# Clinical Study of Yoga Techniques in University Students with Asthma: A Controlled Study

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## ABSTRACT

*Adult asthmatics, ranging from 19 to 52 years from an asthma and allergy clinic in a university setting volunteered to participate in the study. The 17 students were randomly divided into yoga (9 subjects) and nonyoga control (8 subjects) groups. The yoga group was taught a set of breathing and relaxation techniques including breath slowing exercises (pranayama), physical postures (yogasanas), and meditation. Yoga techniques were taught at the university health center, three times a week for 16 weeks. All the subjects in both groups maintained daily symptom and medication diaries, collected A.M. and P.M. peak flow readings, and completed weekly questionnaires. Spirometry was performed on each subject every week. Analysis of the data showed that the subjects in the yoga group reported a significant degree of relaxation, positive attitude, and better yoga exercise tolerance. There was also a tendency toward lesser usage of beta adrenergic inhalers. The pulmonary functions did not vary significantly between yoga and control groups. Yoga techniques seem beneficial as an adjunct to the medical management of asthma.* (Allery and Asthma Proc 19:3–9, 1998)

Yoga, an ancient Indian traditional physical and meditation posture, is becoming popular throughout the world. Yoga is the process of elevating oneself through the process of calming the mind.[1] Yoga helps in the development of the physical,[2] mental, emotional, intellectual, and spiritual growth.[1]

Previous studies showed the efficacy of yoga therapy in various disorders such as asthma,[3–16] hypertension,[17–21] and diabetes.[1,5] Datey et al. demonstrated that yogic exercise (savasana) significantly reduced blood pressure in hypertensive patients.[17] Patel observed that yoga and biofeedback were effective in reducing resting blood pressure over a long period in hypertensive patients in England.[19–21] A prospective investigation by Benson et al. in the United States showed the usefulness of the regular elicitation of the relaxation response in the management of hypertensive subjects on drug therapy.[18] Goyeche et al. concluded that yoga therapy is very effective in patients with asthma followed over a 3-year period at a large university hospital in Japan.[4] Significant symptomatic improvement after yoga training for 9 months in patients with chronic severe airways obstruction was observed in Australia.[8] A decade ago both short[10] and long-term prospective studies in India[11] showed clearly the beneficial effects of yoga in the management of bronchial asthma.

Along with other nonpharmacological adjuncts to conventional therapy for bronchial asthma,[22–26] yoga techniques have been shown to have a beneficial role in the management of asthma.[3,4,7–11] Our earlier pilot study (unpublished observation) in moderately severe outpatient asthmatics showed that performance of yoga techniques over a 20-week period resulted in a significant improvement of lung function, a reduction in theophylline intake, and a decrease in acute episodes.

In order to understand further the beneficial value of yoga techniques, the present study was designed to establish the efficacy of yoga in a clinically controlled situation with mild to moderate asthmatics.

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## PATIENTS AND METHODS

### Patients

Seventeen students with documented asthma, based upon spirometry data of improvement of forced expiratory volume in first second ($FEV_1$) values by at least 20% after bronchodilator inhalation, volunteered for this study. The group consisted of 9 females and 8 males. Ages of the patients ranged from 19 to 52 years with a mean of 26.5 years (Table I) who attended the allergy and asthma clinic at the Hartshorn Health Center of Colorado State University, Fort Collins, Colorado. The study was carefully explained to the students. Each patient signed consent to serve as a subject in the project; each patient then completed a detailed clinical questionnaire regarding his/her asthma. The Expert Panel on the Management of Asthma (National Asthma Education program) defined asthma as a lung disease with the following characteristics: 1) airway obstruction that is reversible (but not completely so in some patients) either spontaneously or with treatment; 2) airway inflammation; and 3) increased airway responsiveness to a variety of stimuli.[27] The severity and diagnosis of asthma was based upon guidelines established by the expert panel of the National Asthma Education program.[28] There were no smokers in either the control or yoga groups. All 17 patients completed the study and there were no dropouts.

### Study Design

Students with asthma were randomly assigned (complete random design) to either the yoga group (9 subjects) or the nonyoga control group (8 subjects). During the study period, the records of both groups were coded. Decoded data were unavailable to the principal investigators. The investigating physicians did not know which patients were undergoing the yoga intervention. The yoga group attended yoga classes offered at the health center by trained yoga teachers. The classes were 45 minutes in duration, three times a week, for the study period of 16 weeks. The participants were given audio cassettes and written information to continue the practices at their residences. All patients, including those in the control group, were seen at the health center by one of the principal investigators at regular intervals. All of the students were given a peak flow meter (ASSESS peak flow meter, Healthscan Products, Cedar Grove, NJ) and instructed to record daily AM and PM peak flow readings throughout the study period.

