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To find the effect of Diaphragmatic breathing on controlling the vital after 6-minute walk test amongst the post COVID individual

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Abstract

When you exercise and your muscles work harder, your body uses more oxygen and produces more carbon dioxide. To cope with this extra demand, your breathing has to increase from about 15 times a minute when you are resting, up to about 40–60 times a minute during exercise. Your circulation also speeds up to take the oxygen to the muscles so that they can keep moving. Any kind of exertion causes some change in vitals. Some amount of fluctuation in vitals after any kind of exertion occurs in every individual and is considered to be normal. But if there is extreme fluctuation in vitals even after mild or moderate form of exertion, it indicates some kind of abnormality or an increased stress on cardiovascular or respiratory system and needs attention. In any case if the vitals fluctuate during any kind of exertion it needs to be stabilized so that its harmful effects can be avoided. For these breathing exercises have been proven to be very beneficial. There are several types of breathing exercises such as deep breathing, diaphragmatic breathing, pursed lip breathing, etc. The objective of this study is to assess the effect of diaphragmatic breathing exercises on vitals after exertion. In the present study we took 100 subjects randomly from Hallet hospital, Kanpur. Method of data collection is random with study duration of 12 weeks. The paired samples t-test shows significant changes observed i.e., null hypothesis is rejected and alternate hypothesis is accepted and we observed that significant improvement along with effectiveness of Diaphragmatic breathing on controlling vitals amongst post covid individuals.

Keywords: Diaphragmatic breathing, 6MWT, Vitals, Blood pressure, Heart rate, Respiratory rate, SPO2, Covid.

1. INTRODUCTION

Corona Virus Disease-19 (Covid-19) is a new type of disease which found in Wuhan, China at the end of 2019 (WHO). The disease, which is caused by Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-Cov-2), quickly spreads from infected people to surrounding people through respiratory droplets and aerosols (World Health Organization [WHO], 2020).A person infected with Covid-19 will generally feel fever (83-99%), cough (59-82%), Fatigue (40-84%), breathlessness (31-40%), myalgia (11-35%) and other nonspecific Signs such as insomnia, nausea, diarrhea, loss of appetite (Jin et al., 2020). The World Health Organization (WHO) classifies the severity of Covid-19 based on the symptoms that appear To be

mild, moderate, severe and critical. The respective percentages of Covid-19 severity Are 40% at a mild level, 40% at a moderate level, 15% at a severe / bad level, and 5% at a Critical level (Jin et al., 2020; World Health Organization [WHO], 2020).[1]

SIX MINUTE WALK TEST The 6MWT evaluates the global integrated response of all the body systems involved during exercise including the pulmonary system cardiovascular system systemic and peripheral circulation of blood neuro-muscular and muscle metabolism.[2]

BREATHING EXERCISE - Breathing exercises are manual techniques commonly used in clinical practice .They can affect breathing patterns and thoraco-abdominal movement ,prioritize one compartment of the chest wall (CW)over another and change the degree of participation of respiratory muscles.[3]

Diaphragmatic breathing - Breathing practice, also known as "diaphragmatic breathing '' or "deep breathing ''is defined as efficient integrative body –mind training for dealing with stress and psychosomatic conditions diaphragmatic involves contraction diaphragm, expansion of the belly ,and deepening of inhalation and exhalation , which consequently decreases the respiration frequency and maximize the amount of blood gases.[4]

OPERATIONAL DEFINITION

HEART RATE - Heart rate reflects the number of contractions of the ventricles per unit time and fluctuates substantially with variations in systemic demand for oxygen.[5] The normal resting heart rate for adults over the age of 10 years including older adults, is between 60 to 100 beats per minute (bpm)

OXYGEN SATURATION - Oxygen saturation is a measure of the amount of haemoglobin that is bound to molecular oxygen at a given time point . It is an important parameter for managing patients in a clinical setup. For adults, the normal range of SpO2 is 95 - 100% . A value lower than 90 , it is considered low oxygen situation ,which is require external oxygen supplementation.[6]

RESPIRATORY RATE - Respiratory rate or the number of breaths per minute is defined as one breath to each movement of air in and out of the lungs .Normal respiratory respiration rate of an adult person at rest ranges from 12 to 16 beats per minute.[7]

BLOOD PRESSURE - Blood Pressure is the pressure measured in mm of Mercury which is the major arterial system of the body. It is conventionally separated into systolic and diastolic determinations . The National institute of health science , normal blood pressure to be below 120 mm systolic and 80 mm HG diastolic.[8]

BMI (BODY MASS INDEX) - BMI may be measured based upon height and weight of an individual. It gives a measure of body fat. It can be calculated :- BMI = Weight (kg)/[Height]

2. METHODOLOGY

This chapter deals with the methods used for the study. This includes the information on subject, inclusion criteria, exclusion criteria, protocol and procedures used in this study. Source of data: Hallet Hospital Kanpur. Method of data collection is random, Sample size is 100 Subjects, Study Duration is 10 weeks and Study design is Comparative study.

