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## Effect of Lung Specific Yoga Mudras on Pulmonary Function Tests in subjects with FEV1% predicted values less than 80%

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### ABSTRACT

**Background and aim:** Mudras are gesticulations of explicit body position. For the most part, Mudras help in correspondence like gesturing head to say indeed, raising thumb to pass on progress. They likewise utilized in yoga, reflection, and dance.

**Materials and methods:** The probable, similar examination was done in the division of Anesthesia of a private Medical College Hospital, Madurai subsequent to getting Institutional Ethical Clearance. 100 individuals in the age gathering of 20-30 years going to General Medicine OP among June and September 2019 and clinic staff who undertook in were enlisted for the investigation. Both weight and stature coordinated with males and females with odd spirometry esteem with FEV1% anticipated qualities under 80% were comprised for the investigation.

**Results:** Pulmonary function tests (PFT) values in control group subjects were statistical, not Significant. On the other hand, significant enhancement in all the limits was seen apart from FEV1/FVC% in the study group. Even Though it is statistically significant, the value had enhanced after mudra practice from  $78.57 \pm 14.28$  to  $81.12 \pm 9.85$ .

**Conclusion:** The outcomes demonstrate that explicit lung mudras essentially improve lung work. The day-by-day schedule can profit populaces experiencing prohibitive and obstructive lung conditions. Particularly this could be valuable for post Coronavirus patients with remaining lung discrepancies.

### 1. Introduction

Mudras are gesticulations of explicit body position. For the most part, Mudras help in correspondence like gesturing head to say indeed, raising thumb to pass on progress. They are likewise utilized in yoga, reflection, and dance. Aside from this, yogic mudras were known to have a healing job in ailments.<sup>[1, 2]</sup> Mudras include gestures of hand (hashta mudras), yet additionally head (mana mudras), and body (kaya mudras). Hasta mudras include the certain situation of hand and fingers. In yogic writing, each finger has got its capacity. Thumb indicates the fire component; the index finger signifies air, the center finger means ether, the ring finger means earth, and the little finger signifies water. Illness happens because of disparity in these five components. Putting the fingers in explicit positions adjusts every one of the components and improves health.<sup>[3]</sup>

Two-point separation edges are a proportion of material keenness. This worth will be littlest where the touch receptors are bountiful and most noteworthy where the touch receptors are lesser in the count. The palm and internal part of fingers have rich tactile innervation. Thus, the two-point separation esteem at the tip of the fingers is between 2-3 mm, because of the presence of plentiful tangible receptors around here.<sup>[4]</sup> At the foundation of the palmar part of fingers, it is almost 5-6 mm and in palm locale 8-15 mm. Hence, there is a bigger space of portrayal for thumb, fingers, and hand in the cerebral sensory and motor homunculus. Placing the fingers at an explicit position invigorates these tactile receptors, communicating impulses through the dorsal section pathway to the inverse sensory cortex. Since both the hands are used for mudras, there will be the concurrent actuation of related spaces of both the cerebral sides of the hemisphere. Customary acts of hand mudras

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can build the space of portrayal in the cortex by continually changing the homunculus map by cortical flexibility. The cerebral cortex thus initiates the autonomic nervous system (ANS) through the nerve center.<sup>[5]</sup> Autonomic efferent fibres supply the cardiovascular muscle, smooth muscles, including bronchial smooth muscle and glands. The movement of ANS keeps up homeostasis in every one of these structures.<sup>[6]</sup>

Scarcely any past investigations had shown the impact of hand mudras in improving emotional wellness and lessening stress.<sup>[7, 8]</sup> A mudra study on cardiovascular and neurological boundaries showed decreased circulatory pressure and enhanced myocardial perfusion and cerebral bloodstream. Even though reviews recommend explicit mudras to improve lung work, the trial proof is as yet inadequate. It is the main investigation of its sort to decide the impact of explicit lung mudras on PFT.

