

# Impact of Short-Term Training of Anulom Vilom (Alternative Nostril Breathing) on Respiratory Parameters

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**Abstract** The primary aim of this research was to determine the impact of short-term anulom vilom pranayama on respiratory parameters. The research was carried out on a sample of 40 university level girls of Department of Physical Education (T), Guru Nanak Dev University, Amritsar between the age group of 21-26 years (Mean  $\pm$ SD: age  $22.68 \pm 1.21$  yrs, height  $5.31 \pm 0.22$  ft, body mass  $60.72 \pm 2.98$  kg). The subjects from experimental group were subjected to a 4-weeks anulom vilom pranayama. Student t test for paired samples was utilized to compare the means of the pre-test and the post-test. Significant differences were found in Expiratory Reserve Volume (ERV), Inspiratory Reserve Volume (IRV), Vital Capacity (VC) and Inspiratory Capacity (IC) in experimental group and insignificant between-group differences were noted in Tidal Volume (VT) of university level girls. The result further indicates that no significant changes over that 4- week period were noted in the control group.

**Keywords:** anulom vilom pranayama, tidal volume, Expiratory Reserve Volume, Inspiratory Reserve Volume, Vital Capacity, Inspiratory Capacity

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## 1. Introduction

The Indian sage patanjali prescribed observance to eight limbs of yoga, aimed at quieting one's mind to achieve the union of mind, body and spirit- the ultimate aim of traditional yoga. Yoga aims through its practices to liberate a human being from the conflicts of duality (body-mind) and from the influences of the Gunas - the qualities of universal energy that are present in every human being [1]. It is now almost a proved fact based on various investigations that a prolonged continuous yogic practice and anulom vilom pranayam, relieve respiratory ailments like Bronchial Asthma, chronic Bronchitis, Bronchiectasis, and Ventilatory functions are much improved in them [2]. Anulom Vilom Pranayam is one of the best and easy most breathing exercises for complete purification of body as well as mind. It completely cures most of the internal body diseases without any medicine. If practiced regularly with devotion, anulom vilom not only intensifies the inner strength of body but also enhances the divine powers [3]. Breath is a dynamic bridge between the body and mind [4]. Breathing is not only an instinctive reflex to satisfy the need of the body for oxygen but it has been considered that consciously controlled breathing can be used as a technique for enhancing mental and physical powers [5]. Pranayama produce different physiological responses in healthy young volunteers [6,7]. The practice of pranayama

has been known to modulate cardiac autonomic status with an improvement in Cardio respiratory functions [8]. It is an art of controlling the breath. It involves taking in breath, retaining it then exhaling it [9,10]. Some studies have shown the various effects of Pranayama on young volunteers. The beneficial effects of six weeks practice of different pranayamas are well reported and have sound scientific basis [11]. Growing number of evidences have claimed that yoga practices increases longevity, [12] has therapeutic [13] and rehabilitative effects [14].

## 2. Material and Methods

### 2.1. Subjects

Forty, university level girls of Department of Physical Education (T), Guru Nanak Dev University, Amritsar between the age group of 21-26 years (Mean  $\pm$ SD: age  $22.68 \pm 1.21$  yrs, height  $5.31 \pm 0.22$  ft, body mass  $60.72 \pm 2.98$  kg) volunteered to participate in the study. The subjects were purposively assigned into two groups:

- Group-A: Experimental ( $n_1=20$ )
- Group-B: Control ( $n_2=20$ )

All the subjects were informed about the objective and protocol of the study. Distribution and demographics of subjects are brought forth in Table 1.

**Table 1. Distribution and Demographics of Subjects**

Sample Size (N=40)			
Variables	Total (N=40)	Experimental group (n <sub>1</sub> =20)	Control group (n <sub>2</sub> =20)
Age	22.68±1.21	20.20±1.11	23.15±1.14
Body Height	5.31±0.22	5.37±0.22	5.24±0.21
Body Mass	60.72±2.98	60.43±2.11	61.01±3.69

**2.2. Methodology**

This study is designed as a retrospective cross-sectional study. The subjects from Group-A: Experimental were subjected to a 4-weeks Anulom Vilom Pranayama. This lasted 4 weeks and consisted of daily sessions. The following respiratory parameters were measured 3 times with the use of a wet spirometer, the respective average values being used in the analysis:

