Research Paper

Volume : 4 | Issue : 10 | October 2015 • ISSN No 2277 - 8179

Effect of Pranyama on Phsyiological Variables

Yogic Science

KEYWORDS : Pranayama, Anaerobic Power, Vital Capacity, Resting Heart Rate, Resting Respiratory Rate, Total Body Fat Percentage, Lean Body Weight, Positive Breath Holding Capacity, Negative Breath Holding Capacity

Dr. Sakti Ranjan Mishra Former Principal, At: Water Works Road, Puri, 752 002.:

Abhijit Ghoshal Ph.D. Scholar

Dr. T.R.Patanaik Sports Officer, NIIT, Rourkela

ABSTRACT

The purpose of this study was to find out the effect of Bhastrika and Ujjayi Pranayama on selected physiological variables among engineering students. For the purpose eight physiological variables such as Anaerobic Power, Vital Capacity, Resting Heart Rate, Resting Respiratory Rate, Total Body Fat Percentage, Lean Body Weight, Positive Breath Holding Capacity, Negative Breath Holding Capacity were selected. The Pranayama Training programme was conducted for six days a week for ten weeks. The analysis of data revealed that the two experimental groups viz., Bhastrika Pranayama and Ujjayi Pranayama showed significant gains in performance of subjects in five physiological variables after administration of yogic exercise for a duration of 10 weeks.

The earliest reference to Pranayama is found in the Vedic literature, which extends from approximately 1500 B.C. backward into a hoary past. The purpose of this study was to find out the effect of Bhastrika and Ujjayi Pranayama on selected physiological variables among engineering students. **Ninety students, with age ranging between 17 to 22 years and studying in Bachelor of Engineering were randomly selected as subjects from Kalna Polytechnique College, Burdwan, W.B. All subjects were, then, randomly assigned to two experimental groups (A and B) and one control group (C), each consisting of 30 subjects. The experimental treatments were also assigned to the groups at random. The groups A and B were treated as experimental groups and were given training programmes of Bhastrika Pranayama and Ujjayi Pranayama respectively. The group – C served as the control group and continued participating in the normal programme of the college.** The selected physiological variables were anaerobic power, vital capacity, resting heart rate, resting respiratory rate, total body fat percentage, lean body weight, positive breath holding capacity and negative breath holding capacity. The Training programme was conducted for six days in a week for ten weeks. The data were collected before commencement of experimental treatment (pre-test) and at the conclusion of training period (post-test). To find out the effect of Bhastrika Pranayama and Ujjayi Pranayama on selected physiological variables among engineering students, analysis of covariance (ANCOVA) was employed at 0.05 level of significance.

Analysis of Co-Variance of the Means of two Experimental Groups and the Control Group in Anaerobic Power Performance

	Groups			Sum of squares		df	Sum of squares	F- ratio
	Bhastrika Pranayam Group	Ujjai Pranayam Group	Control Group					
Pre-test Means	72.53	72.10	72.43	A	3.09	2	1.54	0.03
				W	4041.53	87	46.45	
Post-test Means	74.30	73.50	71.96	A	84.34	2	42.17	1.07
				W	3424.78	87	39.36	
Adjusted Post-test Means	74.15	73.71	71.90	A	85.38	2	42.69	6.74*
				W	544.04	86	6.32	

*Significant at 0.05 level of significance, N= 90, A =Among Means variance, W=Within Group variance, F-Ratio needed for significance at 0.05 level of significance = 3.10 (2, 87) and 3.10 (2, 86). The analysis of co-variance for Anaerobic Power performance indicated that the resultant F-ratio of 0.03 was insignificant in case of pre-test means from which it is clear that the pre-test means does not differ significantly and that the random assignment of subjects to the two experimental groups was quite successful. The post-test means of all the three groups yielded F-ratio of 1.07 which was also insignificant at 0.05 level of confidence. The difference between the adjusted post means was found significant as the obtained F-ratio was 6.74. The F-ratio needed for significance at 0.05 level of confidence was 3.10. As the difference between the adjusted means for three groups were found significant, the critical difference for adjusted means was applied to find out which of the differences between the paired adjusted final means were not significant.