**TABLE I**

**Vital Data**

| Characteristics | Yoga Group | Control Group |
|---|---|---|
| Number of patients | 9 | 8 |
| Males | 6 | 2 |
| Females | 3 | 6 |
| Mean age (years) | 28.12 | 25.11 |
| Mean height (inches) | 68.8 | 70.11 |
| Mean weight (lbs) | 151 | 169 |
| Pulmonary function test: | | |
| Mean $FEV_1$ (Liters) | 3.22 | 4.02 |
| Mean PEFR (Liters/minute) | 413 | 420 |
| Mean FVC | 4.31 | 4.99 |

### Self-Report Measurement

A weekly symptom questionnaire from the asthma symptom check list devised by Kinsman et al.[29] was adapted with modification to assess changes in the symptoms and signs of the patients' asthma. A four point severity scale and five point frequency scale was included in the weekly questionnaire (Table II).

### Physiological Measurements

Pulmonary function was assessed[30] objectively by measurement of $FEV_1$, FVC, and FMEF using a spirometer (Spirometrics, Inc., Flowmate). Weekly measurements were made, and the mean of these recordings was used in the results.

### Yoga Methods

1. The integrated set of yogic practices included
   A. The initial warm up activity with relaxed breathing techniques with stretching exercises. Breathing exercises (5 minutes). Five types of simple, rhythmic, slow, and comfortable breathing practices associated with simple hand and body movements including hands stretch breathing, moon posture breathing, tiger breathing (Fig. 1).
   B. Loosening exercises (5 minutes) (Sithilikarana Vyayama) yoga practices to loosen the various joints.
2. Yogic postures:
   A. General yogasanas-physical postures (20 minutes): Simple, easy physical postures in standing, sitting, prone, and supine positions performed with smooth, comfortable bending movements along with specific slow-breathing procedures. These postures include lateral stretch, half wheel posture, forward bend, crocodile posture, cobra posture, half lotus posture, and shoulder stand (Fig. 2).
   B. Corpse posture (Savasana) (10 minutes): Deep relaxation practice to consciously relax the muscles regionally, followed by conscious slowing of breath and calming of the mind (Fig. 3).
3. Breath slowing techniques (Pranayama) (10 minutes): three types of special breathing techniques (Nadisuddhi, Sitkari, and Bhramari) (Fig. 4) performed with easy, comfortable, and slow deep breathing without voluntary breath-holding.
4. Meditation and discussion session (15 minutes): slow mental chanting of the syllable "aum" leading to slower

TABLE II

**Weekly Symptom Questionnaire and Severity and Frequency Scales**

**Instructions: Indicate which of the following symptoms you have experienced during the past week. Check the severity and frequency of the symptoms. Answer each item in terms of severity and frequency.**

| | | | |
|---|---|---|---|
| Severity Score (S): | A - No symptoms<br>B - Mild symptoms<br>C - Moderate symptoms<br>D - Severe symptoms<br>E - Very severe symptoms | Frequency Score (F): | 1 - Not at all<br>2 - Hardly at all<br>3 - Some of the time<br>4 - Most of the time<br>5 - All of the time |

| | S | F | | S | F |
|---|---|---|---|---|---|
| 1. Panting | | | 20. Pins and needles feeling | | |
| 2. Numbness | | | 21. Itchy throat | | |
| 3. Mucous congestion | | | 22. Wheezy | | |
| 4. Cranky | | | 23. Worried about attack | | |
| 5. Irritability | | | 24. Tingly in spots | | |
| 6. Hard to breathe | | | 25. Chest tightening | | |
| 7. Headache | | | 26. Scared | | |
| 8. Edgy | | | 27. Shallow breathing | | |
| 9. Frightened | | | 28. Choking | | |
| 10. Short of breath | | | 29. Fatigued | | |
| 11. Chest congestion | | | 30. Chest filling up | | |
| 12. Itchy lungs | | | 31. Tense muscles | | |
| 13. Afraid of dying | | | 32. Short tempered | | |
| 14. Frustrated with things | | | 33. Worried | | |
| 15. Dizzy | | | 34. Anxious | | |
| 16. Rapid breathing | | | 35. Itchy skin | | |
| 17. Worn out | | | 36. Nauseated | | |
| 18. Panicky | | | 37. Coughing | | |
| 19. Weak | | | 38. No energy | | |
| | | | 39. Worried about self | | |

