

EFFECT OF YOGA AND PRANAYAMA ON CHEST EXPANSION AND BREATH HOLDING TIME IN CHEFS EXPOSED TO COOKING FUMES

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ABSTRACT

Background: Chefs exposed to cooking fumes are at risk due to the toxic products that are produced during cooking. Studies have shown that exposure to cooking fumes decreases lung capacities, affects breathing and cause other respiratory diseases. Yoga strengthens the respiratory musculature due to which chest and lungs inflate & deflate to fullest possible extent & muscles are made to work to maximal extent. Pranayama makes efficient use of abdominal & diaphragmatic muscles and improves the respiratory apparatus.

Aim: The present study was done to determine the effect of Yoga & Pranayama on chest expansion & breath holding time in chefs exposed to cooking fumes.

Methods: In this experimental study 30 chefs exposed to cooking fumes who fulfilled the inclusion and exclusion criteria using Medical research council questionnaire for respiratory symptoms were selected for yoga and pranayama program for 6 weeks, 3 sessions per week for 45 minutes. Pre and post respiratory functions were assessed by measuring chest expansion and breath holding time. Stastical analysis was done by using Wilcoxon test to compare the pre & post chest expansion. Paired t test was used to compare the pre & post breath holding time.

Results: There was significant increase in chest expansion and breath holding time compared to pre yoga and pranayama practice.

Conclusion: This study showed that there is significant effect of yoga and pranayama on chest expansion & breath holding on chefs.

KEYWORDS: Chefs, cooking fumes, yoga, pranayama, chest expansion, breath holding time.

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INTRODUCTION

The term "cooking fumes" are emissions that are produced during cooking. These cooking fumes are produced by frying, grilling or by heating oil beyond its boiling temperature. When food is cooked on high temperature carbohydrates, fats, proteins are reduced to toxic products like aldehydes and alkanolic acid. Aldehydes such as formaldehyde, acetaldehyde, acrolein, are the chemicals produced by

destruction of sugar and fats and pyrolysis of protein. These aldehydes on inhalational exposure cause irritation of airways[1].

Chefs are exposed to cooking fumes as they have to work for at least 6-7 hours per day. So chefs are at risk from exposure to toxic products that are produced from cooking fumes. Studies have shown that exposure to cooking fumes decreases lung capacities, affects breathing and cause other respiratory diseases [1].

The word YOGA means UNION of mind, body & spirit. Yoga has number of beneficial physiological effects on various systems in our body. Yoga techniques include the practices of meditation, a variety of breathing exercises & the practices of number of physical exercises and postures. Yoga respiration consists of very slow deep breaths with sustained hold of breath after each inspiration and expiration. Yoga strengthens the respiratory musculature due to which chest and lungs inflate & deflate to fullest possible extent & muscles are made to work to maximal extent [7].

The Sanskrit word asana derives from the verbal root as meaning 'to sit' or 'to be present' & in context to yoga tradition means 'to be established in a particular posture. Physiologically proper practice of asanas will balance neurological and hormonal activity, strengthen cardiovascular and respiratory functioning, improve absorption of nutrients and elimination of waste and strengthen body's ability to resist and even overcome chronic diseases [10].

Pranayama is control of breath. Pranayama 'prana' means life force / life energy, 'yama' means discipline/ control, 'ayama' means expansion. So pranayama is control of inspiration & expiration. Its essence lies in modification of our normal process of breathing. The inspiration of pranavayu is shwasa and expiration is prashwasa & cessation of both is characteristics of pranayama [7].

Pranayama consists of modifications of the breathing process which is brought about deliberately and consciously [12]. It improves overall performances of body [7]. The essence of pranayama practice is slow and deep breathing. It also refreshes air throughout the lungs in contrast with shallow breathing that refreshes air only at the base of the lungs. [6] Pranayama makes efficient use of abdominal & diaphragmatic muscles and improves the respiratory apparatus [7]. Thus studies have shown that regular practice of pranayama increases chest wall expansion and almost all lung functions.

MRC Questionnaire on Respiratory Symptoms: The MRCQ is used in epidemiological & occupational respiratory surveys & as a part of assessment of lung function. It comprises of 17

questions on respiratory symptoms, detailed question on smoking history and past illness. The questionnaire also helps in identifying underlying factors including previous chest illness [4].