Paired Adjusted Final Means and Differences between Means for the two Experimental Groups and Control Group in Anaerobic Power Performance

Means			Difference between Means	Critical difference for adjusted Means
Bhastrika Pranayam Group	Ujjai Pranayam Group	Control Group		
74.15	73.71		0.44	1.28
74.15		71.90	2.25*	1.28
	73.71	71.90	1.81*	1.28

It is evident from above Table that significant difference was found between adjusted final mean of Bhastrika Pranayama group and control group; Ujjayi Pranayama group and control group; the difference between means was higher than critical difference for adjusted means. On the other hand insignificant difference was found between the adjusted final means of Bhastrika Pranayama group and Ujjayi Pranayama group, the difference between means was lower than critical difference for adjusted means.

Analysis of Co-Variance of the Means of two Experimental Groups and the Control Group in Vital Capacity Performance

	Groups			Sum of squares		df	Sum of squares	F-ratio
	Bhastrika Pranayam Group	Ujjai Pranayam Group	Control Group					
Pre-test Means	3.65	3.64	3.55	A	0.56	2	0.09	0.46
				W	10.66	87	0.19	

Post-test Means	3.78	3.88	3.53	A	0.95	2	0.97	5.83*
				W	9.74	87	0.16	
Adjusted Post-test Means	3.77	3.87	3.55	A	0.30	2	0.80	5.38*
				W	5.39	86	0.15	

*Significant at 0.05 level of significance, N = 90, A =Among means variance, W =Within Group variance. F-Ratio needed for significance at 0.05 level of significance = 3.10 (2, 87) and 3.10 (2, 86). The analysis of co-variance for Vital Capacity performance indicated that the resultant F-ratio of 0.46 was insignificant in case of pre-test means from which it is clear that the pre-test means does not differ significantly and that the random assignment of subjects to the two experimental groups was quite successful. The post test means of all the three groups yielded F-ratio of 5.83, which was significant at 0.05 level of confidence. The difference between the adjusted post means was found significant as the obtained F-ratio was 5.38. The F-ratio needed for significance at 0.05 level of confidence was 3.10. All the difference between the adjusted means for three groups were found significant, the critical difference for adjusted means was applied to find out which of the differences between the paired adjusted final means were not significant.

Paired Adjusted Final Means and Differences between Means for the two Experimental Groups and Control Group in Vital Capacity Performance

Means			Difference between Means	Critical difference for adjusted Means
Bhastrika Pranayam Group	Ujjai Pranayam Group	Control Group		
3.77	3.87		9.10	0.19
3.77		3.55	0.22*	0.19
	3.87	3.55	0.32*	0.19

*Significant at 0.05 level. It is evident from above table that significant difference was found between adjusted final mean of Bhastrika Pranayama group and control group; Ujjayi Pranayama group and control group since the difference between means was higher than critical difference for adjusted means. On the other hand insignificant difference was found between adjusted final means of Bhastrika Pranayama group and Ujjayi Pranayama group since difference between means was lower than critical difference for adjusted means.

Analysis of Co-Variance of the Means of two Experimental Groups and the Control Group in Resting Heart Rate Performance

	Groups			Sum of squares		df	Sum of squares	F- ratio
	Bhastrika Pranayam Group	Ujjai Pranayam Group	Control Group					
Pre-test Means	64.26	66.16	65.40	A	3.48	2	27.42	1.13
				W	384.83	87	24.12	
Post-test Means	62.12	63.70	65.03	A	157.48	2	64.70	2.66
				W	498.16	87	24.29	
Adjusted Post-test Means	63.03	62.87	64.92	A	131.28	2	38.75	10.96*
				W	120.56	86	3.53	

