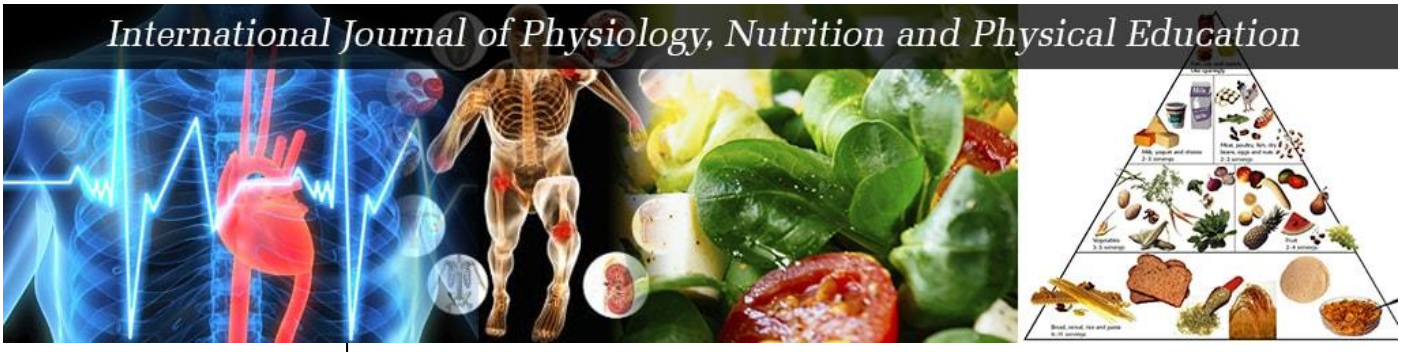

ISSN: 2456-0057
IJPNPE 2019; 4(1): 116-118

www.journalofsports.com
Received: 10-11-2018
Accepted: 12-12-2018

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A study on acute effect of deep breathing exercise on heart rate variability in healthy adults

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Abstract
Introduction: Deep breathing is a stress condition with sequential events of alteration in the cardiovascular, respiratory and nervous system.
Material and methods: Heart rate variability was calculated by using AD instrument powerlab labchart soft ware for five minutes, which is considered as the before values. Then subject was directed to inhale slowly up to the maximum of 5 seconds and exhale slowly up to the maximum of 5 sec. [i.e. at the rate of 6 breaths /min] for 5 minutes. This was followed by recording of the parameters which was considered as the after deep breathing exercise parameters. The data recorded was analysed by using SPSS 17th version by paired Student't' test.
Results: The mean values of heart rate before and after deep breathing exercise were 88.77 ± 8.67 and 88.94 ± 8.19 beats per minute respectively. The mean values of LF nu before and after deep breathing exercise were 50.42 ± 23.24and 51.1289 ± 22.93 respectively. The mean values of HF nu before and after deep breathing exercise were 48.10 ± 21.19 and 47.27 ± 21.28 respectively. The mean values of LF/HF ratio before and after deep breathing exercise were 1.81 ± 2.80 and 1.95± 2.89 respectively.
Conclusion: Even though there was an increase in LF nu, decrease in HF nu and increase in LF/HF ratio but the values were not statistically significant.

Keywords: Deep breathing exercise, heart rate variation

Introduction
Deep breathing is a stress condition with sequential events of alteration in the cardiovascular, respiratory and nervous system. It is basically adjustment of our body for the stressful condition where we will get the alteration in the different parameters [1].
The responses or the changes produced are due to stimulation of Baroreceptors. The Baroreceptors are stimulated in a different manner during the breathing cycle. During the onset and midparts of inhalation Baroreceptor stimulation produces minimal change in heart rate (HR). But when stimulation is performed during the final stage of inhalation produces significant changes [2]. The respiratory type of sinus arrhythmia results due to "spillover" of signals from the medullary respiratory center into the adjacent vasomotor center during inspiratory and expiratory cycles of respiration [3]. The spillover signals leads to alternate decrease and increase in the number of impulses transmitted through the sympathetic and vagus nerves to the heart [4].
Hyper ventilation at a steady rate will decrease the dead space and decreases alveolar carbon dioxide level and will increase the oxygen level. So, the net effect is decreased stimulation of central and peripheral chemo receptors. So it is possible to alter the heart rate by altering the respiration, as respiration is under both voluntary and involuntary control [5]. With this background we did this study to see the acute effects deep breathing exercise on Heart rate and RR interval.

