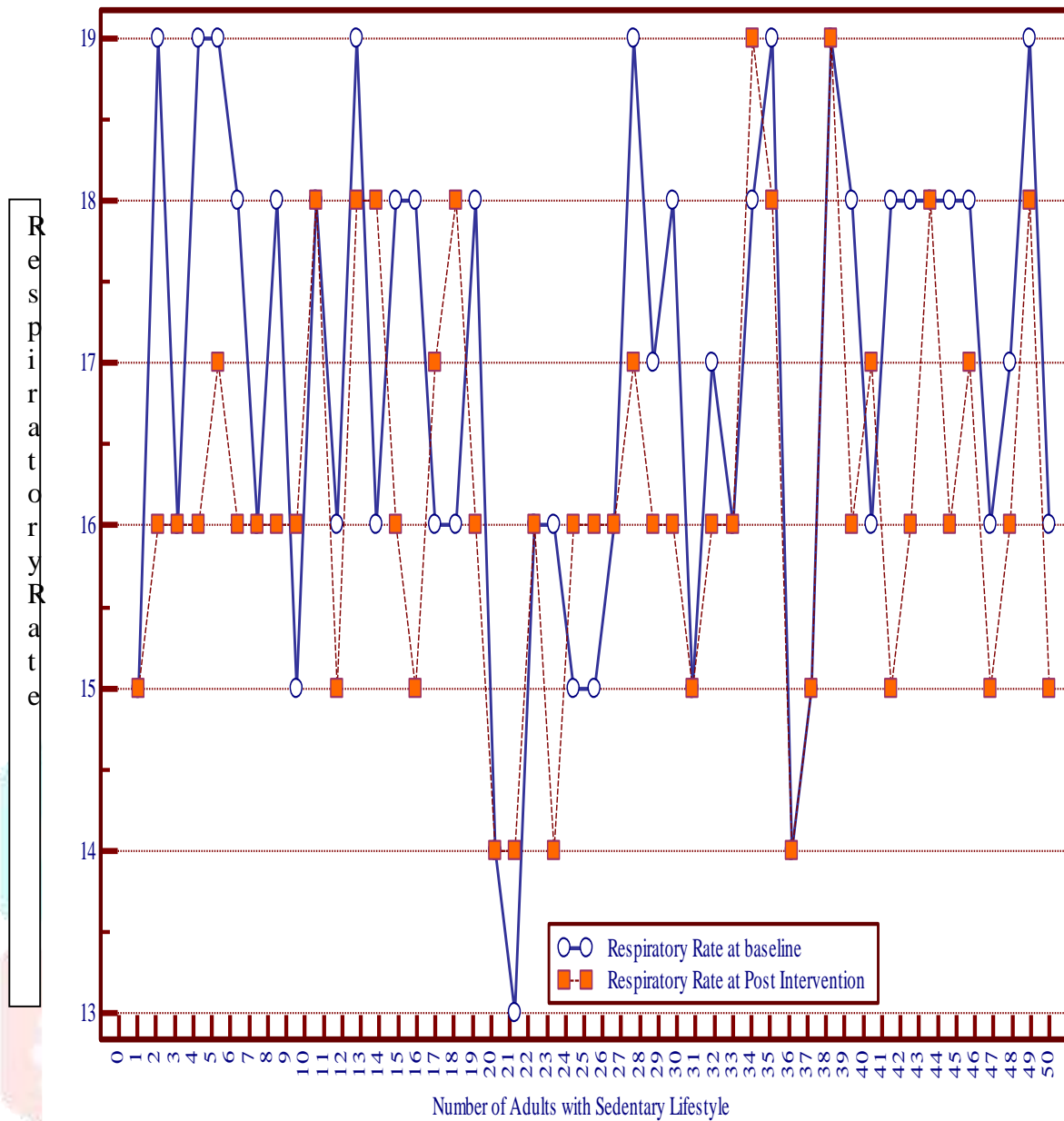
Figure-Line diagram showing the assessment and comparison of respiratory rate between

baseline and post intervention stages.