Pulmonary Function Tests are entirely important in both evaluation and management of lung work. Forced vital capacity (FVC) Forced expiratory volume in 1 second (FEV1), FEV1/FVC proportion, Peak expiratory stream rate (PEFR), Maximal mid expiratory stream rates (FEF25-75%), V max 25%, 50%, and 75% are for the most part used to discover block in bigger and more modest airways routes of the lung. FEV1/FVC esteem under 70 % with FEV1 diminished more than FVC signifies an obstructive sickness, and an FEV1/FVC, more than 70 % with FVC, decreased more than FEV1 indicates a prohibitive illness. FEF25-75%, the maximal flow rates amidst 25%-75% of the essential limit, implies a more modest airway route hindrance. PEFR is utilized to discover bigger airway route obstacles. Henceforth, the point of the current examination is to decide the impact of explicit lung mudras on lung work utilizing PFT.

#### **Aim and objectives**

1. To decide the prompt impact of explicit lung mudras on pneumonic function tests following 30 minutes of mediation in investigation subjects with FEV1% anticipated under 80%.
2. To decide the progressions in pneumonic function tests in controlled subjects with FEV1% anticipated under 80% following 30 minutes of rest.
3. To think about the pneumonic function test changes between the examination and the controlled group.

## **2. Materials and methods**

A probable, similar examination was done in the division of Anesthesia of a private Medical College Hospital, Madurai, after getting Institutional Ethical Clearance No. VMCIEC/17(a)/2018. One hundred individuals in the age gathering of 20-30 years going to General Medicine O.P among June and September 2019 and clinic staff who undertook in were enlisted for the investigation. Both weight and stature coordinated with males and females with odd spirometry esteem with FEV1% anticipated qualities under 80% were comprised for the investigation. Volunteers with ordinary spirometry esteem, on drug treatment, with Musculoskeletal issues, mental infirmities, history of smoking, medical procedures in the current past and past acquaintance to mudra preparing, or other types of normal exercise were omitted from the investigation. The investigation was disclosed obviously to the members, and willful assent was obtained. Reference point information on all members was gathered utilizing an organized survey. Individuals who satisfied the consideration norms went through spirometry to quantify the pulmonary function test (PFT) values. One hundred individuals whose FEV1% anticipated qualities under 80% were then appointed as control bunch (n=50) and study bunch (n=50) by utilizing a random grouping created in Microsoft Excel.

#### **Description of intervention**

The examination subjects were told to abstain from caffeine, nicotine, and liquor. Subjects on free apparel were told to relax for 10 minutes at first in the sitting stance on the ground. At that point, they were educated to play out all hand mudras by a certified yoga teacher, alongside smooth and profound breathing. Specific guidance was given not to move their hands and focus on their fingertips while doing hasta mudras. The resulting were the mudras trained in instruction, using both the hands.<sup>[1]</sup>

#### **Atmanjali mudra**

Join the palms together in Namaste position (5minutes).

#### **Bronchial mudra**

Spot the little finger at the foundation of the thumb, the ring finger on the upper thumb joint, and the center finger on the stack of the thumb. Broaden the index finger (5 minutes).

#### **Asthma mudra**

Press the fingernails of both middle fingers by stretching other fingers. (5 minutes).

#### **Brahmara mudra**

Spot the index finger on the foundation of the thumb. Spot the tip of the thumb on a center fingernail. Expand ring and little finger (7 minutes).

#### **Linga mudra**

Place the two palms together and catch fingers. One thumb ought to stay upstanding; surround it with the thumb and forefinger of another hand (8 minutes). Mudra was adept in standup position synchronizing respiration.

#### **Data collection method and tools**

After an assortment of standard information on arthrometric procedures, both the examination and the controlled groups went through spirometry. PFT was estimated utilizing a Digital spirometer (NDD clinical technologies- Easy one air spirometer, Switzerland). Each day, the method was done between 9-12 pm to keep away from the impact of circadian pace on bronchial tone.