- Tidal volume ( $V_T$ ) - The subject was asked to inhale a normal breath and then to place the mouthpiece of the spirometer between the lips and exhale normally into the spirometer.
- Expiratory Reserve Volume (ERV) - After exhaling normally and placing the mouthpiece between the lips, the subject exhaled forcefully all the additional air possible.
- Inspiratory Reserve Volume (IRV) – After inhaling normally and placing the mouthpiece between the lips, the subject inhaled forcefully all the additional air possible.
- Vital Capacity (VC) – Following a maximum inspiration, all the air possible was forcibly exhaled through the mouthpiece. The vital capacity is the sum of the three primary volumes that can be directly exchanged with the atmosphere ( $VC=IRV + V_T + ERV$ ).
- Inspiratory Capacity (IC) - After exhaling normally, breathes in as deeply as possible, place the mouthpiece and exhale normally. The inspiratory capacity is the sum of the inspiratory reserve volume and the tidal volume ( $IC=IRV + V_T$ ).



**Figure 2.** Subjects Performing Expiratory Reserve Volume (ERV)



**Figure 3.** Subjects Performing Inspiratory Reserve Volume (IRV)



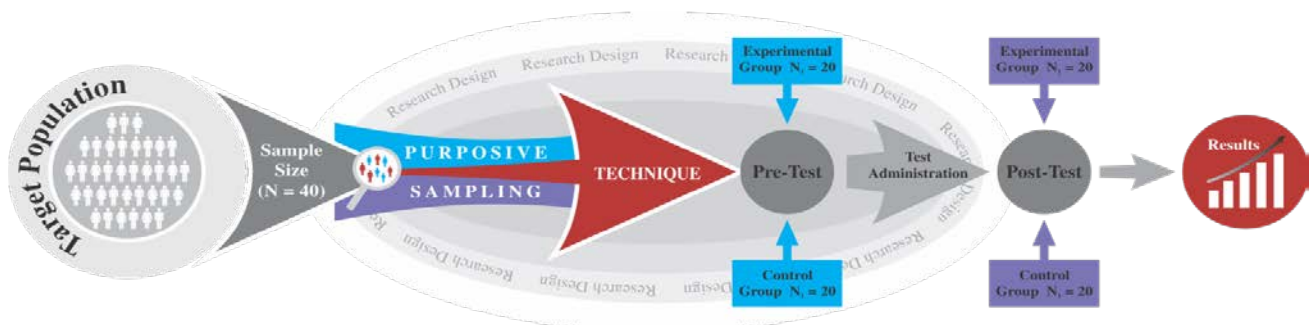
**Figure 4.** Subjects Performing Vital capacity (VC)



**Figure 1.** Subjects Performing Tidal volume ( $V_T$ )



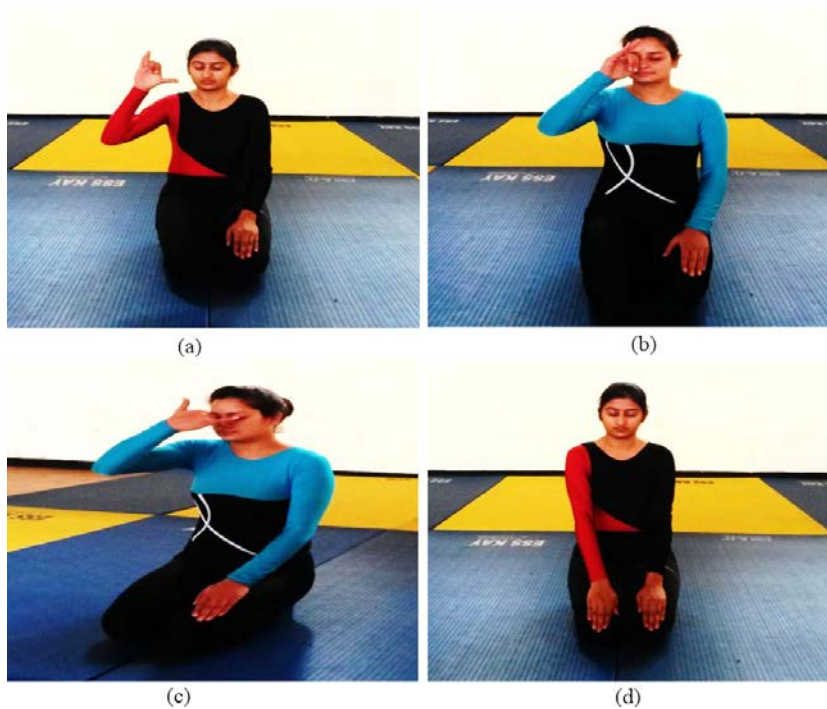
**Figure 5.** Subjects Performing Inspiratory capacity (IC)