DISCUSSION

The aim of the study is to analyze the effectiveness of endurance training on vital parameters among adults with sedentary lifestyle. The assessment of vital parameters such as heart rate and respiratory rate among adults with sedentary lifestyle work carried out at baseline (pre-treatment stage).

Research investigated that HR and RR found to be significantly reduced after intervention of endurance training on vital parameters.

Because of endurance training some physiological changes and adaptation occurs in the body. Aerobic fitness and endurance training place large demand on the heart than any other type of training. Over time these demands result in adaptation to the cardiovascular system. In the heart, muscular walls of the heart increase in thickness particularly in the left ventricle, providing a more powerful contraction. The internal dimensions of left ventricles increase as a result of increase in ventricular filling.

The increase in size of the heart affect left ventricle to stretch more and thus fill with more blood. The increase in muscle wall thickness also increases the contractility resulting in increased stroke volume at rest and during exercise, increasing blood supply to the body.

Cardiac output increases significantly during maximal exercise effort due to the increase in stroke volume. This results in greater oxygen supply, waste removal and hence improved endurance performance and hence significantly improve Heart Rare and Respiratory Rate.

People having normal range of BP, experienced little changes in BP at rest or with exercise. However in the people having HTN found that reduce in blood pressure towards normal as they do more exercise. this is due to a reduction in total peripheral resistance within the artery, and improved condition and elasticity of the smooth muscle in the blood vessel walls..

Limitation and recommendation

- Larger sample size may reveal the results to be more statistically viable.
- Further studies can be done with relative long intervention period (more than 12 weeks).
- Future studies can also be done on the other age groups.
- Specific age group can be selected for further studies.
- Specific gender group can be selected for further studies.

CONCLUSION-

After intervention of endurance training at post intervention sampling stage 2, the endurance power and vital parameters in intervention group one significantly differed and improve when compare to pre intervention sampling stage one.

Result showed that endurance training found effective on improve endurance and vital parameters.

However the endurance training consider as an effective tool to improve endurance and vital parameters among elder with sedentary lifestyle.

Aim of the proposed research title " EFFICACY TESTING OF ENDURANCE TRAINING ON VITAL PARAMETERS IN ADULT POPULATION WITH SEDENTRY LIFESTYLE". Present study shows that there is significant efficacy testing of endurance training on vital parameters in adult population with sedentary lifestyle.

REFERENCES

1- Mansi Matani, Hetal Mistry (2017)- Effect of pectoral stretching in adding to standard breatingexcercises on functional capacity and quality of life in elderly individuals. IOSR-JNHS:6:6-11

2- World Health Organization, Global Health and Aging, National Institute of Aging, National Institute of Health, U.S. Department of Health and Human Service.

3- Ross E. Andersed, Thomas A. Wadden, Susan J. Barlett, Babette Zemel, Tony J Verde, Shawn C. Franckowiak(1999) Effects of lifestyle activity v/s structured aerobic exercise in obese women.281:4:335-340

4- Carlo Vigorito and Francesco Giallauria(2014) Effects of exercise on cardiovascular performance in the elderly.5:51:1-8.

5- Sunita Choudhary, jayantkumar, kamala choudhary, Rajnee, Sonika Choudhary, Raghuveer Choudhary(2015) Effect of aerobic exercise on cardiovascular parameters in untrained and trained subjects. SJAMS;3(2A):538-542.

6- Paula Diehr and Calvin Hirsch (2010) Health benefits of increased walking for sedentary, generally healthy older adults: using longitudinal data to approximate an-intervention trial 65A(9):982-989.

7- Susan B. Sullivan, Thomas J. Schmitz 5th edition- Physical rehabilitation. Chepter 4- 98-108

8- www.lifespanfitness.com/workplace/resources/article/health-riskof-a-sedantary-lifestyle - health risks of a sedentary lifestyle

9- https://medlineplus.gov/emc/article/004006.htm - Aging Changes in the heart and blood vessel.