
Exploring the Therapeutic Effects of Bhastrika Pranayama on Hematological Parameters: An Ancient Practice with Modern Relevance

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Abstract: The purpose of this study was to investigate the effects of bhastrika pranayama on hematological parameters. Thirty Two, university level girls of Department of Physical Education (T), Guru Nanak Dev University, Amritsar between the age group of 19-25 years (Mean \pm SD: age 21.718 \pm 1.887 years, height 5.581 \pm 2.235 feet's, body mass 68.612 \pm 4.209 kg) volunteered to participate in the study. The subjects from Group-A: Experimental were subjected to a 4-week bhastrika pranayama. Student t test for paired samples was utilized to compare the means of the pre-test and the post-test. No significant differences were found in Hemoglobin (Hb), Total Cholesterol (TC), Low Density Lipoprotein Cholesterol (LDL-Cholesterol), High Density Lipoprotein Cholesterol (HDL-Cholesterol) and Triglycerides (TG) among University Level Girls.

Keywords: Bhastrika Pranayama, Hemoglobin, Total Cholesterol, Low Density Lipoprotein Cholesterol, High Density Lipoprotein Cholesterol, Triglycerides

1. Introduction

The ancient research in relation to attaining purification of human body, mind, and soul is commonly brought under the umbrella term of "Pranayama". Speaking etymologically, "Pranayama" is a Sanskrit word comes from the roots prana (universal energy), and yama (to control). Thus, Pranayama is used to control, cultivate, and modify the Prana in the body. Its essence lies in the modification of our normal process of breathing. Pranayama entails of modifications of the breathing process which we bring about deliberately and consciously. The beneficial effects of different pranayama are well reported and has sound scientific basis (1, 2). The effect of different pranayamas on healthy (3) and diseased people (4, 5, 6) has been well studied and they are known to affect the cardiopulmonary activities and autonomic functions. Growing number of evidences have claimed that yoga practices increases longevity, (7) has therapeutic (8) and rehabilitative effects (9). There are various techniques of pranayama but we have applied the technique of Bhastrika

Pranayama on the subjects.

2. Material and Methods

2.1. Subjects

Thirty Two, university level girls of Department of Physical Education (T), Guru Nanak Dev University, Amritsar between the age group of 19-25 years (Mean \pm SD: age 21.718 \pm 1.887 years, height 5.581 \pm 2.235 feet's, body mass 68.612 \pm 4.209kg) volunteered to participate in the study. The subjects were purposively assigned into two groups:

- Group-A: Experimental (n1=16)
- Group-B: Control (n2=16)

All the subjects were informed about the objective and protocol of the study. Distribution and demographics of subjects are presented in (Table-1).

Table 1. Distribution and Demographics of Subjects.

Sample Size (N=32)			
Variables	Total (N=32)	Experimental group (n1=16)	Control group (n2=16)
Age	21.718±1.887	21.375±1.962	22.062±1.806
Body Height	5.581±2.235	5.631±2.386	5.531±2.023
Body Mass	68.612±4.209	69.131±3.673	68.093±4.750

2.2. Methodology

This study is designed as a retrospective cross-sectional study. The subjects from Group-A: Experimental were subjected to a 4-week Bhastrika Pranayama. This lasted 4 weeks and consisted of daily sessions. Hemoglobin was determined in the blood samples of all the subjects with the use of a hematology analyzer (Celldyne model 3500). Blood

samples (10 ml) for the determination of lipid profiles were obtained. All of biochemical tests have been done with serum samples. Lipid parameters (Triglyceride; Cholesterol; Low-density lipoprotein; High-density lipoprotein) were measured using Boehringer Mannheim kits and Clinilab, BioMerieux analyser as used by Jastrzebska et al. (10).

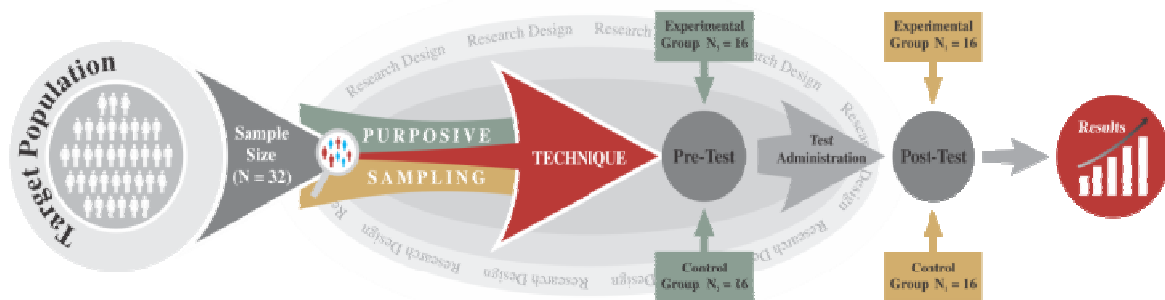


Figure 1. Study Design.

