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Research Article

Effect of 6 Weeks of Kapalabhati Pranayama Training on Peak Expiratory Flow Rate in Young, Healthy, Volunteers

Dinesh T [1], Gaur G S[2], Sharma V K[3], Madanmohan[4] , Harichandra Kumar KT [5], Grrishma B[6]

[1]Dinesh T, Assistant Professor, Department of Physiology, Vinayaka Mission's Medical College, Karaikal- 609605

[2]Gaur G S, Additional Professor, Department of Physiology, Jawaharlal Institute of Postgraduate Medical Education & Research, Puducherry- 605006

[3]Sharma V K, Assistant Professor, Department of Physiology, Jawaharlal Institute of Postgraduate Medical Education & Research, Puducherry- 605006

[4]Madanmohan, Professor & Head, Department of Physiology, Mahatma Gandhi Medical College and Research Institute, Puducherry - 607 402

[5]Harichandra Kumar KT, Lecturer, Department of Biostatistics, Jawaharlal Institute of Postgraduate Medical Education & Research, Puducherry- 605006

[6]Grrishma B, Assistant Professor, Department of Physiology, Yenepoya Medical College, Mangalore-575018

Corresponding author
Dr .Dinesh T

Abstract: Pranayama are breathing techniques that exert profound physiological effects on pulmonary, cardiovascular and intellectual higher centre functions. The science of pranayama deals with the control and enrichment of this vital force which results in rhythmic respiration, calm and alert state of the mind. Previous studies demonstrate that different types of pranayama produce divergent physiological effects. The aim of our study is to find out the beneficial effects 6 weeks of Kapalabhati pranayama training on peak expiratory flow rate, which is one of the pulmonary function parameters were analyzed among young, healthy volunteers. Present study was conducted in Department of Physiology, JIPMER on 60 healthy volunteers of both genders. After getting informed, written consent, subjects were randomized into pranayama group (n=30) and control group (n=30). Supervised training was given to the study group by a certified yoga instructor and they practiced Kapalabhati pranayama started with 30 times for 1 min and increased to 5 minutes/day, twice daily, thrice/week for 6weeks. Baseline recordings of Peak Expiratory Flow Rate (PEFR) were recorded using Peak Flow Meter (Pulmo Peak) before and after the pranayama training. Our results showed a significant difference in peak expiratory flow rate when compared with the values at baseline. The analysis on the effect of 6weeks of Kapalbhati pranayama on peak expiratory flow rate significantly improved ($P<0.05$, respectively). We concluded that 6 weeks of Kapalabhati pranayama training to the young, healthy volunteers showed statistically significant increase in the commonly measured pulmonary function parameters. Kapalabhati pranayama requires breath coordination at higher rate and hence, higher rate of respiratory muscle activity, that produced strengthening of the respiratory muscles and resulted in improvement of pulmonary function.
Keywords: Kapalabhati pranayama, peak expiratory flow rate, healthy lungs.

INTRODUCTION

The great Indian seer Patanjali (200 BC) has compiled and codified the knowledge regarding yoga and defined pranayama as "Regulation of the incoming and outgoing flow of breath with retention". The science of pranayama deals with the knowledge, control and enrichment of this vital force which results in rhythmic respiration, calm and alert state of mind. As a deep breathing technique, pranayama reduces dead space ventilation and decreases work of breathing. It also refreshes air throughout the lungs, in contrast with shallow breathing that refreshes air only at the base of the lungs [1]. Kapalabhati is an important part of Shatkarma the yogic system of body cleansing techniques. The word kapalbhati is made up of two words: kapal meaning 'skull' (here skull includes all the organs under the skull too) and bhati meaning 'shining, illuminating'. Due to the process, the organs under the skull mainly the brain and the small brain are influenced in a good manner. Kapalbhati pranayama helps to detoxify lungs and respiratory tracts, boosts the supply of oxygen and purifies blood and helps to tone up the abdominal muscles. It is also helpful in reducing abdominal fat, improvises concentration span. Pulmonary function tests (PFTs) provide important clinical information to identify and quantify the defects and abnormalities in the functioning of the respiratory system. Spirometry is the basic and useful method available for evaluating these pulmonary function parameters [2]. It is a simple expression of complex process, which measures airflow during inspiration and expiration and has a central role in early diagnosis and management of common respiratory diseases [3]. In view of the above background the present study was conducted to study the effect of 6 weeks of Kapalabhati pranayama training on pulmonary function.

MATERIALS AND METHODS

The Present study was conducted in Department of Physiology, JIPMER on 60 healthy volunteers of both genders, after obtaining clearance from the Institute Ethics Committee. Subjects were randomized into pranayama (n=30) and control groups (n=30), after getting informed, written consent. Mean age of the volunteers was 18.54 $\pm$ 1.65 yrs. The subjects were familiarized with the aims and objectives of the study as well as laboratory environment.

Analysis of Parameters

Using Peak Flow Meter (Pulmo Peak) pulmonary function parameters were recorded. Before recording the Peak Expiratory Flow Rate (PEFR), subjects were shown demonstration of the tests. Consequently minimum three readings were recorded of each test for every subject and the best of the three was selected for having reproducibility and validity of the recorded test. The subjects were instructed to do the procedure in the sitting posture, with the erect spine, without forward bending. The subject is asked to keep the mouth piece inside the mouth with the lips closed so as to make a seal, to avoid air leak while blowing; nose was closed with the nose clips. These procedures were repeated for two more times with of 3-5 minutes of interval in-between. The subjects are instructed to give their maximal effort. PEFR was noted. Three readings were taken and the best value out of them was recorded. The same procure was followed while recording the post values at the end of 6 weeks of pranayama training.

