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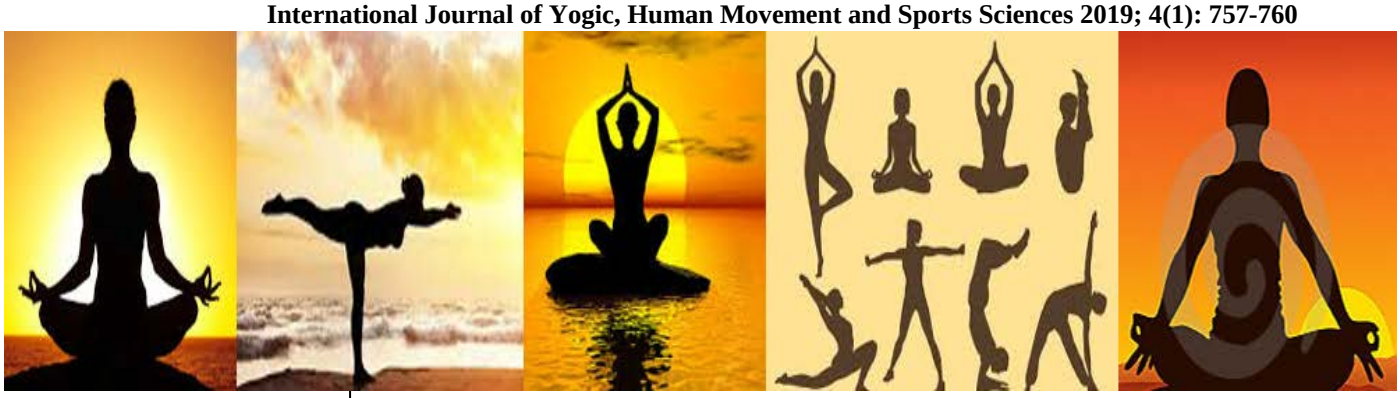

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Short term effects of 4-weeks of Bhramari Pranayama on aerobic fitness of young boys

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Abstract
The present study investigated the effects of 4-weeks Bhramari pranayama program on aerobic fitness of young boys. For this study Twenty-Four, university level boys of Department of Physical Education (T), Guru Nanak Dev University, Amritsar between the age group of 21 - 26 years volunteered to participate in the study. The subjects were purposively assigned into two groups: Group-A: Experimental (n_1 = 12), Group-B: Control (n_2 = 12). Experimental group was subjected to 4-weeks of Bhramari Pranayama. All the subjects were informed about the objective and protocol of the study. The Mean and Standard Deviation values of aerobic fitness of pre-test and post-test of experimental group was 29.8667 ± 1.3186 and 29.7750 ± 1.4486 respectively. However, the Mean and Standard Deviation values of aerobic fitness of pre-test and post-test of control group were 29.6500 ± 1.2660 and 29.6250 ± 1.2983 respectively. In experimental group the observed effect size d is small, 0.25 and in control group the observed effect size d is small, 0.12 the data does suggest that the differences between pre-test and post-test of aerobic fitness in experimental and control group are insignificant.

Keywords: Yoga, bhramari, pranayama, aerobic, fitness, boys

Introduction
Yoga is an ancient discipline designed to bring balance and health to the physical, mental, emotional, and spiritual dimensions of the individual. It is long popular practice in India that has become increasingly more common in Western society. "Yoga" means union of our individual consciousness with the Universal Divine Consciousness in a super-conscious state known as Samadhi. [1, 2]. In Indian religions, yoga (from the Sanskrit word meaning "yoking" or "joining") is "the means or techniques for transforming consciousness and attaining liberation (moksha) from karma [3] and rebirth (samsara)" [4]. It is "a practice by means of which a spiritual seeker strives, (1) to control nature to make the soul fit for union with the Oversoul (the true Self or Atman-Brahman or "God"), and (2) to attain union with God and thus the liberation of the soul from the rounds of rebirth and death" [5]. Madanmohan *et al.* [6] have reported that yoga training of 6 weeks duration attenuates the sweating response to step test and produces a marked increase in respiratory pressures and endurance in 40 mmHg test in both male and female subjects. In another study, they reported that 12 weeks of yoga practice results in a significant increase in maximum expiratory pressure, maximum inspiratory pressure, breath holding time after expiration, breath holding time after inspiration, and hand grip strength [7] Joshi *et al.* [8] have also demonstrated that 6 weeks of pranayama breathing course resulted in improved ventilatory functions in the form of lowered respiratory rate, and increases in the forced vital capacity, forced expiratory volume at the end of first second, maximum voluntary ventilation, peak expiratory flow rate, and prolongation of breath holding time. Similar beneficial effects were observed by Makwana *et al.* [9] after 10 weeks of yoga practice.