Table 2. Experimental Treatment.

4-Weeks Bhastrika Pranayama Training			
Weeks	Schedule	Time	Duration
1 st Week	Preliminary Yogic Exercises	5 Minute	20 Minute
	Practice of Anuloma Viloma Pranayama (9 Rounds X 1 Set)	10 Minute	
	Relaxation Posture	5 Minute	
2 nd Week	Preliminary Yogic Exercises	5 Minute	25 Minute
	Practice of Anuloma Viloma Pranayama (9 Rounds X 2 Set)	15 Minute	
	Relaxation Posture	5 Minute	
3 rd Week	Preliminary Yogic Exercises	5 Minute	30 Minute
	Practice of Anuloma Viloma Pranayama (9 Rounds X 3 Set)	20 Minute	
	Relaxation Posture	5 Minute	
4 th Week	Preliminary Yogic Exercises	5 Minute	35 Minute
	Practice of Anuloma Viloma Pranayama (9 Rounds X 4 Set)	25 Minute	
	Relaxation Posture	5 Minute	

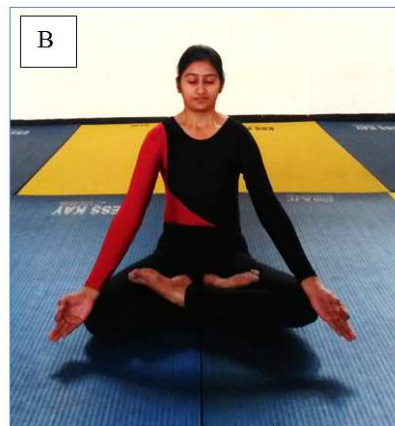




Figure 2. Subject Performing Bhastrika Pranayama .



Figure 3. Biochemical tests with serum samples.

3. Statistical Analysis

Statistical analyses were performed using the Statistical Package for the Social Sciences for Windows version 10.0 software (SPSS Inc., Chicago, IL). Data is expressed as the mean \pm SD. Student t test for paired samples was utilized to compare the means of the pre-test and the post-test. To test the hypothesis, the level of significance was set at 0.05.

4. Results

The results of Hematological Parameter (i.e., Hemoglobin (Hb), Total Cholesterol (TC), Low Density Lipoprotein Cholesterol (LDL-Cholesterol), High Density Lipoprotein Cholesterol (HDL-Cholesterol) and Triglycerides (TG) in university level girls are presented in (Table-3):

Table 3. Descriptive Statistics (Mean & Standard Deviation) and Paired Sample t-test of Hematological Parameter (i.e., Hemoglobin (Hb), Total Cholesterol (TC), Low Density Lipoprotein Cholesterol (LDL-Cholesterol), High Density Lipoprotein Cholesterol (HDL-Cholesterol) and Triglycerides (TG) of University Level Girls.

Hemoglobin (Hb)						
Group	Number	Mean	Standard Deviation	Standard Error of the Mean	t-value	p-value
Experiment (Pre-test)	16	13.225	0.606	0.151	1.567	0.138
Experimental (Post-test)	16	13.262	0.612	0.153		
Control (Pre-test)	16	13.043	0.654	1.321	1.321	0.206
Control (Post-test)	16	13.075	0.610	0.206		
Total Cholesterol (TC)						
Experiment (Pre-test)	16	154.981	10.414	2.603	1.000	0.333
Experimental (Post-test)	16	155.006	10.416	2.604		
Control (Pre-test)	16	155.862	11.555	2.888	0.488	0.632
Control (Post-test)	16	155.875	11.577	2.894		
Low Density Lipoprotein Cholesterol (LDL-Cholesterol)						
Experiment (Pre-test)	16	114.668	6.779	1.695	0.764	0.456

Hemoglobin (Hb)						
Group	Number	Mean	Standard Deviation	Standard Error of the Mean	t-value	p-value
Experimental (Post-test)	16	114.687	6.769	1.692	0.222	0.826
Control (Pre-test)	16	113.081	6.266	1.566		
Control (Post-test)	16	113.087	6.327	1.582		
High Density Lipoprotein Cholesterol (HDL-Cholesterol)						
Experiment (Pre-test)	16	67.850	3.559	0.889	0.939	0.362
Experimental (Post-test)	16	67.875	3.602	0.900		
Control (Pre-test)	16	70.531	5.389	1.347	0.251	0.805
Control (Post-test)	16	70.537	5.392	1.342		
Triglycerides (TG)						
Experiment (Pre-test)	16	135.331	7.651	1.912	2.070	0.056
Experimental (Post-test)	16	135.381	7.649	1.912		
Control (Pre-test)	16	130.900	6.816	1.704	1.074	0.299
Control (Post-test)	16	130.925	6.852	1.713		