#### **Pulmonary function tests**

Subjects are told preceding abstain from the smoking, substantial feast, and tight dress. The subjects were approached to sit in a seat during the move to avoid fall or injury, and the lips were firmly shut to avoid the air spills around the mouth area. They are told to take a full breath in, hold the breath for a couple of moments and afterward breathe out as hard as conceivable into the gadget. Proper execution was guaranteed as the methodology is effort reliant and requires sufficient subject assistance. The move was performed multiple times to guarantee that the outcomes were reproducible and chosen the best three. The difference was under 200 ml between the moves for each subject. The adjustment was made before every session. Spiro meter was satisfactorily disinfected before the following use. Dispensable filters (for microbes and infection) in the spirometer are changed for each subject, and other high-touch surfaces are cleaned utilizing disinfecting wipes. Baseline FVC, FEV1, FEV1/FVC proportion, PEFR, FEF25-75%, Vmax 25%, 50%,

and 75% qualities are recorded for the examination control bunch subjects at first. The PFT esteems re-recorded following 30 minutes of mudra practice in examination bunch subjects and 30 minutes of rest in controlled groups.

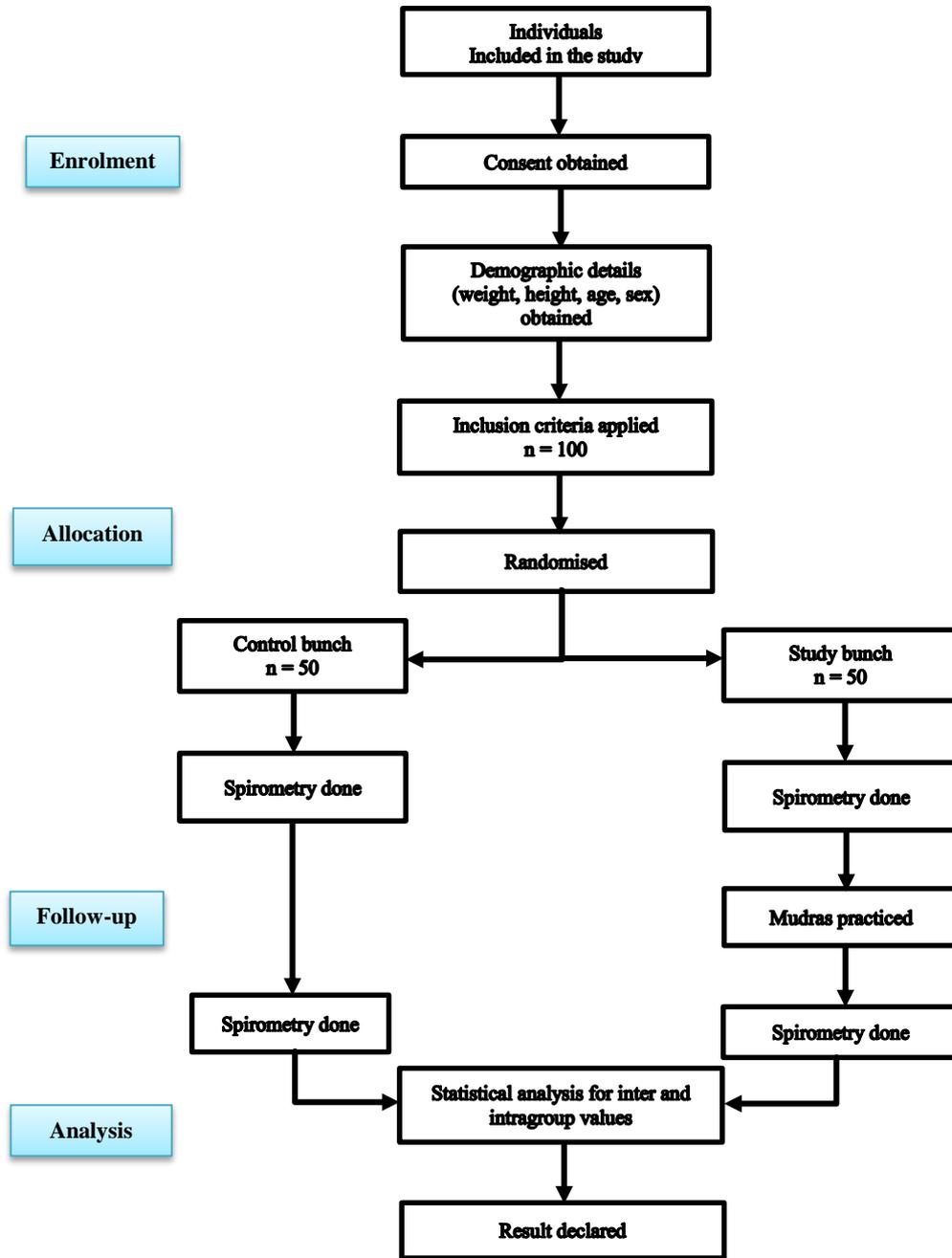


Fig. 1. Consort diagram.