Material and Methods
Participants
Twenty-four, university level boys of Department of Physical Education (T), Guru Nanak Dev University, Amritsar between the age group of 21 - 26 years volunteered to participate in the study. The subjects were purposively assigned into two groups:

- Group-A: Experimental (n_1 = 12)
- Group-B: Control (n_2 = 12)

Experimental group was subjected to 4-weeks of Bhramari Pranayama. All the subjects were informed about the objective and protocol of the study. The sample size (N=24) was calculated using the G*Power 3.1.9.7 software. A power of 0.80 (1-β err prob) and significance level (α) of 0.05. The Protocol of power analysis is brought forth in at Figure 2

Procedure

PFT Three-Mile Run Test: -

⊗ Purpose: This test measures aerobic fitness and leg muscles endurance.

⊗ Equipment required: 3-mile flat running course, stopwatch, marker cones, recording sheets.

⊗ Procedure: The aim of this test is to complete the 3-mile course in the shortest possible time. At the start, all marine line up behind the starting line. On the command 'go,' the clock will start, and you will begin running at your own pace. Walking is allowed.

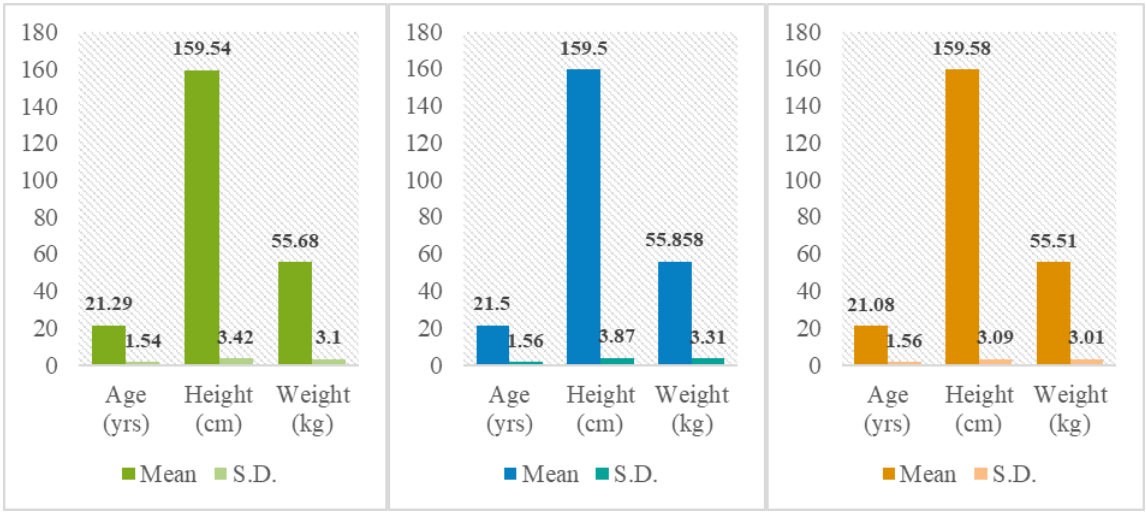
⊗ Scoring: The total time to complete the course is recorded for each participant. For males approximately 1 point is deducted from a hundred for every 10 seconds slower than 18 minutes, for females approximately one point is deducted from a hundred for every 10 seconds slower than 21 minutes.

Statistical Analysis

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.

Table 1: Distribution and demographics of subjects.

Distribution and Demographics (Mean ± S.D.)			
Variables	**Total (N = 24)**	**Bhramari Pranayama (n_1 = 12)**	**Control Group (n_2 = 12)**
Age (yrs)	21.29±1.54	21.5±1.56	21.083±1.564
Height (cm)	159.54±3.42	159.5±3.87	159.58±3.088
Weight (kg)	55.68±3.102	55.858±3.31	55.516±3.007



(a) (b) (c)

Fig 1: Distribution and demographics of subjects (a) Total Subjects (b) Bhramari Pranayama group (c) Control group.