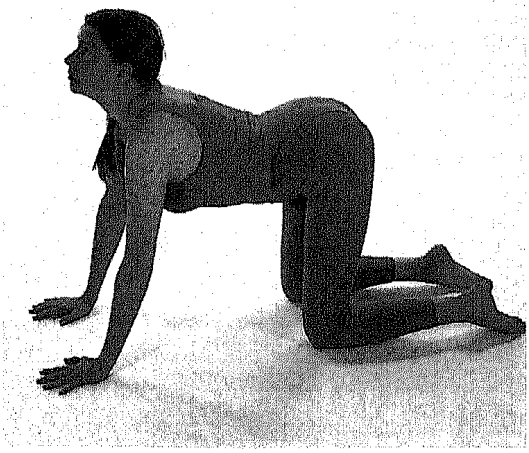

*Figure 1. Tiger Breathing.*

mental activity. The discussion session was designed to understand the emotional well being and positive outlook in general, and to result in a feeling of freedom and relaxation.

5. Lectures and discussions were based on yoga philosophy and yoga therapy. Embedded in these practices are the key features of yoga operating from four different levels: deep relaxation of different groups of muscles, slowing of breath and no voluntary holding of breath, calming of the mind, and emotional equipoise.

### Statistical Analysis

The weekly Symptom Questionnaire from control and yoga groups were analyzed using Mann-Whitney's test by the staff of the Department of Statistics, Colorado State University, Fort Collins, Colorado.

## RESULTS

### Medication Usage

The results showed a reduction in the use of adrenergic inhalers in the yoga group. In the control group, none of the subjects reduced the use of the inhalers; instead, two of the six control subjects showed increased usage of adrenergic inhalers (Table III). However, the difference between the two groups was not statistically significant. There were no differences between the two groups regarding the use of theophylline preparations, inhaled steroids, or antihistamines.

### Self-Report Analysis

The Weekly Symptom Questionnaire included 39 different questions relating to patients' asthma, attitudes, emotions,

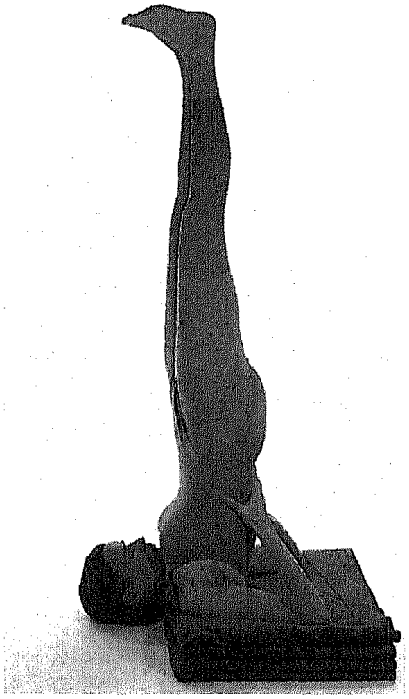

*Figure 2. Shoulder Stand.*

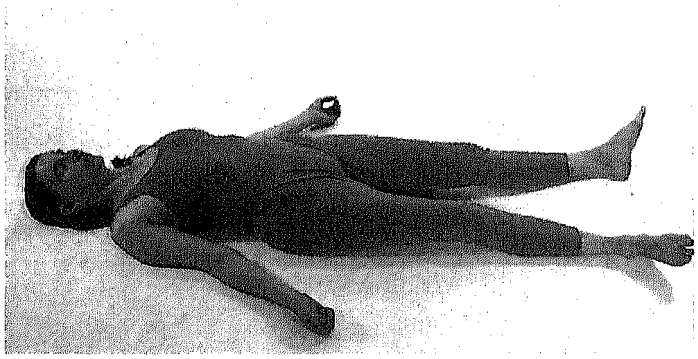

*Figure 3. The Corpse Pose—Savasana.*

and psychological functions. The post-weekly symptom score for severity (A–E) and frequency[1–5] were consolidated into one series of scores on the basis of most frequent occurrence, over the weeks recorded. The difference between the pre and post study values were quantified individually by giving the following weighted points to the quality of change:

Improvement in both the severity and frequency,
2 points
Improvement in either severity or frequency,
1 point
No change in either severity or frequency,
0 points
Worsening in either severity or frequency,
-1 point
Worsening in both severity and frequency,
-2 points

The average weight score for the yoga group (score 7.00) was much higher than for the control group (score 1.75) (Table IV). However, this difference was not statistically significant, based upon the Mann-Whitney test. The non-pulmonary weighted score was higher in the yoga group compared to the control group, but this difference was not statistically significant. There was no significant difference between the two groups regarding the pulmonary weighted score.