In inclusion Criteria is Subjects willing to participate in the study, Only Middle-aged male can participate, with BMI (body mass index) = 18 - 25 (normal weight), Stable vitals, Asymptomatic subject with no history of any Cardiovascular, Skeletal, Neuromuscular Disease and there is no use of alcohol by subjects.

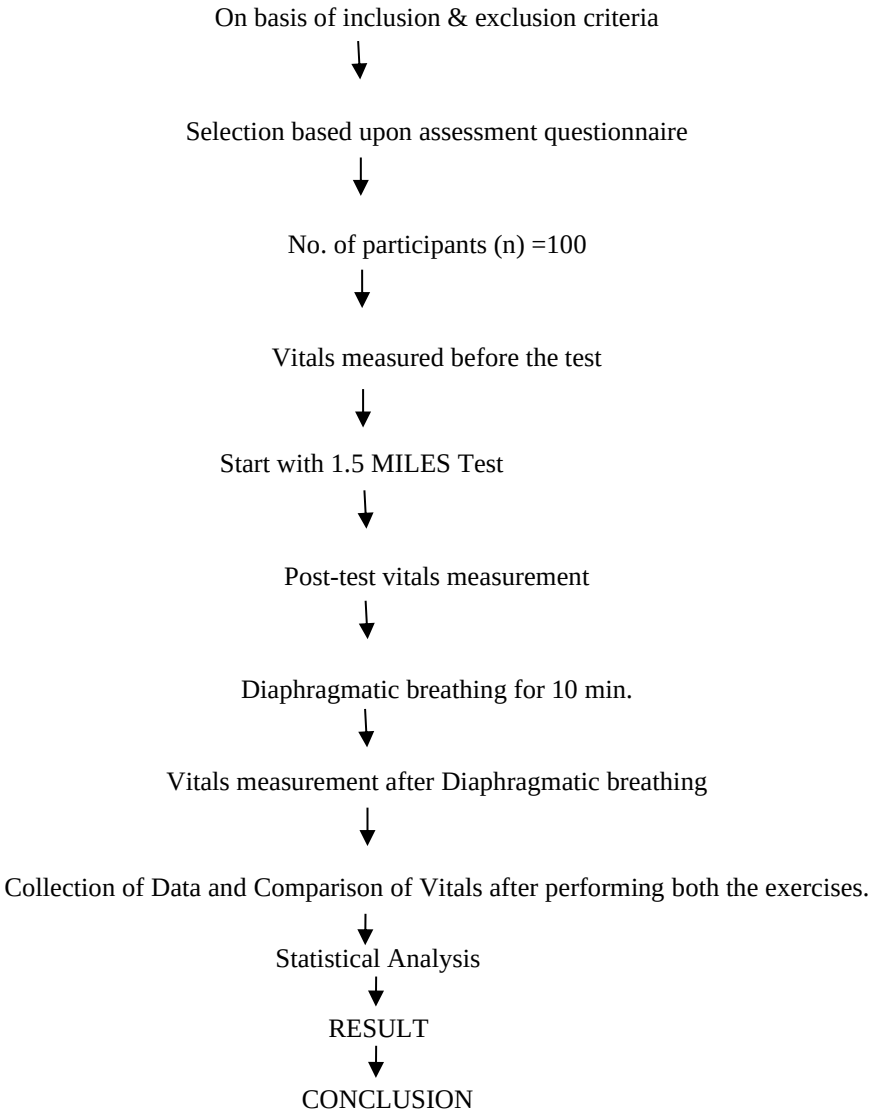
Exclusion Criteria is Resting BP>139/89mmHg, resting heart rate >100bpm, if there is any difficulty in walking, Vertigo, Subject with underweight or obese BMI, any kind of neurological disease, Asthma, Pregnant females, Individuals involved in regular exercise or sports.