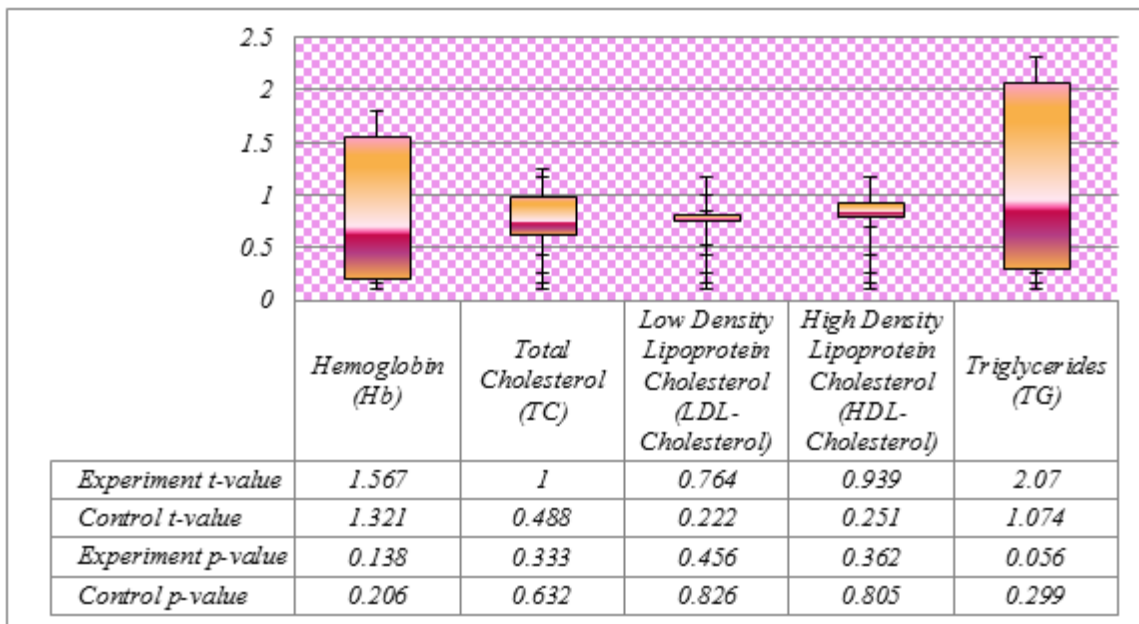


Figure 4. t-value and p-value for the Experimental (Pre-Test & Post-Test) and Control (Pre-Test & Post-Test) Groups Scores of Hematological Parameter.

4.1. Hemoglobin (Hb)

The results of Hematological Parameter in group (Experimental) and group (Control) are shown in (Table-3). The Mean and Standard Deviation values of Hemoglobin (Hb) of pre-test and post-test of experimental group was 13.225 ± 0.606 and 13.262 ± 0.612 respectively. However, the Mean and Standard Deviation values of Hemoglobin (Hb) of pre-test and post-test of control group were 13.043 ± 0.654 and 13.1075 ± 0.610 . The t-value in case of experimental group was 1.567 and for control group it was 1.321.

No significant between-group differences were noted in Hemoglobin (Hb) since the calculated value of ($t=1.567$) is smaller than tabulated value of $t_{.05}(15) = 2.13$ for the selected degree of freedom and level of significance. The data does suggest that the differences between pre-test and post-test of Hemoglobin (Hb) in experimental and control group are insignificant.

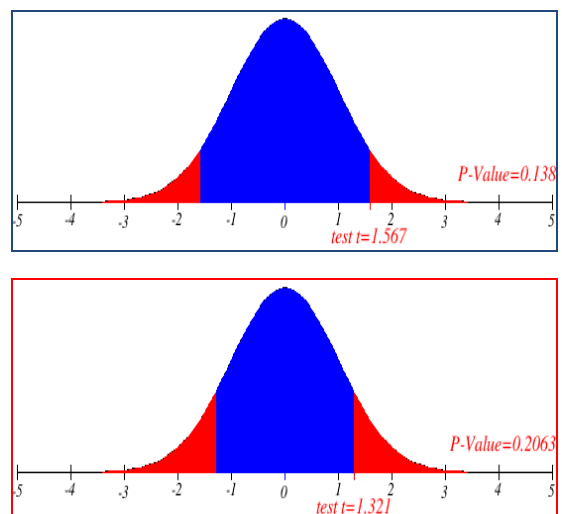


Figure 5. t-test and p-value for the Experimental (Pre-Test & Post-Test) and Control (Pre-Test & Post-Test) Groups on the parameter Hemoglobin (Hb).