**Figure 6.** Study Design

**Table 2. Experimental Treatment**

4-Weeks Anulom Vilom Pranayama Training			
Weeks	Schedule	Time	Duration
1 <sup>st</sup> Week	Preliminary Yogic Exercises	5 Minute	20 Minute
	Practice of Anulom Vilom Pranayama (9 Rounds X 1 Set)	10 Minute	
	Relaxation Posture	5 Minute	
2 <sup>nd</sup> Week	Preliminary Yogic Exercises	5 Minute	25 Minute
	Practice of Anulom Vilom Pranayama (9 Rounds X 2 Set)	15 Minute	
	Relaxation Posture	5 Minute	
3 <sup>rd</sup> Week	Preliminary Yogic Exercises	5 Minute	30 Minute
	Practice of Anulom Vilom Pranayama (9 Rounds X 3 Set)	20 Minute	
	Relaxation Posture	5 Minute	
4 <sup>rd</sup> Week	Preliminary Yogic Exercises	5 Minute	35 Minute
	Practice of Anulom Vilom Pranayama (9 Rounds X 4 Set)	25 Minute	
	Relaxation Posture	5 Minute	



**Figure 7.** Subject Performing Anulom Vilom Pranayama

### 3. Statistical Analyses

Statistical analyses were performed using the Statistical Package for the Social Sciences for Windows version 16.0 software (SPSS Inc., Chicago, IL). Data is expressed as the mean ± SD. Student t test for paired samples was utilized to compare the means of the pre-test and the post-test. The level of significance was set at 0.05.

### 4. Results

The results of Respiratory Parameters (i.e., Tidal Volume (V<sub>T</sub>), Expiratory Reserve Volume (ERV), Inspiratory Reserve Volume (IRV), Vital Capacity (VC) and Inspiratory Capacity (IC) of university level girls are brought forth in table-3-7.

**Table 3. Descriptive Statistics (Mean & Standard Deviation) and Paired Sample t-test of Tidal Volume (V<sub>T</sub>) of University Level Girls**

Group	Number	Tidal Volume (V <sub>T</sub> )Tidal		Standard Error of the Mean	t-value	p-value
		Mean	Standard Deviation			
Experiment (Pre-test)	20	353.85	8.41	1.88	0.9702	0.3441
Experimental (Post-test)		353.20	9.80	2.19		
Control (Pre-test)	20	358.00	18.39	4.11	0.6158	0.5453
Control (Post-test)		360.15	24.26	5.42		

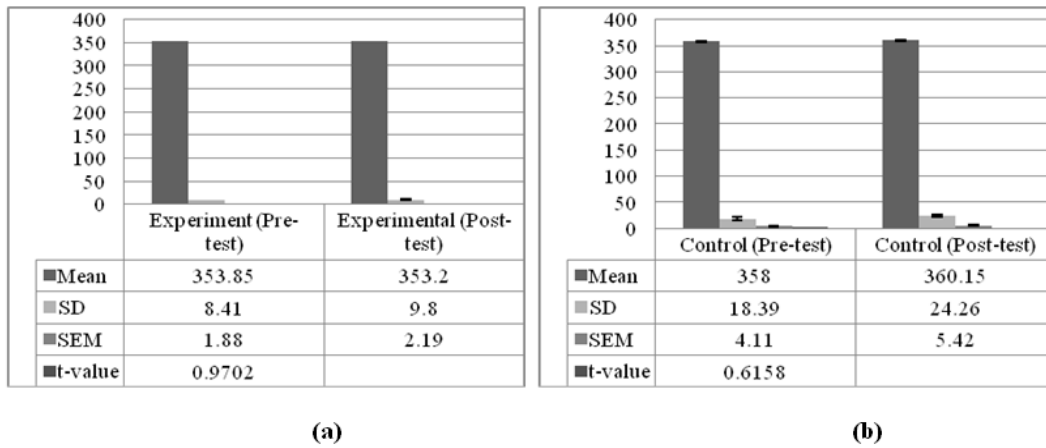
#### 4.1. Tidal Volume (V<sub>T</sub>)