### 3. Results

Statistics applied: Students’ paired t-test for parametric data and Wilcoxon test for non-parametric data ( $p \leq 0.05$  is considered significant).

Table 1. Demographic details.

| Total enrolment | Sex         | Age        | BMI        | Height (cm) |
|-----------------|-------------|------------|------------|-------------|
| 100             | ----        | 22.54±1.97 | ----       | ----        |
| ----            | male = 48   | 22.2±2.14  | 23.12±1.85 | 167.7±5.5   |
| ----            | female = 52 | 22.85±1.8  | 23.11±1.99 | 160.1±5.1   |

**Table 2. PFT values in control group subjects.**

| Parameters    | Pre value<br>(average ± SD) | Post value<br>(average ± SD) | P-value | Remark                         |
|---------------|-----------------------------|------------------------------|---------|--------------------------------|
| FVC(L)        | 3.62±0.59                   | 3.61±0.57                    | 0.28    | Statistically not significant. |
| FEV1(L)       | 2.82±0.54                   | 2.82±0.52                    | 0.31    | Statistically not significant. |
| FEV1/FVC(%)   | 78.11±8.85                  | 79.61±36.11                  | 0.42    | Statistically not significant. |
| PEF(L/s)      | 7.53±2.61                   | 7.54±2.59                    | 0.31    | Statistically not significant. |
| FEF25-75(L/s) | 4.63±0.82                   | 4.63±0.83                    | 0.50    | Statistically not significant. |
| Vmax25%       | 11.23±2.65                  | 11.22±2.70                   | 0.42    | Statistically not significant. |
| Vmax50%       | 9.14±2.83                   | 9.22±1.97                    | 0.07    | Statistically not significant. |
| Vmax75%       | 6.60±1.30                   | 6.57±1.30                    | 0.18    | Statistically not significant. |

**Table 3. PFT values in study group subjects before and after mudra practice.**

| Parameters    | Pre value<br>(average ± SD) | Post value<br>(average ± SD) | P-value | Remark                                       |
|---------------|-----------------------------|------------------------------|---------|--|
| FVC(L)        | 3.62±0.82                   | 3.87±0.78                    | 0.04    | Statistically significant increase.          |
| FEV1(L)       | 2.85±0.84                   | 3.13±0.68                    | 0.003   | Statistically significant increase.          |
| FEV1/FVC%     | 78.57±14.28                 | 81.12±9.85                   | 0.08    | Increased.<br>Statistically not significant. |
| PEF(L/s)      | 7.61±1.39                   | 8.44±2.04                    | <0.001  | Statistically significant increase.          |
| FEF25-75(L/s) | 4.67±1.48                   | 9.66±18.65*                  | 0.03    | Statistically significant increase.          |
| Vmax25%       | 11.32±16.41*                | 12.04±16.31*                 | <0.001  | Statistically significant increase.          |
| Vmax50%       | 9.27±16.21*                 | 10.34±18.49*                 | 0.002   | Statistically significant increase.          |
| Vmax75%       | 6.73±17.83*                 | 7.74±20.57*                  | 0.009   | Statistically significant increase.          |

\*non-parametric data.

Significant enhancements in all the limits were seen apart from FEV1/FVC%. Even Though there is no statistical importance, the value had enhanced after mudra practice from 78.57±14.28 to 81.12±9.85.