4.2. Total Cholesterol (TC)

The Mean and Standard Deviation values of Total Cholesterol (TC) of pre-test and post-test of experimental group was 154.981 ± 10.414 and 155.006 ± 10.416 respectively. However, the Mean and Standard Deviation values of Total Cholesterol (TC) of pre-test and post-test of control group were 155.862 ± 11.555 and 155.875 ± 11.577 . The t-value in case of experimental group was 1.000 and for control group it was 0.488.

No significant between-group differences were noted in Total Cholesterol (TC) since the calculated value of ($t=1.000$) is smaller than tabulated value of $t_{.05}(15) = 2.13$ for the selected degree of freedom and level of significance. The data does suggest that the differences between pre-test and post-test of Total Cholesterol (TC) in experimental and control group are insignificant.

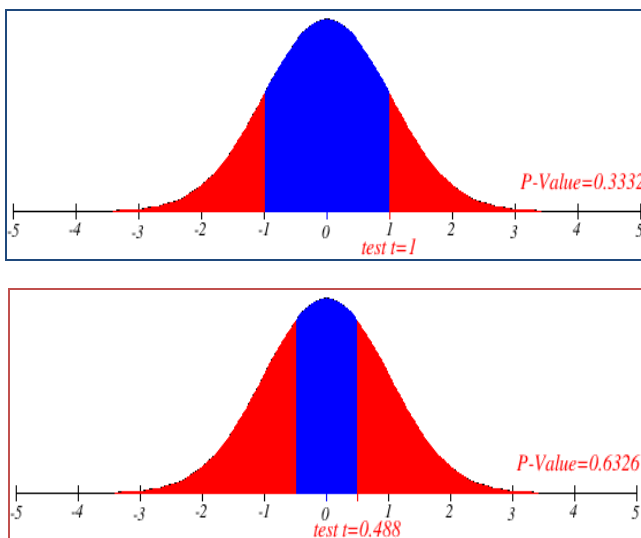


Figure 6. t-test and p-value for the Experimental (Pre-Test & Post-Test) and Control (Pre-Test & Post-Test) Groups on the parameter Total Cholesterol (TC).

4.3. Low Density Lipoprotein Cholesterol (LDL-Cholesterol)

The Mean and Standard Deviation values of Low Density Lipoprotein Cholesterol (LDL-Cholesterol) of pre-test and post-test of experimental group was 114.668 ± 6.779 and 114.687 ± 6.769 respectively. However, the Mean and Standard Deviation values of Low Density Lipoprotein Cholesterol (LDL-Cholesterol) of pre-test and post-test of control group were 113.081 ± 6.266 and 113.087 ± 6.327 . The t-value in case of experimental group was 0.764 and for control group it was 0.222.

No significant between-group differences were noted in Low Density Lipoprotein Cholesterol (LDL-Cholesterol) since the calculated value of ($t=0.764$) is smaller than tabulated value of $t_{.05}(15) = 2.13$ for the selected degree of freedom and level of significance. The data does suggest that the differences between pre-test and post-test of in Low Density Lipoprotein Cholesterol (LDL-Cholesterol) in experimental and control group are insignificant.

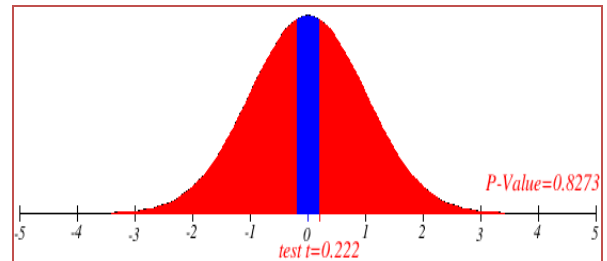
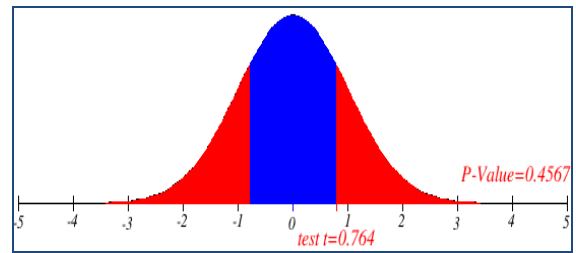


Figure 7. t-test and p-value for the Experimental (Pre-Test & Post-Test) and Control (Pre-Test & Post-Test) Groups on the parameter Low Density Lipoprotein Cholesterol (LDL-Cholesterol).