*Significant at 0.05 level of significance, N= 90, A= Among Means variance, W=Within Group variance, F-Ratio needed for significance at 0.05 level of significance = 3.10 (2, 87) and 3.10 (2, 86). The analysis of co-variance for Resting Heart Rate performance indicated that the resultant F-ratio of 1.13 was insignificant in case of pre-test means from which it is clear that the pre-test means does not differ significantly and that the random assignment of subjects to the two experimental groups was quite successful. The post-test means of all the three groups yielded F-ratio of 2.66, which was insignificant at 0.05 level of confidence. The difference between the adjusted post means was found significant as the obtained F-ratio was 10.96. The F-ratio needed for significance at 0.05 level of confidence was 3.10. As the difference between the adjusted means for three groups were found significant, the critical difference for adjusted means was applied to find out which of the difference between the paired adjusted final means were not significant.

Paired Adjusted Final Means and Differences between Means for the Two Experimental Groups and Control Group in Resting Heart Rate Performance

Means			Difference between Means	Critical difference for adjusted Means	
Bhastrika Pranayam Group	Ujjai Pranayam Group	Control Group			
63.03	62.87		0.16		0.96
63.03		64.92	1.89*	0.96	
	62.87	64.92	2.05*	0.96	

*Significant at 0.05 level. It is evident from the above Table that significant difference was found between adjusted final means of Bhastrika Pranayama group and control group; Ujjayi Pranayama group and control group since the difference between means was higher than critical difference for adjusted means. On the other hand insignificant difference was found between the adjusted final means of Bhastrika Pranayama group and Ujjayi Pranayama group since difference between mean was lower than critical difference for adjusted means.

Analysis of Covariance of the Means of two Experimental Groups and the Control Group in Resting Respiratory Rate Performance

	Groups			Sum of squares		df	Sum of squares	F- ratio
	Bhastrika Pranayam Group	Ujjai Pranayam Group	Control Group					
Pre-test Means	18.96	19.06	18.80	A	1.08	2	0.54	0.08
				W	589.63	87	6.77	
Post-test Means	16.50	16.76	18.83	A	97.86	2	48.93	7.61*
				W	559.03	87	6.42	
Adjusted Post-test Means	16.48	16.66	18.95	A	114.06	2	57.03	37.73*
				W	129.99	86	1.51	

*Significant at 0.05 level of significance, N=90, A=Among Means variance, W=Within Group variance. F-Ratio needed for significance at 0.05 level of significance = 3.10 (2, 87) and 3.10 (2, 86). The analysis of co-variance for Resting Respiratory Rate performance indicated that the resultant F-ratio of 0.08 was insignificant in case of pre-test means from which it is clear that the pre-test means does not differ significantly and that the random assignment of subjects to the two experimental groups was quite successful. The post-test means of all three groups yielded F-ratio of 7.61 which was significant at 0.05 level of confidence. The difference between the adjusted post means was found significant as the obtained F-ratio was 37.73. The F-ratio needed for significance at 0.05 level of confidence was 3.10. As the difference between the adjusted means for three groups were found significant, the critical difference for adjusted means was applied to final out which of the differences between the paired adjusted final means were not significant.

Volume : 4 | Issue : 10 | October 2015 • ISSN No 2277 - 8179

Paired Adjusted Final Means and Differences between Means for the two Experimental Groups and Control Group in Resting Respiratory Rate Performance

Means			Difference between Means	Critical difference for adjusted Means	
Bhastrika Pranayam Group	Ujjai Pranayam Group	Control Group			
16.48	16.66		0.18		0.63
16.48		18.95	1.47*	0.63	
	16.66	18.95	1.29*	0.63	

*Significant at 0.05 level. It is evident from the above Table that significant difference was found between adjusted final mean of Bhastrika Pranayama group and control group; Ujjayi Pranayama group and control group since the difference between means was higher critical difference for adjusted means. On the other hand insignificant difference was found between the adjusted final means of Bhastrika Pranayama group and Ujjayi Pranayama group since difference between means was lower than critical difference for adjusted means.