3. PROCEDURE

Subjects were selected based upon the inclusion & exclusion criteria. They were explained in detail about the type & nature of study before participation. Consent was taken by each subject before participating in the study by signing a consent form that contained all the information necessary for them about the study. Procedure was explained in detail and all the necessary precautions were taken to avoid any inconvenience. Subject preparation was carefully done. They were asked to not to indulge in any kind of vigorous activity prior to the test or to take any heavy meal up to 1 hour by the test. All the subject was made sure to be properly hydrated, wore comfortable clothing & comfortable footwear. Before starting the test, necessary assessment was done and vitals (BP, HR, RR, SPO_2) were measured. All the necessary data such as Age, Sex, Height, Weight and BMI were also documented.

The subjects were asked to perform 1.5 miles test and participants were asked to walk back & forth along this pathway at their own best pace but not to run or race. We encouraged the participants with statements like “You are doing well” or “Keep walking, you are half way done”. Subjects were allowed to stop and rest during the test but instructed to resume walking as soon as they were able to do. After completion of 1.5 Miles test, dyspnea, SBP, DBP, HR, RR, SPO_2 were measured.

Immediately after the vitals measurement, Pursed- lip breathing exercise was performed for 10 min. After this, again vitals were measured and the difference in vitals was measured to see breathing exercise was better to control the vitals after exertion.



***Flowchart 1**: represent the whole protocol of present study*.

4. DATA ANALYSIS

Data analysis was done using IBM SPSS statistics (software package used for statistical analysis 2019 version - 26). Descriptive statistical analysis was done to determine the demographic characteristics of the subjects recruited in the study; paired sample t-test used in the analysis of this study. P – value used in the study to test hypothesis, which help in deciding whether to reject or accept the Null hypothesis. The p – value is probability of obtaining a test value that is at least extreme as the actual calculated value, if the null hypothesis is true. A commonly used value for the p – value is 0.05.

Table 1: Showing descriptive data of DIAPHRAGMATIC BREATHING

	N	Minimum	Maximum	Mean	Std. Deviation
participants age	100	19	75	37.70	16.835
participants height	100	139	173	155.87	9.045
participants weight	100	49	89	62.93	9.209
participants body mass index	100	22	33	26.36	2.782

The descriptive data of shows average age for participants was 37.70 years and the average weight was 62.93 Kg. The participants had an average height of 155.87 cm and correspondingly the average BMI was calculated to be 26.36. This reflects that average participant were in the over-weight category.

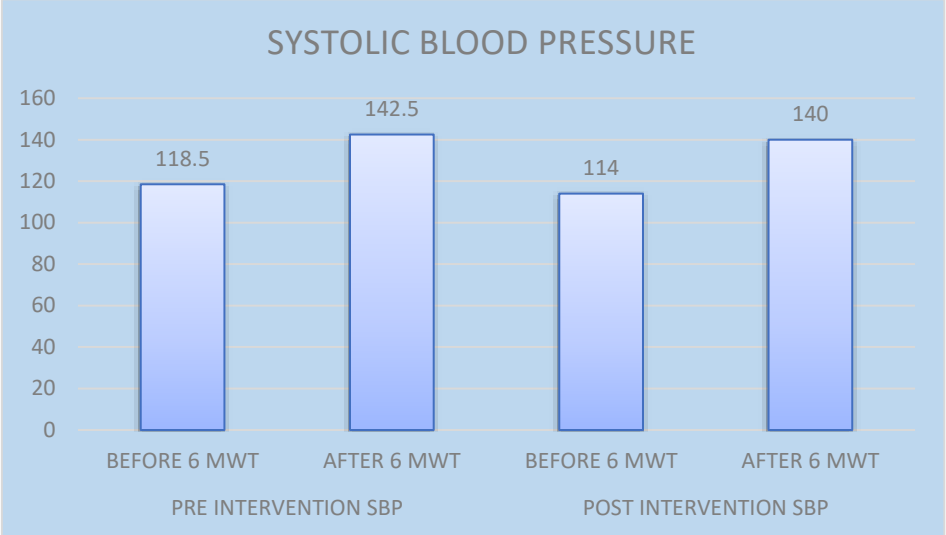
Table 2: Showing statistical data of DIAPHRAGMATIC BREATHING