4.4. High Density Lipoprotein Cholesterol (HDL-Cholesterol)

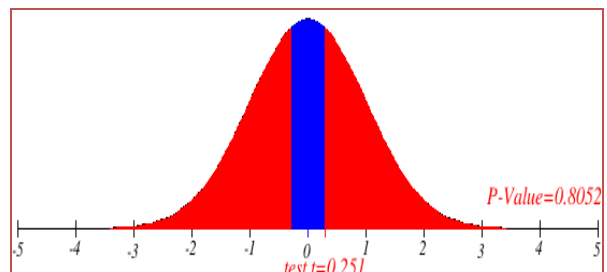
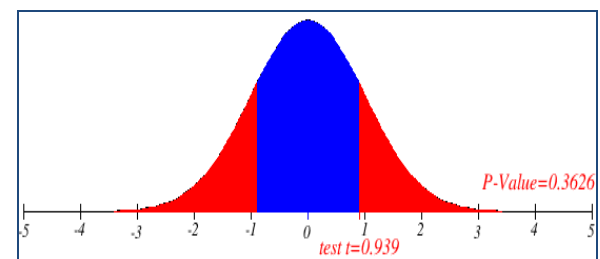


Figure 8. t-test and p-value for the Experimental (Pre-Test & Post-Test) and Control (Pre-Test & Post-Test) Groups on the parameter High Density Lipoprotein Cholesterol (HDL-Cholesterol).

The Mean and Standard Deviation values of High Density Lipoprotein Cholesterol (HDL-Cholesterol) of pre-test and post-test of experimental group was 67.850 ± 3.559 and 67.875 ± 3.602 respectively. However, the Mean and Standard Deviation values of High Density Lipoprotein Cholesterol (HDL-Cholesterol) of pre-test and post-test of control group were 70.531 ± 5.389 and 70.537 ± 5.392 . The t-value in case of experimental group was 0.939 and for control group it was 0.251.

No significant between-group differences were noted in High Density Lipoprotein Cholesterol (HDL-Cholesterol) since the calculated value of ($t=0.939$) is smaller than tabulated value of $t_{.05}(15) = 2.13$ for the selected degree of freedom

and level of significance. The data does suggest that the differences between pre-test and post-test of High Density Lipoprotein Cholesterol (HDL-Cholesterol) in experimental and control group are insignificant.

4.5. Triglycerides (TG)

The Mean and Standard Deviation values of Triglycerides (TG) of pre-test and post-test of experimental group was 135.331 ± 7.651 and 135.381 ± 7.649 respectively. However, the Mean and Standard Deviation values of Triglycerides (TG) of pre-test and post-test of control group were 130.900 ± 6.816 and 130.925 ± 6.852 . The t-value in case of experimental group was 2.070 and for control group it was 1.074

No significant between-group differences were noted in Triglycerides (TG) since the calculated value of ($t=2.070$) is smaller than tabulated value of $t_{.05} (15) = 2.13$ for the selected degree of freedom and level of significance. The data does suggest that the differences between pre-test and post-test of Triglycerides (TG) in experimental and control group are insignificant.

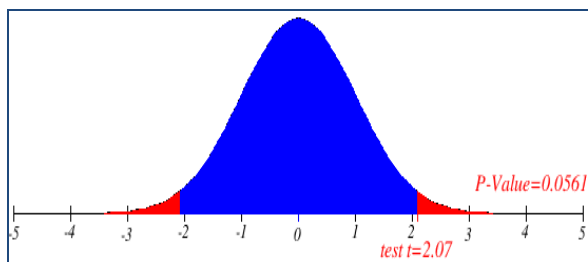


Figure 9. t-test and p-value for the Experimental (Pre-Test & Post-Test) and Control (Pre-Test & Post-Test) Groups on the parameter Triglycerides (TG).

5. Conclusions

This paper seeks to explore the effects of Bhastrika pranayama on hematological parameters of university level

girls. No significant differences were found in Hemoglobin (Hb), Total Cholesterol (TC), Low Density Lipoprotein Cholesterol (LDL-Cholesterol), High Density Lipoprotein Cholesterol (HDL-Cholesterol) and Triglycerides (TG) of University Level Girls.

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