Analysis of Co-Variance of the Means of Two Experimental Groups and the Control Group in Total Body Fat Percentage Performance

	Groups			Sum of squares		df	Sum of squares	F-ratio
	Bhastrika Pranayam Group	Ujjai Pranayam Group	Control Group					
Pre-test Means	13.05	12.11	11.76	A	26.73	2	13.36	1.02
				W	1131.93	87	13.01	
Post-test Means	12.22	12.00	11.77	A	16.69	2	8.34	0.64
				W	1131.49	87	13.00	
Adjusted Post-test Means	12.03	12.19	12.31	A	1.16	2	0.58	9.39*
				W	5.32	86	0.06	

*Significant at 0.05 level of significance, N = 90, A = Among Means variance, W= Within Group variance, F-ratio needed for significance at 0.05 level of significance = 3.10 (2, 87) and 3.10 (2, 86). The analysis of co-variance for Total Body Fat Percentage performance indicated that the resultant F-ratio of 1.02 was insignificant in case of Pre-test means from which it is clear that the pre-test mean does not differ significantly and that the random assignment of subjects to the two experimental groups was quite successful. The post-test means of all the three groups yielded F-ratio of 0.64 which was insignificant at 0.05 level of confidence. The difference between the adjusted post means was found significance as the obtained F-ratio was 9.39. The F-ratio needed for significance at 0.05 level of confidence was 3.10.As the difference between the adjusted means for three groups were found significant, the critical difference for adjusted means was applied to find out which of the differences between the paired adjusted final means were not significant.

Paired Adjusted Final Means and Differences between Means for the two Experimental Groups and Control Group in Body Fat Percentage Performance

Means			Difference between Means	Critical difference for adjusted Means	
Bhastrika Pranayam Group	Ujjai Pranayam Group	Control Group			
12.03	12.19		0.16*		0.12
12.03		12.31	0.28*	0.12	
	12.19	12.31	0.12*	0.12	

*Significant at 0.05 level. It is evident from above Table that significant difference was found between adjusted final mean of Bhastrika Pranayama group and control group; Ujjayi Pranayama group and control group since the difference between means higher than critical difference for adjusted means.

Analysis of Co-Variance of the Means of Two Experimental Groups and the Control Group in Lean Body Weight Performance

	Groups			Sum of squares		df	Sum of squares	F-ratio
	Bhastrika Pranayam Group	Ujjai Pranayam Group	Control Group					
Pre-test Means	60.30	60.60	61.06	A	8.93	2	4.46	0.13
				W	2937.37	87	33.76	
Post-test Means	60.23	60.93	61.16	A	14.15	2	7.07	0.22
				W	2733.40	87	31.41	
Adjusted Post-test Means	60.56	60.98	60.78	A	2.63	2	1.31	0.44
				W	252.05	86	2.93	

*Significant at 0.05 level of significance, N = 90, A = Among Means variance, W= Within Group variance, F-ratio needed for significance at 0.05 level of significance = 3.10 (2, 87) and 3.10 (2, 86). The analysis of co-variance for Lean Body Weight performance indicated that the resultant F-ratio of 0.13 was insignificant in case of pre-test means from which it is clear that the pre-test means does not differ significantly and that the random assignment of subjects to the two experimental groups was quite successful. The post-test means all the three groups yielded F-ratio of 0.22 which was also insignificant at 0.05 level of confidence. The difference between the adjusted post means was found insignificant as the obtained F-ratio was 0.44. The F-ratio needed for significance at 0.05 level of confidence was 3.10. As the difference between the adjusted means for three groups were not found significant, the critical difference for adjusted means was not applied to find out which of the differences between the paired adjusted final means were not significant.

