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Physiological effects of transcendental meditation and physical exercise

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Physical fitness can be improved by regular physical activity and transcendental meditation. A comparative study between them is elusive. Thirty young adults were divided into three groups of 10 each serving as control, exercise and meditating subjects doing respective techniques for 12 weeks. A significant fall was observed only in heart rate, vital capacity and PEFR. Changes, though insignificant, in respiratory rate, blood pressure, maximum oxygen consumption, haemoglobin and cholesterol were also observed indicating the role of both the techniques in physical fitness.

Key words: Physical fitness, Physical exercise, Transcendental meditation

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Modern era has led to sedentary life style and people are gradually becoming hypokinetic. Regular physical exercise has proven effect in improving cardio-respiratory fitness[1,2,3]. Indian philosophy of yoga and meditation also claim the role of such nonexercising technique in improving the inner self and positive effects on various body functions. Researches on transcendental mediation (TM) throw a light of its value in improving physical fitness[4,5,6]. Yet a comparative study of physical exercise with TM is meager and therefore the present study was planned to see the effect of respective techniques on some physiological parameters.

Methodology

The study was conducted on 30 healthy male volunteers between the age group of 17-21 yrs (mean 19.4 yr) with a height of 1.69±0.05m, weighing 59±6.50kg and having BMI 20.34±2.09kg/m^2. They were divided into three groups of ten each. The subjects of first group served as control. They sat in a room with eyes closed for 20 min twice daily (morning and evening). The volunteers of second group practiced the TM technique, which was taught to them by a trained person. They also sat quietly with eyes closed for 20 min morning & evening practicing TM. The subjects of third group performed physical exercises; according to the 5BX plan of exercise used in Royal Canadian Air force, which includes five charts of graded physical exercises becoming tougher from chart one to five. The subjects switched on to the next chart only when they attained the required level of exercise in the previous chart. All the subjects performed their respective techniques for 12 weeks. They were instructed to take isocaloric diet of 2000 calories with fats up to 50 gm/day. All the subjects were medically examined for any illness. They were non-smokers and not addicted to alcohol or any other drug. The various cardio respiratory parameters were measured before and after 12 weeks in all the subjects of three groups. The heart rate (HR) and respiratory rate (RR) were measured by palpatory method by two persons and the average of six readings was taken as subjects' HR and RR. The systolic and diastolic BP was measured by sphygmomanometer by two persons simultaneously recorded in supine position and the average of six reading was taken. The vital capacity and PEFR were measured by using Wright's mini spirometer and peak flow meter and average of three readings was taken. The maximum oxygen consumption (VO_2 max) was measured by doing Masters' step exercises for three minutes and using Astrand Rhyming nomogram. The haemoglobin (Hb%) was measured by Sahli's heamoglobinometer and the serum cholesterol by the method of Wybenga *et al.* [7]. All the parameters were analyzed by using ANOVA test.

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Table 1— Effect of Transcendental meditation and physical exercise on some physiological and biochemical parameters

S No	Parameter	Control		Exercise		T Meditation		Observed 'F'	Critical difference at 5%	1%
		Initial	Final	Initial	Final	Initial	Final			
1.	Heart rate (Beat/min)	98.70 ± 9.85	98.40 ±9.74	103.00 ±14.76	79.40*±4.90	100.40 ±12.53	87.00 *@ ±9.04	13.83	7.46	10.08
2.	Respiratory rate (Breaths/min)	21.00 ±1.30	20.00 ±1.80	22.00 ±2.00	19.20 ±2.86	21.60 ±1.26	18.70 ±2.13	1.29	1.67	2.23
3.	Systolic blood pressure (mm Hg)	124.40 ±6.91	123.80 ±5.80	120.00 ±8.16	118.00±8.37	124.60 ±8.51	119.60 ±8.42	1.60	6.87	9.28
4.	Diastolic blood pressure (mm Hg)	78.80 ±4.23	77.60 ±2.27	80.00 ±4.85	75.40 ±4.42	78.80 ±4.02	76.40 ±5.46	0.66	3.92	5.29
5.	Vital capacity (L)	3.71 ±0.07	3.69 ±0.65	3.79 ±0.50	4.73*@ ±0.57	3.04 ±0.77	3.79 ±0.77	8.76	0.56	0.76
6.	PEFR (L/ min)	480.00 ±60.27	467.50 ±59.17	475.00 ±61.50	557.00* ±51.61	503.00 ±54.13	565.00* ±64.80	8.46	53.99	72.91
7.	VO_2 max (ml/min/kg)	32.00 ±4.00	32.80 ±3.32	31.00 ±3.16	34.70 ±3.89	33.80 ±3.25	35.70 ±3.59	1.64	3.33	4.49
8.	Haemoglobin (gm/dl)	12.41 ±0.33	12.58 ±0.29	12.16 ±0.31	12.34 ±0.31	12.20 ±0.21	12.36 ±0.23	3.26	0.27	0.36
9	Cholesterol (mg/dl)	201.70 ±28.70	200.50 ±25.07	230.00 ±39.44	176.50±31.98	221.50 ±43.24	200.00 ±39.06	1.71	30.47	41.14

Data presented as mean ±SD of 10 subjects in each group. Table value of F (2, 27) at 5% = 3.35.
*P<0.01 in comparison to final values of control group. @P<0.05 in comparison to final values of respective exercise or TM group.