	Mean	Std. Deviation	t - value	df	p - value
SBP	14.620	19.932	7.335	99	.000
DBP	12.310	7.215	17.062	99	.000
HR	40.400	10.230	39.493	99	.000
RR	11.560	5.505	20.998	99	.000
SPO2	3.190	3.512	9.082	99	.000

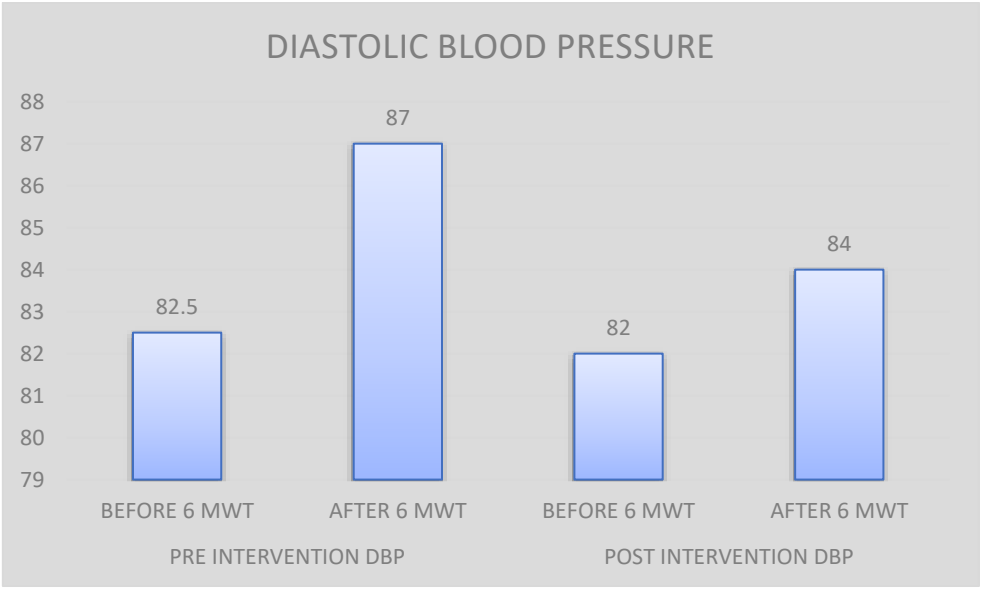
The table 2 shows the statistical data of Diaphragmatic breathing, while analyzing the group Diaphragmatic breathing data it has been found that Diaphragmatic breathing was significant in improving the vitals sign. There is improvement in systolic blood pressure with Mean (±SD) of 14.620 (±19.932) and t – value was 7.335 with p – value of .000, diastolic blood pressure with Mean (±SD) of 12.310 (±7.215) and t – value was 17.062 with p – value of .000, heart rate with Mean (±SD) of 40.400 (±10.230) and t – value was 39.493 with p – value of .000, There is improvement in respiratory rate with Mean (±SD) of 11.560 (±5.505) and t – value was 20.998 with p – value of .000, There is improvement in SPO2 with Mean (±SD) of 3.190 (±3.512) and t – value was 9.082 with p – value of .000. so, the table two shows that diaphragmatic breathing was significant at the 95% confidence level.

5. RESULT

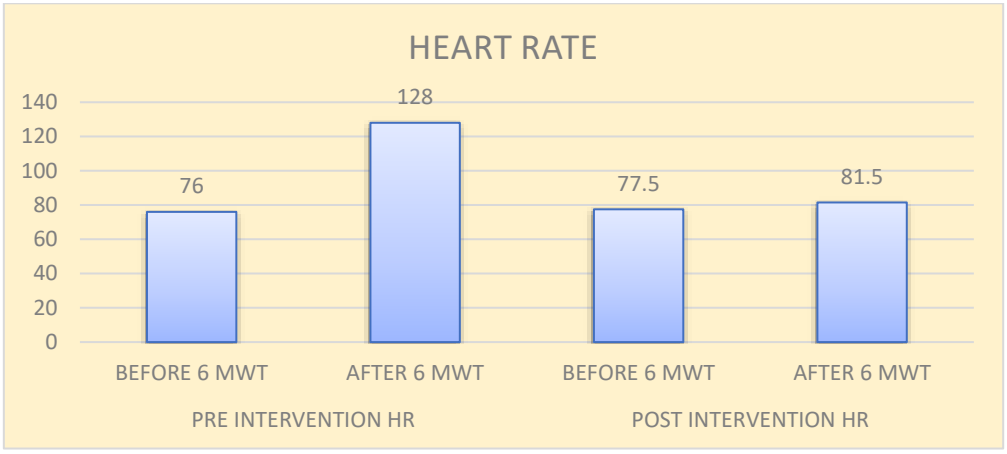
The 95% confidence level of paired samples t - test shows significant improvement i.e., null hypothesis is rejected and alternate hypothesis is accepted and we statistically observed improvement along with effectiveness of Diaphragmatic breathing on vitals in over weight individuals.