The results of Respiratory Parameters in group (Experimental) and group (Control) are shown in Table-3. The Mean and Standard Deviation values of Tidal Volume (V<sub>T</sub>) of pre-test and post-test of experimental group was

353.85 ± 8.41 and 353.20 ± 9.80 respectively. However, the Mean and Standard Deviation values of Tidal Volume (V<sub>T</sub>) of pre-test and post-test of control group were 358.00 ± 18.39 and 360.15 ± 24.26. The t-value in case of experimental group was 0.9702 and for control group it was 0.6158.

Insignificant between-group differences were noted in Tidal Volume ( $V_T$ ) since the calculated value of ( $t=0.9702$ )

is less than tabulated value of  $t_{05} (19) = 2.09$  for the selected degree of freedom and level of significance.



**Figure 8.** Descriptive Statistics (Mean & Standard Deviation) and Standard Error of the Mean of Tidal Volume ( $V_T$ ) of (a) Experimental (Pre & Post) and (b) Control (Pre & Post) group of University Level Girls

**Table 4. Descriptive Statistics (Mean & Standard Deviation) and Paired Sample t-test of Expiratory Reserve Volume (ERV) of University Level Girls**

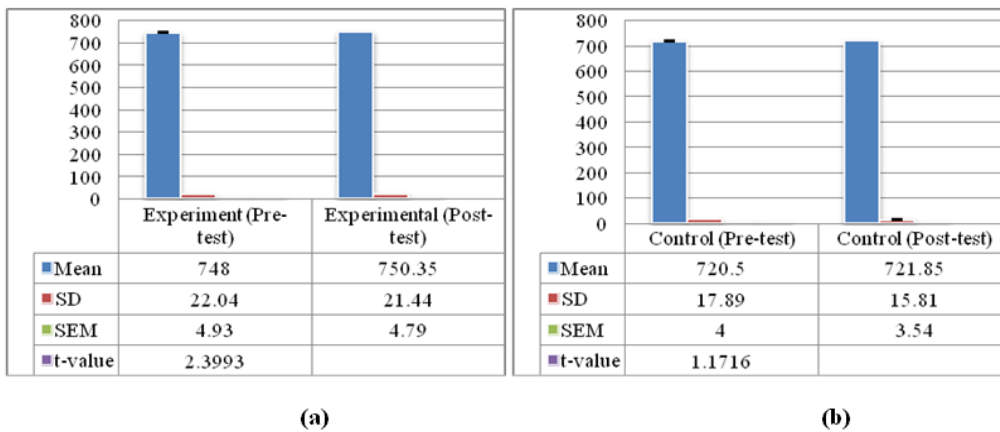
Expiratory Reserve Volume (ERV)						
Group	Number	Mean	Standard Deviation	Standard Error of the Mean	t-value	p-value
Experiment (Pre-test)	20	748.00	22.04	4.93	2.3993*	0.0268
Experimental (Post-test)		750.35	21.44	4.79		
Control (Pre-test)	20	720.50	17.89	4.00	1.1716	0.2558
Control (Post-test)		721.85	15.81	3.54		

**4.2. Expiratory Reserve Volume (ERV)**

The Mean and Standard Deviation values of Expiratory Reserve Volume (ERV) of pre-test and post-test of experimental group was  $748.00 \pm 22.04$  and  $750.35 \pm 21.44$  respectively. However, the Mean and Standard Deviation values of Expiratory Reserve Volume (ERV) of pre-test and post-test of control group were  $720.50 \pm$

$17.89$  and  $721.85 \pm 15.81$ . The t-value in case of experimental group was  $2.3993^*$  and for control group it was  $1.1716$ .

Significant between-group differences were noted in Expiratory Reserve Volume (ERV) since the calculated value of ( $t=2.3993^*$ ) is greater than tabulated value of  $t_{05} (19) = 2.09$  for the selected degree of freedom and level of significance.



