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Yogasana and pranayama practice promotes physiological functions in male adolescents: A randomized controlled trial

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Abstract: Yoga has been investigated in relation to a variety of topics with focus in the reduction of symptoms of various illnesses and disorders. There has been limited research regarding yoga's effect on physiological functions in adolescents. The purpose of the present investigation was to examine the effects of Yoga and Pranayama practice on physiological capacities of male adolescents. The Subjects for the study were adolescent boys studying between 13 to 16 years. Total 80 Subjects studying at a private school were selected through simple random sampling technique for the present investigation. 40 subjects each were placed in treatment as well as control group. All the subjects selected for this study were tested twice prior to treatment (pre-test) and at the conclusion of treatment (post-test) with a time gap of 24 weeks. Selected physiological capability parameters and testing tools were used in the present investigation. Treatment in the form of selected yogic asana along with pranayama was given to selected subjects in the specified treatment group. Twenty four weeks of training included systematic yogasana and pranayama training for six days in a week. In order to examine the hypothesis of the study paired samples 't' test was used. There were significant differences in aerobic capacity and resting heart rate during pre test and post test of experimental group was 77.71and 92.89 respectively, whereas the differences in mean was not significant in control group during pre test and post test situations. In case of anaerobic capacity, systolic blood pressure and diastolic blood pressure although there were significant differences in pre and post test scores of experimental as well as control groups. On the basis of the present investigation it can be concluded that the physiological functions significantly improves in terms of aerobic capacity and heart rate in adolescent boys following yoga training.

Keywords: Health, physiological functions, yoga, pranayama, aerobic capacity, heart rate

INTRODUCTION

Yoga is oldest spiritual technique of physical and mental exercise known to humanity. Yoga is a psycho-somatic-spiritual discipline for achieving union and harmony between our mind, body, and soul and the ultimate union of our individual consciousness with the universal consciousness[1]. Yogic techniques produce consistent physiological changes and have sound scientific basis[2,3]. Yoga has been practiced for thousands of years. It is based on ancient theories, observations and principles of the mind-body connections. Substantial research has been conducted to look at the physiological benefits of yoga through yoga postures (*asanas*), yoga breathing (*pranayama*) and meditation.

Yoga has been investigated in relation to a variety of topics with focus in the reduction of symptoms of various diseases and ailments, such as lower back pain, arthritis, diabetes and heart disease[4], as well as the treatment of mental health issues, principally the reduction of stress[5-6]. There has been limited research regarding yoga's effect on aerobic capacity, anaerobic capacity, systolic and diastolic blood pressure and heart rate in adolescents. In particular, there is a lack of evidence as to whether the practice of yoga can provide sufficient physical activity to improve and/or maintain cardio respiratory endurance, muscular fitness and blood pressure response. The purpose of the present investigation was

to examine the effects of Yoga and Pranayama practice on physiological capacities of male adolescents.

METHODS

The Subjects for the study were adolescent boys studying in 8th to 10th standard and their age ranged between 13 to 16 years. Total 80 Subjects studying at a private school at Mysore were selected through simple random sampling technique for the present investigation. 40 subjects each were placed in treatment as well as control group. All the subjects selected for this study were tested twice prior to treatment (pre-test) and at the conclusion of treatment (post-test) with a time gap of 16 weeks. The details on physiological parameters and testing tools is given in table 1.

Table 1: Details on physical capabilities along with respective testing tools

S.No.	Physical parameters	Testing tools
1	Aerobic Capacity	Harvard Step Test
2	Anaerobic Capacity	50 meter dash test
3	Blood pressure	Sphygmomanometer &stethoscope
4	Resting heart rate	Radial pulse

Treatment in the form of yogic asana along with pranayama was given to selected subjects in the specified treatment group. Control group did not take part in any form of physical training and observed normal daily routine. Twenty four weeks of training included systematic yoga and pranayama training for six days in a week. The training was scheduled in the morning 80 minutes which included 10 minutes for warm up, 60 minutes for pre planned treatment and another 10 minutes for cool down. In order to examine the hypothesis of the study paired samples 't' test was used.

RESULTS

The results on physiological capacities during pre and post test situations of experimental and groups are given in table 2 and 3 respectively.

RESULTS

Table 4 depicts mean of aerobic capacity during pre test and post test of experimental group was 77.71and 92.89 respectively, whereas the mean of aerobic capacity during pre test and post test of control group was 66.40 and 64.85respectively. The "t" value in case of experimental group was 11.183 and for control group it was .767 respectively. The resting heart rate during pre test and post test of experimental group was 73 and 64 respectively, whereas the mean of resting heart rate during pre test and post test of control group was 80 and 82 respectively. The "t" value in case of experimental group was 17.351 and for control group it was -1.765 respectively. In these cases null hypothesis is rejected at .05 level of significance. In case of anaerobic capacity, systolic blood pressure and diastolic blood pressure although there were significant differences in pre and post test scores of experimental group, significant differences were also observed in control group results.