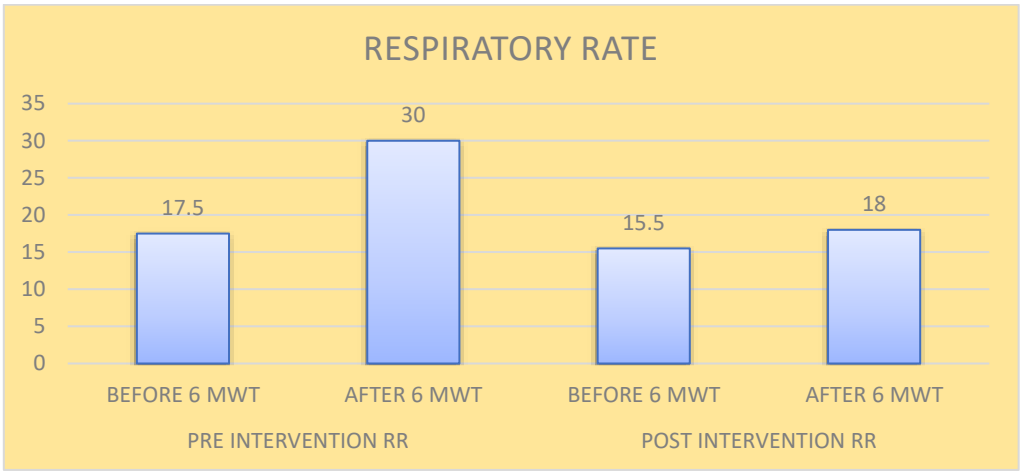
Graph – 1: shows the systolic blood pressure distribution of all the study subjects of Diaphragmatic breathing group. A finding shows that SBP with Means (±SD) of 14.620 (19.932) and t – value was 7.335 with p – value of .000 for Diaphragmatic Breathing, which was statistically significant.



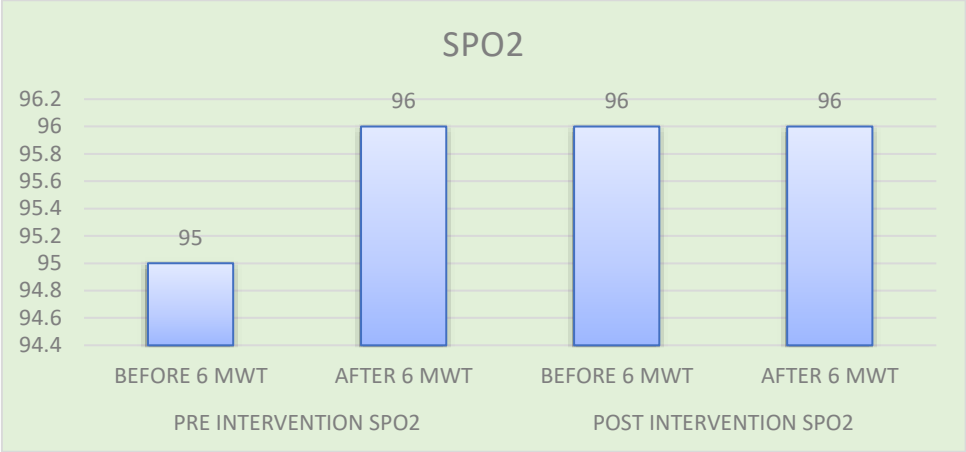
Graph – 2: shows the Diastolic blood pressure distribution of all the study subjects of Diaphragmatic breathing group. A finding shows that DBP with Means (±SD) of 12.310 (7.215) and t – value was 17.062 with p – value of .000 for Diaphragmatic Breathing, which was statistically significant.



Graph – 3: shows the Heart Rate distribution of all the study subjects of Diaphragmatic breathing group. A finding shows that HR with Means (±SD) of 40.400 (10.230) and t – value was 39.493 with p – value of .000 for Diaphragmatic Breathing, which was statistically significant.