**Figure 9.** Descriptive Statistics (Mean & Standard Deviation) and Standard Error of the Mean of Expiratory Reserve Volume (ERV) of (a) Experimental (Pre & Post) and (b) Control (Pre & Post) group of University Level Girls

**Table 5. Descriptive Statistics (Mean & Standard Deviation) and Paired Sample t-test of Inspiratory Reserve Volume (IRV) of University Level Girls**

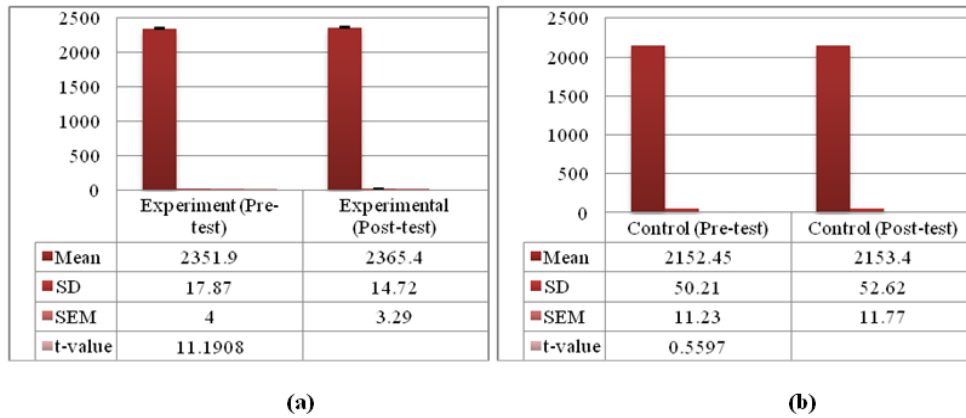
Inspiratory Reserve Volume (IRV)						
Group	Number	Mean	Standard Deviation	Standard Error of the Mean	t-value	p-value
Experiment (Pre-test)	20	2351.90	17.87	4.00	11.1908*	0.0001
Experimental (Post-test)		2365.40	14.72	3.29		
Control (Pre-test)	20	2152.45	50.21	11.23	0.5597	0.5822
Control (Post-test)		2153.40	52.62	11.77		

**4.3. Inspiratory Reserve Volume (IRV)**

The Mean and Standard Deviation values of Inspiratory Reserve Volume (IRV) of pre-test and post-test of experimental group was  $2351.90 \pm 17.87$  and  $2365.40 \pm$

14.72 respectively. However, the Mean and Standard Deviation values of Inspiratory Reserve Volume (IRV) of pre-test and post-test of control group were  $2152.45 \pm 50.21$  and  $2153.40 \pm 52.62$ . The t-value in case of experimental group was 11.1908\* and for control group it was 0.5597.

Significant between-group differences were noted in Inspiratory Reserve Volume (IRV) since the calculated value of ( $t=11.1908^*$ ) is greater than tabulated value of  $t_{0.05} (19) = 2.09$  for the selected degree of freedom and level of significance.



**Figure 10.** Descriptive Statistics (Mean & Standard Deviation) and Standard Error of the Mean of Inspiratory Reserve Volume (IRV) of (a) Experimental (Pre & Post) and (b) Control (Pre & Post) group of University Level Girls

**Table 6. Descriptive Statistics (Mean & Standard Deviation) and Paired Sample t-test of Vital Capacity (VC) of University Level Girls**