Table 2. Summary of results on physiological capacities at pre and post test situations of experimental group.

	Aerobic capacity		Anaerobic capacity		Systolic Blood Pressure		Diastolic Blood Pressure		Resting Heart rate	
	Pre	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**
Sample size	40	40	40	40	40	40	40	40	40	40
Arithmetic mean	77.71	92.89	9.06	8.56	106.08	112.45	60.80	67.43	73	64
Standard deviation	11.52	12.64	1.06	1.00	8.30	7.48	6.71	6.59	6.77	7.41
Standard error of the mean	1.8214	1.9989	.1671	.1585	1.3119	1.1826	1.0617	1.0414	1.0711	1.1723
Paired samples t-Mean difference	-15.1788		.4977		-6.3750		-6.6250		9.2250	
Standard deviation	8.5840		.5026		4.3951		4.6337		3.3626	
't' value	11.183		6.264		9.174		9.042		17.351	
Degrees of Freedom	39		39		39		39		39	
Two-tailed probability	P = .000		P = .000		P = .000		P = .000		P = .000	

Table 3. Summary of results on physiological capacities at pre and post test situations of control group.

	Aerobic capacity		Anaerobic capacity		Systolic Blood Pressure		Diastolic Blood Pressure		Resting Heart rate	
	Pre	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**
Sample size	40	40	40	40	40	40	40	40	40	40
Arithmetic mean	66.40	64.85	10.26	10.58	107.25	66.85	111.45	72.03	80	82
Standard deviation	14.21	16.51	2.00	1.95	8.42	5.85	8.81	5.60	10.86	11.42
Standard error of the mean	2.2470	2.6104	.3162	.3084	1.3314	.9251	1.3923	.8847	1.7168	1.8063
Paired samples t-Mean difference	1.5573		-.3183		40.4000		39.4250		-2.5750	
Standard deviation	12.8450		.3553		6.5036		7.4966		9.2290	
't' value	.767		5.665		39.287		33.261		-1.765	
Degrees of Freedom	39		39		39		39		39	
Two-tailed probability	P = . 448		P = .000		P = .000		P = .000		P = .085	

Table 4: Summary of 't' test results on physiological capacities at pre and post test situations of both groups.

		Mean ± SD	SEM	't' Value
Aerobic capacity	Experiment (Pre-test)	77.71	1.8214	11.183
	Experimental (Post-test)	92.89	1.9989	
	Control (Pre-test)	66.40	2.2470	.767
	Control (Post-test)	64.85	2.6104	
Anaerobic capacity	Experiment (Pre-test)	9.06	.1671	6.264
	Experimental (Post-test)	8.56	.1585	
	Control (Pre-test)	10.26	.3162	5.665
	Control (Post-test)	10.58	.3526	
Systolic Blood Pressure	Experiment (Pre-test)	106.08	1.3119	9.174
	Experimental (Post-test)	112.45	1.1826	
	Control (Pre-test)	107.25	1.3314	39.287
	Control (Post-test)	66.85	.9251	
Diastolic Blood Pressure	Experiment (Pre-test)	60.80	1.0617	9.042
	Experimental (Post-test)	67.43	1.0414	
	Control (Pre-test)	111.45	1.3923	33.261
	Control (Post-test)	72.03	.8847	
Resting Heart rate	Experiment (Pre-test)	73	1.0711	17.351
	Experimental (Post-test)	64	1.1723	
	Control (Pre-test)	80	1.7168	-1.765
	Control (Post-test)	82	1.8063	

DISCUSSION

Physiological functions have great implications in determining the physical performance as well as health of an individual. Ray U.S. et al[7] observed significant improvement in VO2 max after Yogic training. Raju P.S. et al [8] have found a significant increase in oxygen consumption per unit work after yoga training. It also reported that cardiovascular endurance increases due to yoga training [7]. It is found that observed that yoga training significantly increase in aerobic power (VO2 max) of muscles [8]. The study by Singh *et al* demonstrated the beneficial effect of Nadi shodhana pranayama on heart rate of youth between the age groups 18-24 [9]. It also observed statistically significant reduction in heart rate after short term Yoga training[10-11] . In case of anaerobic endurance, there were significant differences in pre and post test results of experimental group.

There were significant differences observed in pre and post test results of experimental group in systolic and diastolic blood pressure. The present results are supported by numerous other studies[12].

CONCLUSION

On the basis of the present investigation it can be concluded that the physiological functions

significantly improves in terms of aerobic capacity and heart rate in adolescent boys following yoga training.

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