Materials & methods
The present research study was approved by Institutional ethics committee. After briefing the details of research project, written consent was taken from the participants. Parameters were recorded in apparently healthy I MBBS students [n=72: female 49, male 23] at 4.30 PM., after their regular class hours. The parameters included were: Anthropometrical parameters [height in cms, weight in kg, BMI in kg/m2]; Cardiorespiratory parameters like Heart rate [bpm], RR

interval [in milliseconds], frequency domain parameters studied were low frequency in normalized units (LF nu), high frequency in normalized units (HFnu) and the ratio of LF to HF (LF/HF ratio). Inclusion criteria: Healthy Medical Students of age group 18 to 25 years were included in the study. Exclusion criteria: Students having a history of cough, asthma, respiratory symptoms, history of smoking, any chronic respiratory disease or systemic illness like diabetes or hypertension, dermatological problems or allergy, anomalies of spine and thoracic cage or any connective tissue and musculo -skeletal disorders, compromising the pulmonary functions, students under medication, not willing to participate voluntarily were excluded. Initially we connected the ECG leads with attachments for lead II. Then the Heart rate variability was calculated by using AD instrument powerlab labchart soft-ware for five minutes, which is considered as the before values. Then subject was directed to inhale slowly up to the maximum of 5 seconds and exhale slowly up to the maximum of 5 sec. [i.e. at the rate of 6 breaths /min] for 5 minutes. This was followed by recording of the parameters which was considered as the after deep breathing exercise parameters.

Data management and statistical analysis was done using SPSS 17th version for calculating & comparing the means both by paired & unpaired Student 't' test.

Results

The mean age of our study population for males 20.34 yrs and females 18.18 years. Height and Body mass index of males were comparatively same as that of females. The mean values of heart rate before and after deep breathing exercise were 88.77 ± 8.67 and 88.94 ± 8.19 beats per minute respectively. The mean values of LFnu, HFnu and LF/HF ratio before and after five minutes of slow deep breathing are tabulated in Table 2 and shown in Figure 1.

Even though there was an increase in LF nu, decrease in HF nu and increase in LF/HF ratio but the values were not statistically significant.

Table 1: Age (in years) comparison between study group and control group

Variable	Male [n=23]	Female [n=49]	P value
Age (Years)	20.34	18.18	0.190
Height (meter)	1.68	1.62	0.067
Weight (Kgs)	56.47	52.24	0.0299
Body mass index (Kg/Sq mtrs)	20.16	19.28	0.368

P value less than 0.05 is considered significant.

Table 2: comparison of various physiological parameters before & after deep breathing exercise among both genders (n=72).

Variable	Before deep breathing exercise (mean ± SD)	After deep breathing exercise (mean ± SD)	P value
RR interval (ms)	686.22 ± 71.15	684.57 ± 66.34	0.77
Heart rate (beats/min)	88.77 ± 8.67	88.94 ± 8.19	0.79
LF nu	50.42 ± 23.24	51.1289 ± 22.93	0.81
HF nu	48.10 ± 21.19	47.27 ± 21.28	0.75
LF/HF ratio	1.81 ± 2.80	1.95± 2.89	0.57

P value less than 0.05 is considered significant.

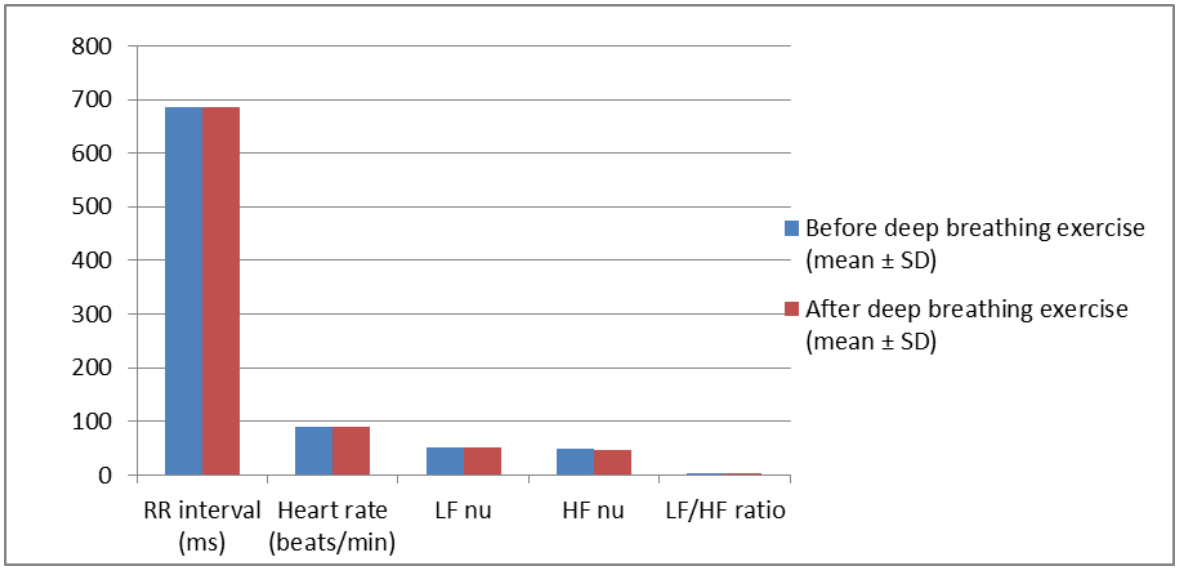

Fig 1: comparison of various physiological parameters before & after deep breathing exercise among both genders