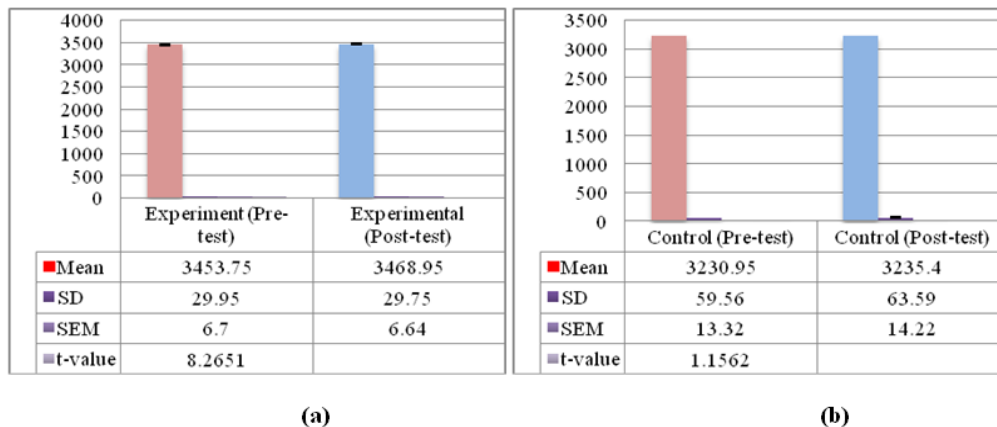
Vital Capacity (VC)						
Group	Number	Mean	Standard Deviation	Standard Error of the Mean	t-value	p-value
Experiment (Pre-test)	20	3453.75	29.95	6.70	8.2651*	0.0001
Experimental (Post-test)		3468.95	29.75	6.64		
Control (Pre-test)	20	3230.95	59.56	13.32	1.1562	0.2619
Control (Post-test)		3235.40	63.59	14.22		

The t-value in case of experimental group was 8.2651\* and for control group it was 1.1562.

#### 4.4. Vital Capacity (VC)

The Mean and Standard Deviation values of Vital Capacity (VC) of pre-test and post-test of experimental group was  $3453.75 \pm 29.95$  and  $3468.95 \pm 29.75$  respectively. However, the Mean and Standard Deviation values of Vital Capacity (VC) of pre-test and post-test of control group were  $3230.95 \pm 59.56$  and  $3235.40 \pm 63.59$ .

Significant between-group differences were noted in Vital Capacity (VC) since the calculated value of ( $t=8.2651^*$ ) is greater than tabulated value of  $t_{0.05} (19) = 2.09$  for the selected degree of freedom and level of significance.



**Figure 11.** Descriptive Statistics (Mean & Standard Deviation) and Standard Error of the Mean of Vital Capacity (VC) of (a) Experimental (Pre & Post) and (b) Control (Pre & Post) group of University Level Girls

**Table 7. Descriptive Statistics (Mean & Standard Deviation) and Paired Sample t-test of Inspiratory Capacity (IC) of University Level Girls**

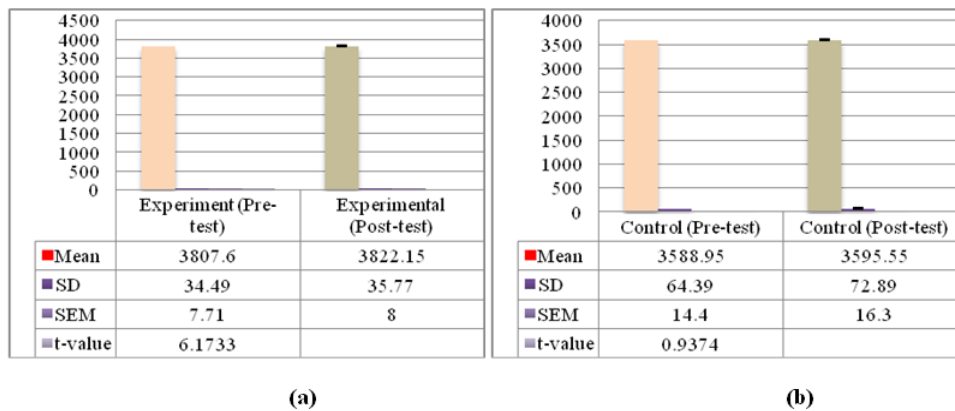
Inspiratory Capacity (IC)						
Group	Number	Mean	Standard Deviation	Standard Error of the Mean	t-value	p-value
Experiment (Pre-test)	20	3807.60	34.49	7.71	6.1733*	0.0001
Experimental (Post-test)		3822.15	35.77	8.00		
Control (Pre-test)	20	3588.95	64.39	14.40	0.9374	0.3603
Control (Post-test)		3595.55	72.89	16.30		

The Mean and Standard Deviation values of Inspiratory Capacity (IC) of pre-test and post-test of experimental

#### 4.5. Inspiratory Capacity (IC)

group was  $3807.60 \pm 34.49$  and  $3822.15 \pm 35.77$  respectively. However, the Mean and Standard Deviation values of Inspiratory Capacity (IC) of pre-test and post-test of control group were  $3588.95 \pm 64.39$  and  $3595.55 \pm 72.89$ . The t-value in case of experimental group was 6.1733\* and for control group it was 0.9374.