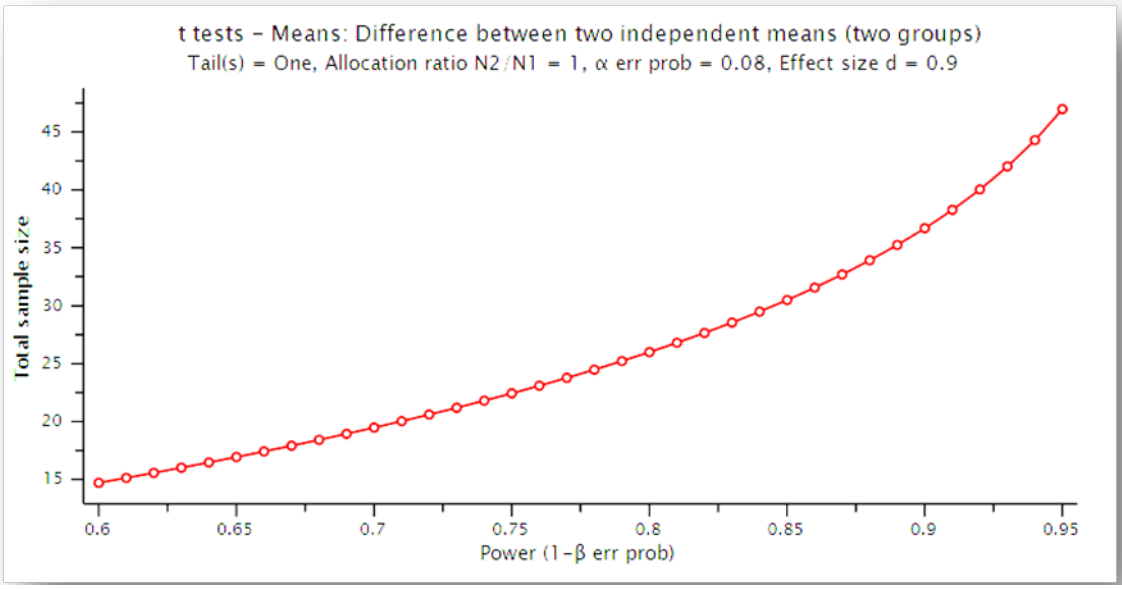


Fig 2: Mean Difference between two dependent means α err prob – 0.05, Effect size dz – 0.5.

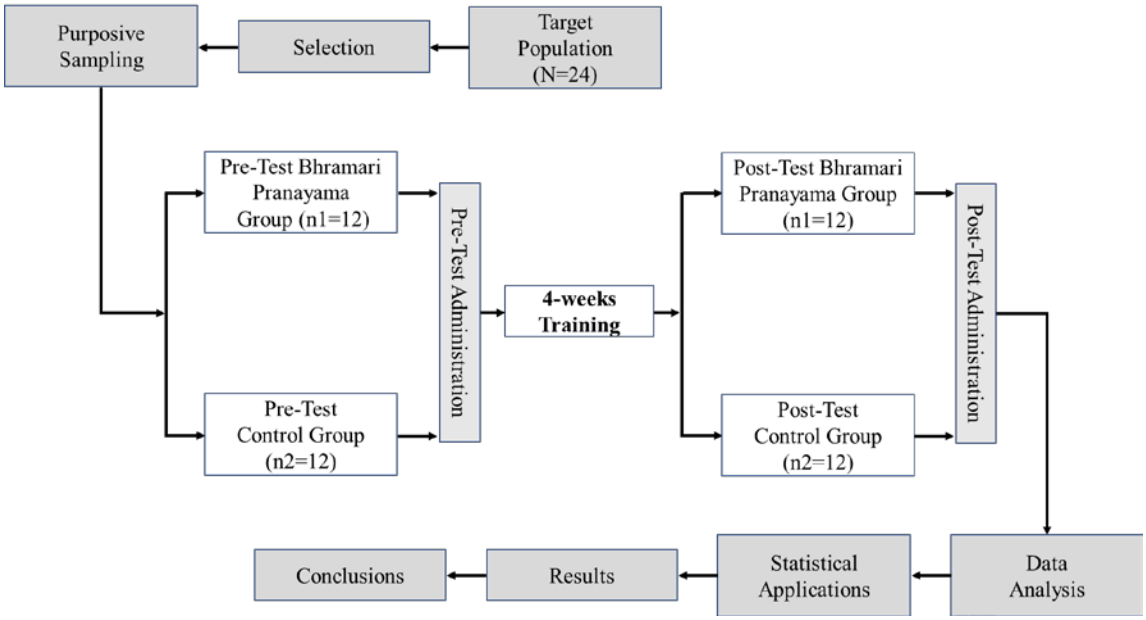


Fig 3: Study flow chart.

