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Clinical Effect Of Pranayama Practices On Metabolic Fitness: A Randomized Control Study

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Abstract:

Aim: The objective was to analyze the effect of 12-week pranayama practices on metabolic fitness (VO2 max) of female participants. ***Methodology***: For the purpose of the study, Total sixty (N=60) female participants of Department of Physical Education (T), Guru Nanak Dev University, Amritsar (Punjab) between the age group of 21-29 years were selected. The sixty subjects (N=60), were further divided into two groups: Group-A: Experimental (n_1=30) and Group-B: Control (n_2= 30). ***Statistical analysis:*** Paired-sample student t-test was used to compare the means of the pre-test and the post-test. The level of significance was set at 0.05. ***Results:*** The results show that there is significant difference between pre-test and post-test in metabolic fitness (VO2 max) of experimental group with respect to pranayama practices. Whereas, that there is insignificant difference between pre-test and post-test in metabolic fitness (VO2 max) of control group with respect to pranayama practices of female participants (21-29) years.

Keywords: Metabolic fitness, VO_2 max, pranayama.

Introduction

Yoga is one of the best lifestyle modifications and an ancient vedic science thought to have originated in India in 5000 BC which is being applied in the field of therapeutics [1, 2]. It includes practice of specific posture (asana), regulated breathing (Praṇayama) etc., Breath is the dynamic bridge between body and mind and Praṇayama is one of the most important yogic practices [3]. Pranayama is an ideal method for producing calmness and tranquillity [4]. The techniques or pranayama provides the method where by the flow of prana, in the nadis is regulated, activated and purified giving physical and mental stability [5].

Pranayama has been assigned a very important role in yogic system of exercises and is said to be much more important than yogasana for keeping a sound health [6]. With increased awareness and interest in health and natural remedies, yogic techniques including pranayamas are gaining importance and are becoming acceptable to scientific community [7].

Aerobic capacity (VO2 max) is the maximal oxygen uptake and refers to the amount of oxygen the body is utilizes in one minute. Physical fitness depends mainly on Cardio-respiratory endurance of an individual. VO2 max (maximal oxygen uptake/ maximal aerobic power/ aerobic capacity) is widely accepted as the best measure of cardio-respiratory endurance and refers to the level of oxygen consumption beyond which no further increase in oxygen consumption occurs with further increase in the intensity of exercise and is expressed in ml/kg/minute. VO2 max is probably the best physiological indicator of a person's capacity to continue strenous work [8]. Determination of cardiorespiratory fitness in terms of direct

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measurement of maximum oxygen uptake (VO2 max) is restricted within the laboratory because of its exhausting and difficult experimental protocol [9].

Assessment of oxygen consumption is used in determining energy requirements for healthy lifestyles, exercise programs, and critically ill patients [10, 11]. Oxygen consumption is reported to increase with adaption to physiological stress and pathology [12, 13].

VO2 max is considered as one of the strong indicator or marker for cardio-respiratory fitness or health by World Health Organization (WHO) demonstrating its strong association with better physical performance. Studied epidemiological data reveals that having a proportionally high VO2 max is a strong sign of health and life expectancy in all age group individuals [14, 15, 16].

In developing countries like India with the increasing automated work environment, there is marked decline in physical activity at work places. Sedentary life style and eating habits have proven side effects over health conditions. As per the documented surveys and data available, Yoga is one of the most practiced complementary or alternative interventions to achieve best possible physical and mental health [17, 18].

Methodology

Subjects:-

Sixty female participants of Department of Physical Education (T), Guru Nanak Dev University, Amritsar between the age group of 21-29 years (Mean ± SD: age 24.00 ± 1.79 yrs, height 159.12 ± 5.43 cm, body mass 52.97 ± 7.62 kg) were selected. They were further divided into two groups:

- Group-A: Experimental (n_1=30)
- Group-B: Control (n_2= 30)

Distribution and demographics of subjects are brought forth in **Table-1**.

Table-1. Distribution and demographics of subjects.

Variables	**Simple Size (N=60)**		
	Total (N=60)	***Experimental (n_1=30)***	***Control (n_2=30)***
Age (yrs)	24.00±1.79	24.17±1.91	23.93±1.66
Body Height (cm)	159.12±5.43	159.23±5.48	159.00±5.47
Body Weight (kg)	52.97±7.62	53.27±7.68	52.67±7.68

Design:-

The present study was a longitudinal (observational research method) follow-up study where the participants were selected using a convenience sampling technique i.e., participants were selected based on their availability to take part in the trial. Participants were assessed in two separate sessions' pre-and post.

Assessments:-

Baseline data of each participant for metabolic fitness (VO2 max) were measured in the laboratory of Health Centre, Guru Nanak Dev University, Amritsar (Punjab). Participants were evaluated two times throughout the study-pre-and post-test time.

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Intervention:-

Sixty female participants of Department of Physical Education (T), Guru Nanak Dev University, Amritsar underwent Pranayama training program for 12-weeks; repeat assessments were performed on experimental group. There were no dropouts in the study.

Table-2. 12-week pranayama training for subjects.

12-week Pranayama Training			
Week (s)	**Schedule**	**Execution Time**	**Volume**
1-4 Week	Preliminary Yogic Exercises 5 minute 20 minute	5 minute	35 minute
	Practice of Anuloma Viloma Pranayama Bhastrika Pranayama Kapal Bhati Pranayama Bhramari Pranayama (9X1 Set)	25 minute	
	Om chanting & breathing for relaxation	5 minute	
5-8 week	Preliminary Yogic Exercises 5 minute 20 minute	5 minute	45 minute
	Practice of Anuloma Viloma Pranayama Bhastrika Pranayama Kapal Bhati Pranayama Bhramari Pranayama (12X1 Set)	35 minute	
	Om chanting & breathing for relaxation	5 minute	
9-12 week	Preliminary Yogic Exercises 5 minute 20 minute	5 minute	55 minute
	Practice of Anuloma Viloma Pranayama Bhastrika Pranayama Kapal Bhati Pranayama Bhramari Pranayama (15X1 Set)	45 minute	
	Om chanting & breathing for relaxation	5 minute	

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.