Results

Table 1 reveals that there is no significant variation in all the parameters in the three groups at the beginning of the study. The heart rate exhibited a significant decline in both TM and exercise groups (P<0.01). However, the fall in TM group is lesser than exercise group (p<0.05). The respiratory rate, systolic BP and diastolic BP decreased in all the three groups as compared to their respective control but the fall was not much different than the control group (p>0.05).

The post regimen vital capacity and PEFR increased in exercise and TM groups only. However, this rise in the former was significantly greater (p<0.01) as compared with control or TM group, whereas the rise in the latter was significant (p<0.01) in both groups than control. The maximal oxygen consumption (VO_2 max) revealed an insignificant increase in all the three groups (p>0.05) after 12 weeks of respective schedules. There was an increase in Hb% and fall in serum cholesterol in all the three groups at the end of the study though these changes were insignificant in either group.

Discussion

Regular physical activity has a proven effect in improving physical fitness. It can be assessed by some physiological and biochemical parameters affecting cardio-respiratory system. Similarly scientific researches have shown the positive effect of transcendental meditation (TM) on physical fitness by reducing anxiety levels. However, the comparison between these two processes remains inconclusive.

A significant fall in heart rate was found in exercise as well as in the TM groups in the present study. But this fall was greater in the former. A decrease in heart rate of individuals practicing TM as well as doing submaximal exercise on bicycle ergometer has been demonstrated[4,6,8]. The findings of the present work matches with those of above workers but lesser fall in TM group might be due to lesser duration of meditation. The probable cause of decrease in heart rate is low level of sympathetic activity in meditators, since the heart rate is governed by the balance between sympathetic and parasympathetic branches of the autonomic nervous system[9]. The decreased heart rate following regular exercise appears to be due to progressive increase in vagal tone.

Reduction in systolic as well as diastolic blood pressure in normotensive and hypertensive individuals doing meditation for more than one year has been reported[4,10]. This reduction was ascribed to alteration in behaviour regardless of antihypertensive medication. A significant fall in BP after two years of regular physical exercises in both sexes depending upon the grade of exercise and physique of the individual has also been demonstrated[1]. Though a fall in respiratory rate in individuals practicing TM has been noticed, the present study also revealed an insignificant decline in respiratory

rate and blood pressure probably due to shorter course of respective schedules[4].

An increase in vital capacity and PEFR in both the groups was also observed. This rise was greater in exercise group (0.94 L and 82 L/min) than meditating group (0.75 L and 62 L/min), when compared with their respective controls. An increase in mean vital capacity by 0.23 L after meditating for six weeks attributed to inhaling more air under influence of this mind and body relaxing technique has been reported[11]. The greater rise (0.75 L) in the present study seems to be due to longer period of meditation (12 weeks). The rise in vital capacity in exercise group can be assigned to better chest expansion as compared to sedentary subjects of control group[11,12]. Since, the greater inhalation of air will naturally be expired by a forceful thrust, both parameters are interlinked. An average PEFR in agricultural workers was reported to be higher than the sedentary workers[13,14]. Similar findings were observed in present study too indicating the direct effect of physical work on PEFR.

One of the best indicators of physical fitness is exercise tolerance, which is physiologically assessed by maximal oxygen consumption (VO_2 max). The present study did not reveal any significant change in VO_2 max in either TM or exercise group than controls. These findings do not corroborate the earlier report of improvement in cardiovascular fitness and VO2 max after six weeks of meditation in athletes[10]; which was suggested to be due to better athletic endurance as the technique relaxes mind and body resulting in reduced anxiety level leading to improvement in many cardiovascular functions, viz. vital capacity blood pressure and haemoglobin, expressed as improved exercise tolerance (VO_2 max) as well. Yet an uprising trend in VO_2 max in TM group was observed though the subjects were of sedentary habit. An increase in VO_2 max by 16% after 16 weeks of physical training was noticed[15-17]. The 11.9% rise in VO_2 max. after 12 weeks of physical exercise in this study bolsters[15].

Though insignificant, the haemoglobin showed an increasing but serum cholesterol – decreasing trend during this study in both the groups. However, earlier reports regarding haemoglobin are equivocal[2,11,16]. It appears that the time required to change the haemoglobin level is variable under different ethnic and physiological conditions. A fall in serum cholesterol in hypercholestermic subjects was observed after meditation[18] and exercise on treadmill[19]. The findings exhibit similar results even in subjects with normal cholesterol levels. Thus the changes in haemoglobin and serum cholesterol levels reflect the probable role of both techniques on them.

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