PHYSIOLOGICAL CHANGES IN SPORTS TEACHERS FOLLOWING 3 MONTHS OF TRAINING IN YOGA

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Introduction

Three months of training in the ancient Indian science of Yoga, which included different asanas (physical postures) and Pranayamas (voluntary regulation of the breathing) has following effects in normal, hea1thy subjects, viz a significant reduction in heart rate, BP and an increase in mean skin temperature, and alpha index of EEG, reduction in blood glucose, plasma cholesterol, dopamine B hydroxylase and monoamine oxidase, and increased levels of urinary 17-keto steroids. These changes were interpreted as a shift in autonomic equilibrium towards parasympathetic dominance. The present study was conducted to assess whether yogic training of the same duration (3 months) would cause physiological changes in 40 male physical education teachers whose ages were between 25 and 48 years (34.7 + 5.9), and who had already been actively engaged in diverse physical activities for 8.9 + 5.8 years.

The subjects were attending a 3 month residential camp at the Vivekananda Kendra Yoga Research Foundation campus (Bangalore, India) to receive training to teach yoga in schools. Since it was a residential camp, the living conditions of the group were approximately constant. The Yoga training consisted of practice of different asanas (physical postures), Pranayamas (voluntary regulation of breathing), meditation, devotional sessions and lectures on the theory and philosophy of yoga. In addition, special emphasis was given to their grasping the total approach of Yoga to bring about eyesight improvement, voice culture, enhancement of physical stamina, memory and creativity, emotion culture, I.Q., Spiritual and personality development. The actual practices were as follows.(1) Asanas : (a) Those performed when standing - ardhakati - cakrasana, trikonasana and padahastasana. (b) Those performed when sitting - vajrasana, padmasana, yoga mudra, ustrasana, sasankasana, ardha matsyendrasana, pascimatanasana and suptavajrasana. (c) Those performed in the prone position were bhujangasana, dhanurasana, and relaxation in makarasana. (d) Asanas performed in the supine position - sarvangasana, matsyasana, halasana and relaxation in savasana. Usually asanas were performed between 5.30 am and 7.00 am everyday. (2) Pranayama practices included initial cleansing (kapalabhati) followed by sectional (i.e. clavicular, thoracic and abdominal) breathing, full yogic breathing and nadisuddhi pranayama. Pranayama was practised between 11 am and 12 noon, daily. (3) Kriyas or cleansing practices such as jala neti, sutra neti and vaman dhouti were practised two times a week. Also occular exercises (tratakas) intended to 'cleanse' the eyes and improve vision were practised for 20 min everyday. (4) Meditation was silent mental chanting of the syllable "OM" for about 15 mins. Also for 60 min everyday 'cyclic meditation' was carried out. This actually is based on 'stimulation followed by relaxation', and at the end of the practice the subject lies in savasana (with instructions) to experience higher levels of expansion. (5) Devotional Sessions with singing bhajans, for 60 min daily. (6) Lectures usually 2 lectures per day, 60 min each.

The subjects were given 2 days to get accustomed to the routine of the camp, then the study, (which conformed to the ethics laid down by the Indian Council of Medical Research, New Delhi) was explained to them, and their signed consent was taken. On the third day the following parameters were assessed: forced expiratory volume in 1 sec (FEV1), forced vital capacity (FVC) both recorded using (Vitallograph Ltd., U.K.), PEER (Mini Wright's peak flow meter), galvanic skin resistance and stethographic record of respiration using a 4-channel portable polygraph (Lafayette, U.S.A.), ECG (Lead 1) to derive heart rate by counting successive QRS complexes, using a clinical electrocardiograph (BPL, India), body weight, breath holding time and BP (sphygmomanometer record). All assessments were repeated twice on each subject initially and twice finally as well. Both recordings were made on the same day. Also the timings of the 2 initial

recordings and the 2 final recordings were kept the same. In addition, the steadiness and co-ordination of the hands were tested with a 'steadiness' tester (Anand Agencies, Pune, India) according to the method described by Mellon. The total of 'errors' made by each subject initially and after 3 months of yogic training, were noted.

The data obtained at the end of 3 months was compared with that taken initially, using paired t-test (two-tailed).

Table 1. Changes in autonomic, respiratory, and general health parameters. (Mean + S.E.) after 3 months yogic training in 40 male physical education teachers

Parameters	Initial Values	Values after 3 months Yogic training
Body weight (kg)	59.50+1.24	58.60±1.05*
Blood pressure (mm Hq)		
Systolic BP	127.10 + 2.54	117.80 ±1.28*
Diastolic BP	82.60 ± 2.08	75.60 ± 0.99***
FEV_1,(1 BTPS) FEV_1	2.20 ± 0.12	2.56 ± 0.08**
FVC (1 BTPS)	2.95 ± 0.13	3.48 ± 0.1 1 ***
FEV_1/FVC FEV_1 / FVC	74.50 ± 2.48	74.30 ± 1.26
PFR (1 /min)	499.10 ± 11.20	528.90 ± 10.90***
Breath holding time (sec)	35.60 ± 1.97	49.80 ± 2.44***
Heart rate (beats/min)	71.03 ± 1.48	68.00 ± 1.27*
Respiratory rate (breaths/min)	16.70 ± 0.82	14.30 ± 0.77*
GSR (Kilohms)	69.67 ± 6.80	77.35 ± 5.20
Steadiness test		
(Number of 'errors')	21.50 ± 1.21	17.40 ± 1.13*

*= 'P<0.05; ** = p < 0.01" *** = <0.001 (Paired t-test, two tailed)

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RESULTS

There was a significant increase in PFR (60%) FEV1. FVC (18%) (though FEV1/ FVC % did not change), Breath holding time (40%), and a significant reduction in heart rate, respiratory rate, systolic and diastolic BP readings, body weight, and also in the number of errors made in the steadiness test (Table 1). There was a trend of increase in Galvanic Skin Resistance (GSR) reflecting reduction in sympathetic activity supplying the sweat glands. However this was not significant (paired t-test, two tailed) for the group as a whole. When the GSR data of each subject was analysed separately (Student's t-test, two tailed), it was revealed that at the end of 3 months, the subjects fell into 3 groups: (i) 21 subjects had increased GSR, (ii) 9 subjects had decreased GSR, and (iii) 10 subjects showed no change. On examining the GSR data of the subjects belonging to each of the 3 groups separately, it was observed that the subjects who showed increased GSR at the end of 3 months had lower initial values than the others (group average

initial value ± S.E was 44.1±2.7 K Ohms) and after 3months the group average value S.E. was 82.0±4.7 KOhms. On the other hand, those who showed a decrease at the end of 3 months had higher initial values than the rest (group average initial value S.E. was 116.5±3.8 KOhms). Their final value (group average ± S.E. was 79.1 = 2.4 K Ohms). The subjects who showed no change had initial values in- between those of the other two groups (group average initial value ± S.E. was 82.0 ± 8.4 K Ohms) and this did not alter significantly after 3 months (group average ± S.E. was 74.0 t. 7.0).

Summary

1. This report shows that in a group of 40 physical education teachers who already had an average of 8.9 years physical training, 3 months of yogic training produced significant improvement in general health (in terms of body weight and BP reduction and improved lung functions).

2. There was also evidence of decreased autonomic arousal and more of psychophysiological relaxation (heart rate and respiratory rate reduction), and improved somatic steadiness (decreased errors in the steadiness test).

3. The changes at the end of 3 months in volar GSR in different directions (increase /decrease/ no change), depending on the initial values, suggests that practising yoga may help to bring about a balance in different autonomic functions, so that functioning is optimised.

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