Significant between-group differences were noted in Inspiratory Capacity (IC) since the calculated value of ( $t=6.1733^*$ ) is greater than tabulated value of  $t_{0.05} (19) = 2.09$  for the selected degree of freedom and level of significance.



**Figure 12.** Descriptive Statistics (Mean & Standard Deviation) and Standard Error of the Mean of Inspiratory Capacity (IC) of (a) Experimental (Pre & Post) and (b) Control (Pre & Post) group of University Level Girls

## 5. Conclusion

Significant differences were found in Expiratory Reserve Volume (ERV), Inspiratory Reserve Volume (IRV), Vital Capacity (VC) and Inspiratory Capacity (IC) in experimental group and insignificant between-group differences were noted in Tidal Volume ( $V_T$ ) of university level girls. The result further indicates that no significant changes over that 4- week period were noted in the control group.

## References

- [1] James A Raub. Psychophysiological. Effects of Hatha yoga on musculoskeletal and cardiopulmonary function. A Literature Review. *Journal of Alternative and complementary medicine*. 8 (6), 797-812. 2002.
- [2] Yadav R.K., & Das, S. Effect of yogic practice on pulmonary functions in young females. *Indian Journal of Physiology and Pharmacology*. 45 (4), 493-496. 2001.
- [3] Chavhan, D.B. The Effect of Anulom-Vilom and Kapalbhathi Pranayama on Positive Attitude in School Going Children. *Edubeam Multidisciplinary- Online Research Journal*. VII, 1, 1-8. 2013.
- [4] Bijilani, R.L. The Yogic Practices: Asanas, Pranayamas and Kriyas. Understanding medical physiology. 3<sup>rd</sup> edition. *Jaypee Brothers Medical Publishers, New Delhi, India*. 883-889. 2004.
- [5] Gharote, M.L. Pranayama – the science of breath theory and guidelines for practice. 1st edition *Pune*. 9. 2003.
- [6] Madanmohan. Effect of slow and fast pranayamas on reaction time and cardiorespiratory variables. *Indian J Physiol Pharmacol*. 49 (3), 313-18. 2005.
- [7] Shivraj, P., Manaspure, A.F., & Damodara, G. Effect of selected breathing techniques on respiratory rate and breath holding time in healthy adults. *IJABPT*. 2 (3), 25-29. 2001.
- [8] Subalakshmi, N.K., Saxena, S.K., Urmimala., Urban., & D'Souza. Immediate effect of Nadi-Shodhana pranayama on some selected parameters of cardiovascular, pulmonary, and higher functions of brain. *TJPS*. 18 (2), 10-16. 2005.
- [9] Sri Paramhansa Yogananda. God Talks with Arjuna. The Bhagavad Gita, Royal Science of God-Realization. The immortal dialogue between soul and spirit. A new translation and commentary, chapter IV verse 29. *YSS Publication*. 496-507. 2002.
- [10] Swami Ramdev. Chapter: *Hatha yoga and Satkarma*. In: Yoga sadhana and Yog chikitsa rahasya. Divya prakashan. Divya yog mandir (trust). Kanakhal. Haridwar, 114-20. 2004.
- [11] Joshi, L.N., Joshi, V.D., & Gokhale, L.V. Effect of short term pranayama on breathing rate and ventilatory functions of lungs. *Indian J Physiol Pharmacol*. 36 (2), 105-8. 1992.
- [12] Bharshankar, J.R., Bharshanker, R.N., Deshpande, V.N., Kaore, S.B., & Gosavi, G.B. Effect of yoga on cardiovascular system in subjects above 40 years. *Indian J Physiol Pharmacol*. 47 (2), 202-06. 2003.
- [13] Khanam, A.A., Sachdev, V., Guleria, R., & Deepak, K.K. Study of pulmonary and autonomic functions of asthma patients after yoga training. *Indian J Physiol Pharmacol*. 40 (4), 318-24. 1996.
- [14] Katiyar, S.K., & Bihari, S. Role of pranayama in rehabilitation of COPD patients – a randomized controlled study. *Indian J Allergy Asthma Immunol*. 20 (2), 98-104. 2006.