Graph – 4: shows the Respiratory Rate distribution of all the study subjects of Diaphragmatic breathing group. A finding shows that HR with Means (±SD) of 11.560 (5.505) and t – value was 20.998 with p – value of .000 for Diaphragmatic Breathing, which was statistically significant.



Graph – 5: shows the Respiratory Rate distribution of all the study subjects of Diaphragmatic breathing group. A finding shows that HR with Means (±SD) of 3.190 (3.512) and t – value was 9.082 with p – value of .000. for Diaphragmatic Breathing, which was statistically significant.

6. CONCLUSION

Hence, we concluded that, based on the results of this study and previous research, null hypothesis is rejected and alternate hypothesis is accepted. As per the result, it has been concluded that Diaphragmatic Breathing can used to control the vitals in over-weight patients.

7. DISCUSSION

The present study was done to determine the efficacy of Diaphragmatic breathing on vitals. The study was done on over-weighted individuals. The pre and post effect of Diaphragmatic breathing is taken with the help of stethoscope, sphygmomanometer and pulse-oximeter. There is total 100 subjects were recruited according to inclusion and exclusion criteria. Those who satisfied the criteria were allowed to perform the study. All total 100 subjects were successfully completed the study. All the subjects were taken from Hallet hospital, Kanpur.

The data collected from the study represents that null hypothesis is rejected and alternate hypothesis is accepted, which means treatment protocol i.e., Diaphragmatic breathing were effective in lowering the vitals in over-weight subjects.

We also found same conclusion in 2016 *Brenda Morrow et al*., in their study "**The effect of positioning and diaphragmatic breathing exercises on respiratory muscle activity in people with chronic obstructive pulmonary disease** " concluded that This study has shown that, in people with COPD GOLD Stage 2 or higher, postural correction and upright positioning had no impact on respiratory muscle activity, whilst diaphragmatic breathing resulted in a transient increase in diaphragmatic activity, with no change in intercostal muscle activity. Perception of dyspnoea was not affected by the study interventions. Whilst there was no difference in diaphragmatic activity response for participants with different GOLD classifications, nutritional status did significantly affect diaphragmatic activity response to positioning and diaphragmatic breathing, with the greatest response occurring in those with normal BMI. Vital signs remained constant, except for a reduction in BP following study interventions..[9]

2020 *Hidetaka Hamasaki et a*l., in their study **"Effects of Diaphragmatic Breathing on Health: A Narrative Review"** concluded that in conclusion, Previous systematic reviews and meta-analyses have shown that DB is effective for improving the exercise capacity and RR in patients with COPD. On the other hand, DB could deteriorate dyspnea in severe COPD patients. Moreover, the effect of DB on the QoL of patients with asthma still needs to be investigated further. DB may also be beneficial for reducing both physiological and psychological stress and could improve the respiratory function and respiratory muscle strength, but more firm evidence will be needed in the future. In addition, DB may help in treating eating disorders, chronic functional constipation, hypertension, migraine, and anxiety, as well as the QoL of patients with cancer and GERD and the cardiorespiratory fitness of patients with heart failure. Furthermore, DB could be a feasible and practical technique for patients with such disorders. Although further studies are needed to clarify the effects of DB on human health, DB can support clinical practice.[10]

2019 *Hopper Susan et al*; in their study **"Effectiveness of diaphragmatic breathing for reducing physiological and psychological stress in adults: a quantitative systematic review"** concluded that in conclusion, The evidence suggests that diaphragmatic breathing may decrease stress as measured by physiologic biomarkers, as well psychological self-report tools. Given the benefits of diaphragmatic breathing on stress reduction, ongoing research is needed to continue to establish the evidence-base for this self-administered, low-cost, non-pharmacologic intervention..[11]

2010 *Wellington P. et al*; in their study **"Diaphragmatic Breathing Training Program Improves Abdominal Motion During Natural Breathing in Patients With Chronic Obstructive Pulmonary Disease: A Randomized Controlled Trial**" concluded that DBTP for patients with chronic obstructive pulmonary disease induced increased diaphragm participation during natural breathing, resulting in an improvement in functional capacity.[12]

The current study is very unique, so we can do a lot in future. This study was conducted for a short period of time and with small sample size; future research involving long time period and larger sample size and comparing of two different intervention is also possible. The result of this study will help the physiotherapist to choose whether which intervention is best for lowering the vitals in overweight subjects.

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