Analysis of Co-Variance of the Means of Two Experimental Groups and the Control Group in Positive Breath Holding Capacity Performance

	Groups			Sum of squares		df	Sum of squares	F-ratio
	Bhastrika Pranayam Group	Ujjai Pranayam Group	Control Group					
Pre-test Means	90.60	111.16	93.66	A	5270.37	2	2635.18	0.56
				W	40828.06	87	4693.08	
Post-test Means	101.03	94.93	93.96	A	880.87	2	440.43	2.14
				W	17837.75	87	205.80	
Adjusted Post-test Means	101.39	93.92	94.60	A	1021.21	2	510.60	3.08
				W	14232.01	86	165.48	

*Significant at 0.05 level of significance, N = 90, A = Among Means variance, W= Within Group variance, F-ratio needed for significance at 0.05 level of significance = 3.10 (2, 87) and 3.10 (2, 86). The analysis of co-variance for Positive Breath Holding Capacity performance indicated that the resultant F-ratio of 0.56 was insignificant in case of pre-test means from which it is clear that the pre-test means does not differ significantly and that the random assignment of subjects to the two experimental groups was quite successful. The post-test means of all the three groups yielded F-ratio of 2.14, which was also insignificant at 0.05 level of confidence. The difference between the adjusted post means was found insignificant as the obtained F-ratio was 3.08. The F-

ratio needed for significance at 0.05 level of confidence was 3.10. As the difference between the adjusted means for three groups were not found significant, the critical difference for adjusted means was not applied to find out which of the differences between the paired adjusted final means were not significant.

Analysis of Co-Variance of the Means of Two Experimental Groups and the Control Group in Negative Breath Holding Capacity Performance

	Groups			Sum of squares		df	Sum of squares	F-ratio
	Bhastrika Pranayam Group	Ujjai Pranayam Group	Control Group					
Pre-test Means	70.33	69.50	70.26	A	12.84	2	6.42	0.10
				W	5504.06	87	63.26	
Post-test Means	72.53	72.20	71.43	A	19.06	2	0.15	0.15
				W	5533.65	87	63.60	
Adjusted Post-test Means	72.26	72.67	71.22	A	33.66	2	16.83	1.32
				W	1090.54	86	12.68	

*Significant at 0.05 level of significance, N = 90, A = Among Means variance, W= Within Group variance, F-ratio needed for significance at 0.05 level of significance = 3.10 (2, 87) and 3.10 (2, 86). The analysis of co-variance for Negative Breath Holding Capacity performance indicated that the resultant F-ratio of 0.10 was insignificant in case of pre-test means from which it is clear that the pre-test means does not differ significantly and that the random assignment of subjects to the two experimental groups was quite successful. The post-test means of all the three groups yielded F-ratio of 0.15 which was also insignificant at 0.05 level of confidence. The difference between the adjusted post means was found insignificant as the obtained F-ratio was 1.32. The F-ratio needed for significance at 0.05 level of confidence was 3.10. As the difference between the adjusted means for adjusted means for three groups were not found significant, the critical difference for adjusted means was not applied to find out which of the differences between the paired adjusted final means were not significant.

Conclusion: The analysis of data revealed that the two experimental groups' viz., Bhastrika Pranayama and Ujjayi Pranayama showed significant gains in performance of subjects in anaerobic power, vital capacity, resting heart rate, resting respiratory rate, total body fat percentage after administration of yogic Pranayama for a duration of 10 weeks. The control group did not show any significant increase in the performance of coordinative abilities under study. As the study indicated that lean body weight were not improved by pranayama practices. It is rather strange that both the varieties of pranayama have not proved to be effective in positive as well as negative breathing holding, which is usually considered to be automatic outcomes. Probably this may prove effective by having longer duration of practice of these pranayamas.

REFERENCE

1. Shri Krishna, "Essence of Pranayama" (Mumbai: Jolly Offset Printing press. 1985) P. 49. 2. Swami Kuvalayananda, Pranayama. (Pune: Kirloskar Press, 1983). 3. His Holiness Swami Rama,., What is Yoga. (New Delhi: S. Newman and Company, 1976). 4. Maharshi Mahes Yogi, Maharshi Mahesh Yogi on Bhagwad Gita : A New Translation and Commentary. (Baltimore, Maryland Penguin: Maharshi Press, 1971).