Since yoga and pranayama have proven to be beneficial and therapeutic effects on respiratory functions, this study was performed to determine the effect of Yoga & Pranayama on chest expansion & breath holding time in chefs exposed to cooking fumes.

METHODS

The type of study performed was experimental study. Sample size was obtained through convenient sampling method. Chefs between 30-40 years of age exposed to cooking fumes were selected. Subjects who were willing to participate in this study. Chefs cooking for 6 hours per day were included in the study. Subjects with respiratory disorder, cardiovascular disorder, neurological disorder, history of smoking, history of hypertension, psychological illness and who were already on exercise program were excluded from the study.

Prior to starting the study, a written consent form was taken from all the subjects in language best understood by them. The subjects were explained about the procedure. The subjects were asked to fill the MRC Questionnaire of respiratory symptoms.

Through this questionnaire we were able to exclude the subjects with history of respiratory, cardiovascular disorder, smoking.

Prior to treatment chest expansion and breath holding time was recorded. Chest expansion was measured using measuring tape at all the three levels axillary, nipple & xiphisternum level. Three readings were taken. Then from those three readings mean value was calculated.

Breath holding time was measured in seconds from the time of holding breath after deep inspiration till the break point of held breath by using a stop watch. The maximum value of 3 similar trials were taken. Then from those three readings mean value was calculated.

After recording chest expansion and breath holding time all subjects were given yoga & pranayama training for a period of 6 weeks,

3 sessions per week for 45 minutes.

Yoga protocol will include:

- 1) Prayer - 2 minutes.
- 2) Asana - 8 minutes.
 - a) Tadasana - 2 minutes.
 - b) ArdhaChakrasana - 2 minutes.
 - c) Bidilasana - 2 minutes.
 - d) Uttanapadasana - 2 minutes.
- 3) Pranayama - 30 minutes
 - a) Nadishuddhi - 15 minutes.
 - b) Kapalbhathi - 10 minutes.
 - c) Bhaya - 10 seconds 5 times. (1 minute for each session)
- 4) Prayer - 2 minutes.

After 6 weeks chest expansion and breath holding time was again assessed as before the start of yoga training.

Wilcoxon test has been used to find the significance between the pre & post chest expansion values and $p < 0.05$ was considered to be significant. Paired t test has been used to find the significance between the pre & post breath holding time and a $p < 0.0001$ was considered to be significant.

Fig. 1: indicates the materials used for the research purpose. It includes pen, paper, stopwatch, measuring tape and yoga mat.

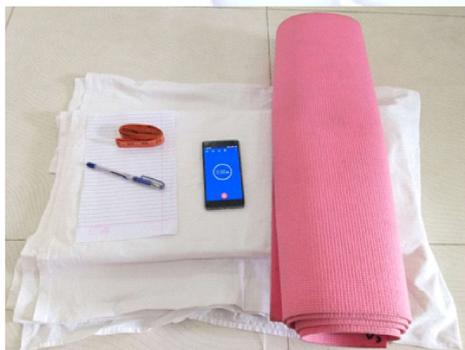


Fig. 2:Tadasana.



Fig. 3:ArdhaCakrasana.

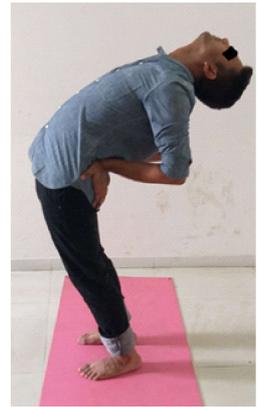


Fig.4:Bidilasana.



Fig. 5:Uttanapadasana.



Fig. 6:Nadishuddhi Pranayama.



Fig. 7:Kapalbhathi Pranayama.



Fig. 8: Bhaya Pranayama.



RESULTS

Results were presented as Mean \pm SD. The age of the subjects ranged from 30-40 years the mean age being 32.05 ± 2.06 years.

Effect on Chest Expansion: The chest expansion of the subjects were increased significantly at the end of 6 weeks of yoga and pranayama practice.

Table 1: Effect of yoga and pranayama on chest expansion (in inches).