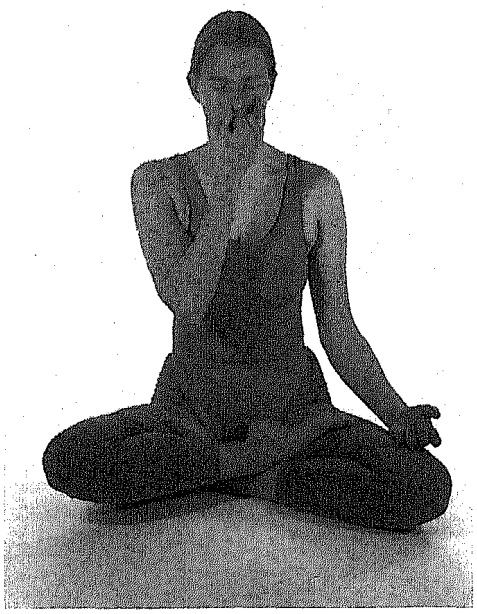

*Figure 4. Alternate Nostril Breathing—Nadi Suddhi Pranayama.*

### Respiratory Measurements

Peak expiratory flow rates were recorded daily (AM and PM) for both the yoga and control groups throughout the study period. Analysis of the data revealed that there were no significant differences in the AM and PM peak flow rates between the groups (Table V). Table VI) shows the mean FVC, $FEV_1$, and FMEF 25–75% readings recorded in both the yoga and control groups at baseline and at weeks 4 and 6. Both yoga and control group showed no improvement in FVC, $FEV_1$, and FMEF 25–75% between weeks 4 and 6 of the study.

## DISCUSSION

The results showed a tendency toward a decrease in the usage of beta adrenergic inhaler during 16 weeks of regular practice of yoga. Varandani[5] reported a 74% rate of improvement in 255 asthma patients who used yoga therapy alone (no medication except for emergencies) at Yogic Treatment-cum-Research Center in Jaipur, India. Similarly, a 76% rate of improvement was found in 114 asthma cases treated during a 1-year period by only yoga methods.[7] In another report, Vahia[6] claimed a 93% improvement rate in 15 asthmatics undergoing yoga therapy. Other studies carried out in Yoga centers in India also claimed that other standard yoga practices were effective with asthma as well.[5,7,15,16]

TABLE III

Medication Usage in Yoga and Control Group

| Medications | Number of Patients | Dosage Increase | Dosage No Change | Dosage Decrease |
|---|---|---|---|---|
| Yoga Group | | | | |
| β-Adrenergic Inhalers | 4 | 0 | 2 | 2 |
| Inhaled Steroids | 2 | 0 | 1 | 1 |
| Theophylline | 2 | 0 | 2 | 0 |
| Antihistamines | 3 | 0 | 3 | 0 |
| Control Group | | | | |
| β-Adrenergic inhalers | 6 | 2 | 4 | 0 |
| Inhaled steroids | 2 | 1 | 0 | 1 |
| Theophylline | 2 | 1 | 1 | 0 |
| Antihistamines | 3 | 0 | 3 | 0 |

TABLE IV

Weighted Score of the Responses from Weekly Questionnaires

| Groups | Total Score | Mean | Mean Pulmonary | Mean Nonpulmonary |
|---|---|---|---|---|
| Yoga | 7.00 (10.16) | 0.23 (0.31) | 0.01 (0.72) | 0.36 (0.33) |
| Control | 1.75 (24.14) | 0.06 (0.81) | 0.05 (1.28) | 0.07 (0.53) |
| Significance | NS | NS | NS | NS |