Pranayama training

Supervised training was given to the study group by a certified yoga instructor at Advanced Centre for Yoga Therapy Education and Research (ACYTER), JIPMER, Puducherry as per the guidelines of Morarji Desai National Institute of Yoga, New Delhi and they practiced Kapalabhati pranayama started with 30 times or 1 min and increased to 5 minutes/day, twice daily, thrice/week for 6 weeks. Rest of the days, subjects were motivated to practice at their home.

Statistical analysis

Data for all parameters at baseline and post test were collected as per the study protocol and computerized in Microsoft Excel database. Data was summarized by using descriptive statistics such as percentage, mean and SD for different parameters. Longitudinal changes in each group were compared by using Student's paired t-test. $P<0.05$ was considered as statistical significant.

RESULTS

Our results showed a significant difference in peak expiratory flow rate among the two groups. The highest value recorded at the end of 6weeks of Kapalbhati pranayama was around 300-350 L\M and in control group the value was around 200-250 L\M. Our study reveals that Kapalbhati pranayama has a wide role in improving the airway movement around the pulmonary system which shows effective values on PEFR. Analysis done by Student's paired t-test. *P<0.05,

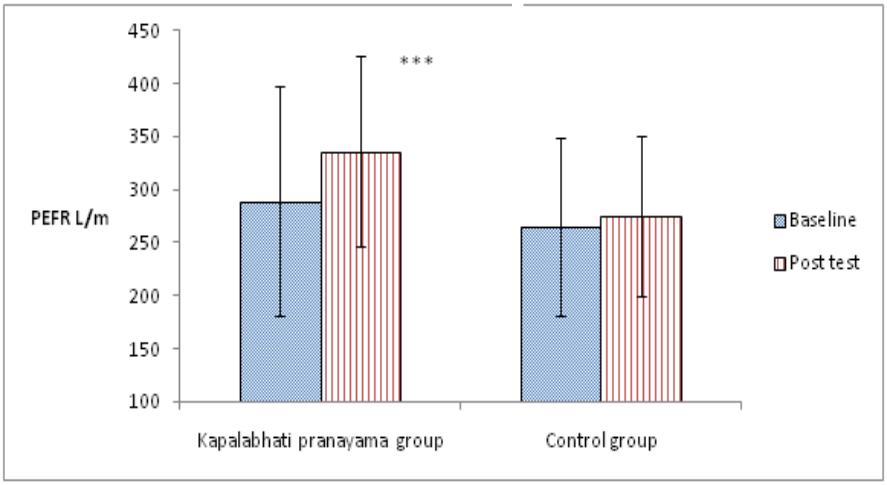

Figure 1: Shows the comparison of peak expiratory flow rate (PEFR) of the study participants before and after 6 weeks of study period

DISCUSSION

Pranayama involves manipulation of breath movement and the breath is a dynamic bridge between the body and mind. Pranayama consists of three phases: purak (inhalation), kumbhak (retention) and recheck (exhalation) that can be practiced in either slow or fast manner [4]. The psychosomatic effects of different pranayamas are believed to derive from differences in duration of the phases of the breathing cycle, tidal volume and other factors including the use of mouth, nostrils, and constriction of the laryngeal muscles and position of the glottis [5]. Kapal is forehead and bhati means glow. Kapalbhati pranayama purifies entire respiratory system and ensures you radiant and glowing

skin. The technique of Kapalabhati pranayama involves short and strong forceful exhalations and inhalation happens automatically. Very few references are available on the effect of Kapalabhati pranayama training on cardio-respiratory parameters in individuals. Our results are in agreement with that of Raghuraj *et al* [6] who found that practicing fast pranayamas like kapalabhati for 6 weeks lead to decrease in sympathetic activity and is not in agreement with observations of few other studies. Madanmohan *et al* [7] evaluated short term effect of three weeks of bhastrika pranayama practice on cardio-respiratory variables and reported an increase in sympathetic activity. Yadav and Das [8] attributed that improvement in the PFT parameters by yogic practices due to increased respiratory muscle strength, clearing of respiratory secretions and using the diaphragmatic & abdominal muscles for filling the respiratory apparatus more efficiently and completely. Also, the improvement in the PFT parameters may be due to rise in thoracic–pulmonary compliances and broncho dilatation by pranayama training.

Stimulation of pulmonary stretch receptors by inflation of the lung reflexely relaxes smooth muscles of larynx and tracheo bronchial tree. Probably, this modulates the airway caliber and reduces airway resistance [9]. Previous investigators demonstrated the effect of pranayama on enhancement of the respiratory muscle efficiency and lung compliance due to reduction in elastic and viscous resistance of lung [10]. Significantly higher improvement in PFT parameter (FEF_{25-75}) in Kapalabhati pranayama group can be hypothesized to the reason that breathing during fast pranayama like Kapabhati requires breath coordination at higher rate and hence, higher rate of respiratory muscle activity. This produces strengthening of the respiratory muscles and therefore improvement in the effort produced by the subjects. Our study further substantiates the claim that Kapalabhati pranayama practice is beneficial on the pulmonary function in healthy, volunteers.

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