#### 4. Discussion

In the current investigation, MEP and MIP expanded fundamentally following four months of yoga preparing in examination bunch subjects. The current discoveries are reliable with Mandanmohan et al., who revealed that a half-year yoga preparing causes huge expansions in MEP& MIP esteems in subjects of 12-15 age gatherings.<sup>[6]</sup> De Godoy DV et al. announced that yoga causes enhancement in maximal inspiratory pressure.<sup>[7]</sup> Maximum respiratory pressures are accurate and straightforward indices of the strength of respiratory muscles.<sup>[8]</sup> The increases in MIP and MEP in our yoga group indicate yoga training improves the strength of expiratory as well as inspiratory muscles. Kapalbhathi included in our present training program involves powerful exhalation strokes that train the subjects to use the diaphragm and abdominal muscles fully. Slow, deep, full inspiration and expiration in pranayama also train the respiratory muscles and increases respiratory muscle strength. Respiratory pressures are specific and sensitive indices of respiratory muscle strength.

Black and Hyatt<sup>[9]</sup> Have demonstrated that values of MIP and MEP are altered even before there is an alteration in other commonly used pulmonary function tests. Hence evaluation of respiratory muscle strength is important from a physiological as well as a clinical point of view.

The present study shows significant improvement in FEV1, PEFR after yoga training. In accordance with our findings, Joshi et al. and Madanmohan et al. showed a statistically significant increase in FEV1, PEFR after yoga training which was statistically significant.<sup>[4, 6]</sup> Hirschi G. et al. concluded that the practice of yoga seems to be beneficial for respiratory efficiency.<sup>[3]</sup> He found significant increases in FEV1 after yoga training of 10 weeks. Bhatt J. K D et al. also found improvement in lung function parameters after the practice of yoga.<sup>[10]</sup> Bhole et al. had reported a significant increase in vital capacity after three weeks of yoga training.<sup>[11]</sup> Singh K. et al. in his study, found that there was an improvement in FEV1 and PEFR after yoga training in asthmatic patients.<sup>[11]</sup> Kaniethapriya A S. et al. also studied the effects of pranayama and yoga on asthmatic patients and found that there were significant changes in these parameters at the end of 12 weeks of yoga training.<sup>[12]</sup>

- By asana 'pressing and soaking' measure happens, in which a respiratory organ is tightened (crushed) during an asana and after emerging from the position, in this manner delivered, after that body 'soaks' it with an abundance new, supplement rich blood.
  - Asanas have the extra respiratory advantage of extending and rubbing the diaphragm, an essential muscle of breathing.
  - There happens to reinforce respiratory musculature related to the normal activities of pranayama breathing, during which the lungs and chest blow up and empty to the fullest possible level, and muscles are made to work to the maximal amount.
  - Lung expansion close to total lung capacity is a significant physiological upgrade for the issue of lung surfactants and prostaglandin into alveolar spaces, which builds lung consistency and diminishes bronchiolar smooth muscle quality and airway confrontation.<sup>[13, 14]</sup>
  - Peak expiratory flow rate (PEFR) relies upon stretchy recoil of lungs, air route opposition, and strength of expiratory muscles.<sup>[15]</sup> Yoga impacts on the versatile elastic of lung and airway route obstruction. Yoga may build the strength of expiratory muscle and expansion in the top expiratory stream rate seen.
  - By rehearsing pranayama, the different reflex components that control the respiratory focus may be changed or adjusted by creating a solid cortical power that modifies the autonomic sensory system. Hence, it moves towards the parasympathetic predominance and has advantageous effects respiratory framework.
  - By Deep Relaxation strategy, the thoughtful sensory system quiets down, which helps in diminishing bronchiolar smooth muscle tone and airway route obstruction.
  - Yogic rehearses cause one to take an increasingly slow breath with complete mindfulness; it straightforwardly and roundaboutly benefits the respiratory framework. Every one of the systems of the body are firmly related, and a large part of the gainful impact of yogic practices comes from their all-encompassing impact on the body as a bound together life form.
- The above consequences express that yoga positively affects pulmonary functions and respiratory pressure and enhances physiological purpose.

## 5. Conclusion

The outcomes demonstrate that explicit lung mudras essentially improve lung work. Day-by-day schedules can profit populaces experiencing prohibitive and obstructive lung conditions. Particularly this could be valuable for post Coronavirus patients with remaining lung discrepancies.

## Conflict of Interest

The authors declared that there is no conflict of interest.

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