Results

The demographic and clinical characteristics of VO2 max are presented in the following tables:-

Table-3. Descriptive statistics (Mean & Standard Deviation) and paired sample t-test of experimental and control group of metabolic fitness of female participants.

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Metabolic Fitness (VO2 max) ml/kg/min						
Group	**Number**	**Mean**	**Standard Deviation**	**Standard Error of the Mean**	**t-value**	***p*-value**
Experimental (Pre-test)	30	31.26	5.47	1.00	5.8352	0.0001*
Experimental (Post-test)	30	33.57	5.97	1.09		
Control (Pre-test)	30	30.89	4.96	0.90	0.5019	0.6195
Control (Post-test)	30	31.18	4.56	0.83		

(a). Metabolic Fitness (VO2 max)

A glance at **Table-3** shows the Mean and Standard Deviation values of VO2 max of pre-test and post-test of experimental group of female participants was 31.26 ± 5.47 and 33.57 ± 5.97 respectively.

Significant differences were noted between pre-test and post-test in VO2 max since the calculated value of (t = 5.835) is greater than tabulated value of $t_{0.05}$ (29) = 2.04 for the selected degree of freedom and level of significance. The data does suggest that the difference between pre-test and post-test of experimental group of female participants of VO2 max is significant. The t-test and p-value for the (pre-test & post-test) on the variable VO2 max has been presented graphically in **Figure -1**.

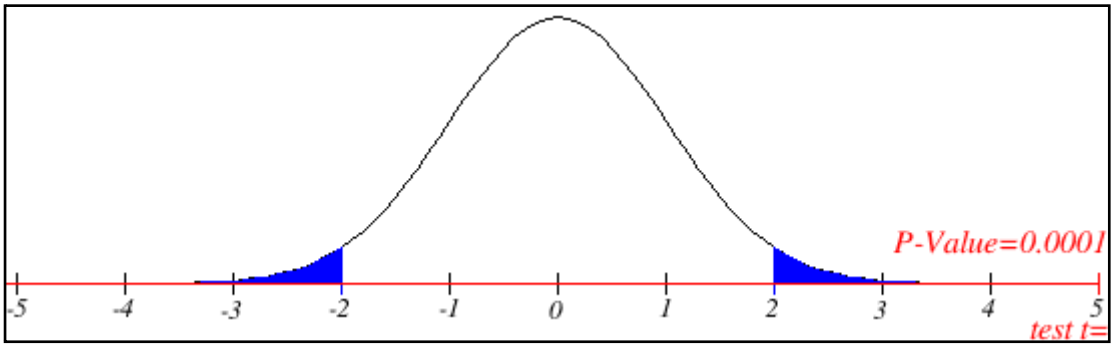

Figure-1. t-test and p-value of (pre-test & post-test) of experimental group of female participants on the variable metabolic fitness (VO2 max).

(b). Metabolic Fitness (VO2 max)

A glance at **Table-3** shows the Mean and Standard Deviation values of VO2 max of pre-test and post-test of control group of female participants was 30.89 ± 4.96 and 31.18 ± 4.56 respectively.

Insignificant differences were noted between pre-test and post-test in VO2 max since the calculated value of (t = 0.501) is less than tabulated value of $t_{0.05}$ (29) = 2.04 for the selected degree of freedom and level of significance. The data does suggest that the difference between pre-test and post-test of control group of female participants of VO2 max is insignificant. The t-test and p-value for the (pre-test & post-test) on the variable VO2 max has been presented graphically in **Figure-2**.

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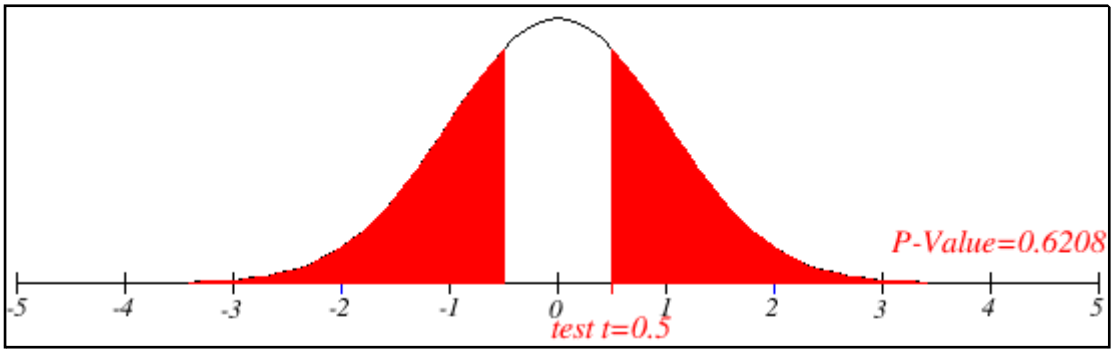

Figure -2. t-test and p-value of (pre-test & post-test) of control group of female participants on the variable Metabolic Fitness (VO2 max).

Conclusions

I. The outcomes of **Table-3** shows that the values of Mean and Standard Deviation of pre-test and post-test of experimental group of metabolic fitness (VO2 max) of female participants are significant.

II. The outcomes of **Table-3** shows that the values of Mean and Standard Deviation of pre-test and post-test of control group of metabolic fitness (VO2 max) of female participants are insignificant.

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