Results

Table 2: Descriptive statistics of Bhramari Pranayama (Pre-Test & Post-Test) and Control (Pre-Test & Post-Test) group.

	Bhramari Pranayama (Pre-Test)	**Bhramari Pranayama (Post-Test)**
Sample size	12	12
Arithmetic mean	29.8667	29.7750
95% CI for the mean	29.0288 to 30.7045	28.8546 to 30.6954
Variance	1.7388	2.0984
Standard deviation	1.3186	1.4486
Standard error of the mean	0.3807	0.4182
Mean difference		-0.09167
Standard deviation of differences		0.3630
Standard error of mean difference		0.1048
95% CI of difference		-0.3223 to 0.1389
Test statistic t		-0.875
Degrees of Freedom (DF)		11
Two-tailed probability		P = 0.4003
	Control (Pre-Test)	**Control (Post-Test)**
Sample size	12	12
Arithmetic mean	29.6500	29.6250
95% CI for the mean	28.8456 to 30.4544	28.8001 to 30.4499
Variance	1.6027	1.6857
Standard deviation	1.2660	1.2983
Standard error of the mean	0.3655	0.3748
Mean difference		-0.02500
Standard deviation of differences		0.2006
Standard error of mean difference		0.05790
95% CI of difference		-0.1524 to 0.1024
Test statistic t		-0.432
Degrees of Freedom (DF)		11
Two-tailed probability		P = 0.6742

Aerobic Fitness

Table-2 shows the Mean and Standard Deviation values of aerobic fitness of pre-test and post-test of experimental group was 29.8667 ± 1.3186 and 29.7750 ± 1.4486 respectively. However, the Mean and Standard Deviation values of aerobic fitness of pre-test and post-test of control group were 29.6500 ± 1.2660 and 29.6250 ± 1.2983. In experimental group the observed effect size d is small, 0.25 and in control group the observed effect size d is small, 0.12 the data does suggest that the differences between pre-test and post-test of aerobic fitness in experimental and control group are insignificant.

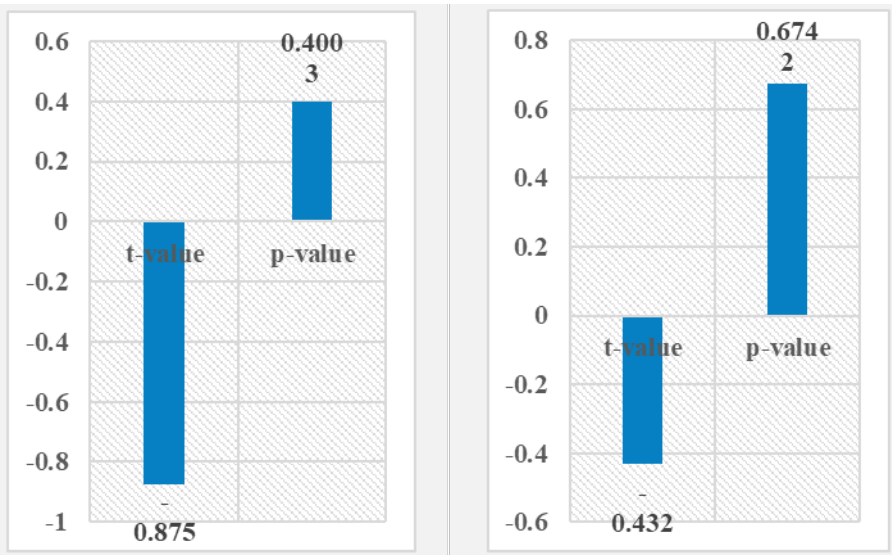


Fig 4: t-value and p-value of aerobic fitness of experimental (a) and control groups (b).

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