Discussion

In our study, HRV analysis showed an increased LFnu, decreased HFnu and increased LF/HF ratio with after five minutes of deep breathing exercise but the values were not statistically significant. But the heart rate remained almost the same before and after slow deep breathing.

Sympathetic nervous system modulation of cardiovascular system can be made out by changes in LF nu with very little contribution by the parasympathetic system and vagal modulation can be made out by the values of HF nu. Sympathetic and parasympathetic balance can be made out by looking at the values of HF/LF ratio.

The changes in the Heart rate variability observed in our study is in accordance with the study done by Surekharani Chinagudi, *et al*. In their study they found significant increase in LFnu, decrease in HFnu and increase in LF/HF ratio [6]. Yet, another study also correlates with our findings which implies with insignificant decrease in respiratory rate, heart

rate, and mean arterial blood pressure in young adults of both sexes but breath holding time significantly increase after deep breathing exercise [5]. Likewise in a study done by Grunovas *et al*, heart rate (HR) was increased, ECG JT interval decreased at the onset of breath-holdings, the intervals ratio (JT/RR) increased and the ST-segment depression was not altered significantly [1]. In a study done by Tharion E *et al*, they found practice of deep slow breathing exercise improves heart rate variability in healthy subjects, without altering their cardiac autonomic balance [7]. According to a study decreased systolic and diastolic BP as well as heart rate of patients with essential hypertension was found after practicing of slow deep breathing exercise [8]. Likewise in a study done by Stancák A Jr *et al*, they found decreased respiratory rate and increased SBP and low-frequency blood pressure oscillations after Kapalabhati exercise [9].

Conclusions

The study was conducted on 72 subjects, among which Male [n=23], Female [n=49]. There was an increase in LF nu, decrease in HF nu and increase in LF/HF ratio but the values were not statistically significant.

Acknowledgment

We would like to thank the first year medical students of ESIC Medical College, Sanathnagar, Hyderabad.

References

1. Grunovas A, Trinkunas E. Cardiovascular Response to Breath-Holding Explained by Changes of the Indices and their Dynamic Interactions. Biol Syst Open Access [Internet]. 2015; 05(01):1-8. Available from: http://www.omicsgroup.org/journals/cardiovascular-response-to-breathholding-explained-by-changes-of-theindices-and-their-dynamic-interactions-2329-6577-1000152.php?aid=68603
2. Reyes Del Paso GA, Mu~ Noz Ladr on De Guevara C, Montoro CI. Rehabilitation Section Brief Research Report Breath-Holding During Exhalation as a Simple Manipulation to Reduce Pain Perception. 2015; 1835-41.
3. Barrett KE. Ganong' s Review of Medical Physiology, 2012, 752.
4. Riddall Wood J, Sandalls SA. The Circulation. The Lancet. 1837; 28:768.
5. Bindu C, Dharwadkar A, Dharwadkar A. Comparative study of the immediate effects of deep breathing exercise coupled with breath holding up to the breaking point, on respiratory rate, heart rate, mean arterial blood pressure and peak expiratory flow rate in young adults. Med Sci. 2013; 1(2):33-8.
6. Chinagudi S, Badami S, Herur A, Patil S, Shashikala G V, Ankad R. Immediate effect of short duration of slow deep breathing on heart rate variability in healthy adults. Natl J Physiol Pharm Pharmacol. 2014; 4(3):233-5.
7. Tharion E, Samuel P, Rajalakshmi R, Gnanasenthil G, Subramanian RK. Influence of deep breathing exercise on spontaneous respiratory rate and heart rate variability: A randomised controlled trial in healthy subjects. Indian J Physiol Pharmacol, 2012.
8. Mohamed LAE, Hanafy NF, El-Naby AGA. Effect of slow deep breathing exercise on blood pressure and heart rate among newly diagnosed patients with essential hypertension. J Educ Pract [Internet]. 2014; 5(4):36-45. Available from: http://www.iiste.org/Journals/index.php/JEP/article/view/10788
9. Stancák A Jr, Kuna M, Srinivasan, Vishnudevananda S DC. Kapalabhati- yogic cleansing exercise. I. Cardiovascular and respiratory changes. Homeost Heal Dis, 1991