	PRE	POST
Mean	3.2	3.78
Standard Deviation	0.65	0.71
P value	<0.0001	

Effect on Breath Holding Time: The breath holding time of the subjects were increased significantly at the end of 6 weeks of yoga and pranayama practice.

Table 2: Effect of yoga and pranayama on breath holding time (in seconds).

	PRE	POST
Mean	27.45	31.52
Standard Deviation	4.62	4.52
P value	<0.0001	
Correlation coefficient [®]	0.983	

DISCUSSION

The purpose of this study was to determine the effect of yoga and pranayama on chest expansion and breath holding time on chefs exposed to cooking fumes.

Cooking fumes contains aldehydes. When food is cooked on high temperature carbohydrates, fats, proteins are reduced to toxic products like aldehydes and alkanolic acid. Aldehydes such as formaldehyde, acetaldehyde, acrolein, are the chemicals produced by destruction of sugar and

fats and pyrolysis of protein. These aldehydes on inhalational exposure cause irritation of airways [1].

Studies have shown that exposure to cooking fumes decreases lung capacities, affects breathing and cause other respiratory diseases. Yoga has number of beneficial physiological effects on various systems in our body. Yoga respiration consists of very slow deep breaths with sustained hold of breath after each inspiration and expiration [7]. By doing so, it expands the lungs more than during normal breathing and thus recruiting previously closed alveoli which results in increased surface area of respiratory membrane and air diffusion across the membrane. It is also known that yoga appears to result in somatic muscular relaxation finally resulting in reduction in airway resistance [14]. Chanavirut R (2006) et al demonstrated that short term yoga increases chest wall expansion and lung volumes in young healthy Thais.

Pranayama is control of inspiration & expiration. Usually breathing is not a conscious event and is regulated automatically by the nervous system through the respiratory centers located in the medulla oblongata and pons. These are the dorsal and ventral group of neurons located in the medulla, the pneumotaxiccenter and the apneustic center located in the pons. The activity of these respiratory centers is in turn modified by supra-pontine influences, in the conscious being. While the basic respiratory rhythm in normal situations is maintained by the impulses discharged by the dorsal group of neurons, the pneumotaxiccenter indirectly controls the duration of inspiration and helps in relaying the suprapontine impulses which promote voluntary inspiration and expiration. During daily practice of pranayama the basic activity of the bulbo-pontine complex is modified in such a way as to slow down its rhythm. Thus after continuous practice of pranayama for few weeks, the bulbo-pontine complex is adjusted to the new pattern of breathing which is slower than its basal rhythm. Also by voluntarily prolonging the phase of inspiration and expiration, the respiratory muscles are stretched to their full extent and the respiratory apparatus is able to work to their maximal capacity represented by increased

chest wall expansion and lung volumes [6].

In pranayama there is continuation of the phase of inhalation with strong voluntary control so that lungs are expanded considerably and the walls of the alveoli are stretched to the maximum extent. Thus the chest continues to get expanded under cortical control. The stretch receptors are thus trained to withstand more and more stretching. This helps in holding the breath for a longer time. In addition, increased development of respiratory musculature and endurance due to regular practice of pranayama delays the onset of fatigue, thus allowing the breath holding for longer time [6].

In the present study, six weeks yoga & pranayama protocol was given to chefs who were exposed to cooking fumes. The sample consisted of 20 male chefs. Prior to yoga & pranayama chest expansion & breath holding time was noted and then after six weeks again chest expansion & breath holding time was recorded. Stastical analysis was done by using Wilcoxon test to compare the pre & post chest expansion which is statistically significant ($p=0.0001$). Paired t test was used to compare the pre & post breath holding time which is also significant ($p=0.0001$).

Thus our study showed significant effect of yoga & pranayama on chest expansion & breath holding time on chefs exposed to cooking fumes.

CONCLUSION

The study concluded that there is significant effect of yoga and pranayama on chest expansion & breath holding on chefs. Compared with the general population, chefs have a much higher prevalence of both chronic and acute respiratory symptoms. Practice of yoga and pranayama will help in enhancing the respiratory capacity of chefs. It is suggested that measurement of other respiratory parameters could have been done using large sample size. Also the duration of yoga and pranayama could have been increased. The study can be clinically implied by prescribing Yoga & Pranayama more effectively for health promotion and also to improve respiratory system functioning.

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Conflicts of interest: None

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