*Values represent means, standard deviation in parentheses, NS not significant.*

TABLE V

Peak Expiratory Flow Rates in Yoga and Control Groups

| Group | Number of Patients | Baseline (Liters/min) | 4 Weeks (Liters/min) | 6 Weeks (Liters/min) |
|---|---|---|---|---|
| A.M. | | | | |
| Yoga | 7 | 413 (48) | 413 (48) | 412 (60) |
| Control | 7 | 420 (79) | 424 (76) | 397 (48) |
| P.M. | | | | |
| Yoga | 7 | 406 (49) | 406 (49) | 406 (62) |
| Control | 7 | 412 (63) | 411 (65) | 402 (57) |

*Peak Expiratory Flow rates expressed as Liters/minute. Values represent means, standard deviation in parentheses.*

We hypothesized that results similar to those reported elsewhere would be obtained here with asthma patients of different ethnicity. In contrast, our studies showed no significant improvement in medication usage in patients practicing yoga. Failure to confirm our hypothesis may be due to inappropriate exposure of the patients to the Yoga philosophy, a short study period, and a possible lack of positive attitude toward yoga therapy. According to Goyeche[4] better results may be attainable with asthmatic patients in the Indian environment at institutions solely devoted to yoga, where yoga was born and has been known for thousands of years. However, other investigators reported decreased blood pressures in hypertensive subjects[17,18] who practiced yogic techniques and a yogic technique combined with biofeedback.[19–21]

In our study, no significant improvement of respiratory function, such as $FEV_1$ and FMEF 0.25–0.75, was observed after yoga therapy in the yoga group and only FVC values improved slightly during the study period. The improvement of FVC alone without improvement of either $FEV_1$ or FMEF 0.25–0.75 is not indicative of changes consistent with asthma. A similar result was obtained in a much larger study by Nagarathna et al.[10] wherein 51 patients were evaluated over a 6-month period, although the authors do report a significant improvement of FVC with no improvement of $FEV_1$ or FMEF 0.25–0.75 or peak flow rates. Early studies on Hatha Yoga by Udupa et al.[2] showed a significant improvement in respiratory function, with lowered rate of respiration, increased expansion of the chest, vital capacity, and breath-holding time in 12 young, (23.0+3.36 years) normal male volunteers.

The Weekly Questionnaire revealed that the yoga subjects were more positive and relaxed compared to the control group. Using mental and muscular relaxation therapy,

TABLE VI

Pulmonary Function Data

| Yoga Group | Baseline | 4 Weeks | 6 Weeks | *P* Value |
|---|---|---|---|---|
| FVC (Liters) | 4.31 (1.06) | 4.39 (1.12) | 4.51 (1.18) | NS |
| $FEV_1$ (Liters) | 3.22 (0.68) | 3.10 (0.86) | 3.29 (0.82) | NS |
| FMEF 25–75% (Liters/second) | 2.95 (1.26) | 2.36 (1.15) | 2.57 (0.98) | NS |
| **Control Group** | **Baseline** | **4 Weeks** | **6 Weeks** | ***P* Value** |
| FVC (Liters) | 4.99 (1.55) | 4.97 (1.67) | 5.63 (1.40) | NS |
| $FEV_1$ (Liters) | 4.02 (1.64) | 3.60 (1.57) | 4.19 (1.05) | NS |
| FMEF 25–75% (Liters/second) | 3.11 (1.30) | 3.00 (1.80) | 3.64 (1.86) | NS |

*Values represent means, standard deviation in parentheses.*

the yoga group in general exhibited a more positive attitude, feeling of well being, and felt less panicky over the period of the study. There was little difference between the two groups regarding the pulmonary weighted score. This could be due to the possibility that the yoga techniques did not result in any significant change in their asthma control in the short period of the study or that the subject number may be too small to derive any conclusions. Using mental and muscular relaxation therapy, Erskine[31] observed a moderate correlation between objective respiratory measurement of improvement ($FEV_1$) and subjective assessment of improvement.

The probable reasons for the lack of statistical differences in several of the parameters between the two groups may be due to the fact that the number of subjects was too small; their pulmonary physiology is basically normal to start with, and such yoga practices need to be performed over a longer period of time. These points need to be considered in future studies in this field.

The yoga group reported a better sense of well being overall with more positive attitude and enthusiasm based on the Weekly Questionnaire. This could be an important factor to be considered in view of a reported increase in asthma morbidity in patients with negative attitudes and poor self-image.[32] At the end of the study period, the majority of control group patients switched to the yoga practice. The patients in the yoga group continued to perform yoga exercises on a regular basis. The long-term effects and the relative therapeutic value of the yoga techniques in asthma remain to be established.

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