EFFECT OF 12 WEEKS OF KAPALABHATI PRANAYAMA TRAINING ON CARDIO-RESPIRATORY PARAMETERS IN YOUNG, HEALTHY VOLUNTEERS OF JIPMER POPULATION

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ABSTRACT

BACKGROUND

In the recent decades, interest has been increasing all over the world in the applications of yogic techniques in the field of therapeutics and research. Pranayama are breathing techniques that exert profound physiological effects on pulmonary, cardiovascular and mental functions.
OBJECTIVE

To study the effect of 12 weeks of Kapalabhati pranayama training on cardio-respiratory parameters in healthy, young subjects.

KEYWORDS: Kapalabhati pranayama, Heart Rate, Blood Pressure, Respiratory rate.

INTRODUCTION

Yogic system was developed by the sages of India which has been practiced down the ages. In the recent decades, interest has been increasing all over the world in the applications of yogic techniques in the field of therapeutics and research. With increased awareness and interest in alternative and complementary remedies, yogic techniques including pranayama are gaining importance and becoming acceptable to the public as well as scientific community\(^1\). Pranayama are breathing techniques that exert profound physiological effects on pulmonary, cardiovascular and mental functions. 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. Pranayama has variable effect on cardio-respiratory system\(^2\). Regular practice of pranayama improves cardio-vascular and respiratory functions, improves autonomic tone towards parasympathetic system, decreases the effect of stress and strain on the body and improves physical and mental health\(^{1,3,5}\). 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'. The technique of Kapalabhati involves short and strong forceful exhalations and inhalation happens automatically. The aim of the study is to find out the beneficial effects of Kapalabhati pranayama training on cardio-respiratory parameters in young, healthy, volunteers of both genders.
MATERIALS AND METHODS

The Present study was conducted in Department of Physiology, JIPMER on 62 healthy volunteers. The distribution was n=32 Pranayama training group and control groups n=30. Kapalabhati pranayama started with 30 times for 1 min and increased to 5 minutes/day, twice daily, thrice/ week for 12 weeks. Cardio-respiratory parameters including resting heart rate (HR), systolic blood pressure (SBP) and diastolic blood pressure (DBP) measured after 10 minutes of supine rest. Respiratory rate (RR) was recorded before and after 12 weeks of study period.

The Present study was conducted in Department of Physiology, JIPMER on 62 healthy volunteers of both genders, after obtaining clearance from the Institute Ethics Committee. Subjects were randomized into pranayama (n=32) and control groups (n=30), after getting informed, written consent. Mean age of the volunteers was 18.54 ± 1.65 yrs. The subjects were familiarized with the aim and objective of the study as well as laboratory environment.

PARAMETERS ANALYZED

Cardio-respiratory parameters including resting HR, SBP and DBP were measured after 10 minutes of supine rest using digital BP monitor (Citizen- CH 432B, Japan) and respiratory rate (RR) was recorded passively by observing the abdominal movements while recording the HR and BP. The same procedure was followed while recording post values at the end of 12 weeks of pranayama training.
PRANAYAMA TRAINING

Supervised pranayama training was given to the study group by a certified yoga instructor at Advanced Centre for Yoga Therapy Education and Research (ACYTER), JIPMER, Puducherry according to the guidelines of Morarji Desai National Institute of Yoga, New Delhi and they practiced Kapalabhati pranayama started with 30 times or one minute and increased to 5 minutes/day, twice daily, thrice/week for 12 weeks. Rests of the days, subjects were motivated to practice at their home. Control group did not involve in any pranayama training during this 12 weeks study period.

STATISTICAL ANALYSIS

Data for all parameters at baseline and post test were collected according to the study protocol and computerized in Microsoft Excel database. Data were 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 statistical significant.

RESULTS

Pranayama training resulted in marginal decrease (P>0.05) in all basal cardiovascular parameters while RR decreased significantly (P<0.01). On the other hand, there was a significant (P<0.05) increase in RR.

Mean age of the volunteers was (18.54 ± 1.65). The analysis on the effect of 12 Weeks of Kapalbhati pranayama on cardio-respiratory parameters has been given in Table No.1 that shows a significant decrease in RR from 17.34 ± 2.09 to 16.41 ± 0.61(P=0.03) and Marginal decrease in other parameters (P>0.05) such as SBP, DBP and HR.
**Table. 1** Effect of 12 weeks of Kapalabhati pranayama training (n=32) on cardio-respiratory parameters: heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP) and respiratory rate (RR). Values are expressed as mean ± SD.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Before pranayama training</th>
<th>After pranayama training</th>
</tr>
</thead>
<tbody>
<tr>
<td>HR (beats/min)</td>
<td>85.47 ± 10.47</td>
<td>83.75 ± 8.91**</td>
</tr>
<tr>
<td>SBP (mmHg)</td>
<td>112 ± 11.71</td>
<td>110.68 ± 10.74*</td>
</tr>
<tr>
<td>DBP (mmHg)</td>
<td>72.44 ± 10.92</td>
<td>72.16 ± 9.52*</td>
</tr>
<tr>
<td>RR (beats/min)</td>
<td>17.34 ± 2.09</td>
<td>16.41 ± 0.61***</td>
</tr>
</tbody>
</table>

Analysis done by Student’s paired t-test. *P<0.05, **P<0.01, ***P<0.001.

**Table. 2** Changes in control group (n=30) after 12 weeks of study period on cardio-respiratory parameters: heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP) and respiratory rate (RR). Values are expressed as mean ± SD.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Before 12 weeks study period</th>
<th>After 12 weeks study period</th>
</tr>
</thead>
<tbody>
<tr>
<td>HR (beats/min)</td>
<td>86.33 ± 9.65</td>
<td>87.47 ± 7.78*</td>
</tr>
<tr>
<td>SBP (mmHg)</td>
<td>107.23 ± 13.55</td>
<td>111.4 ± 11.24**</td>
</tr>
<tr>
<td>DBP (mmHg)</td>
<td>71.45 ± 6.791</td>
<td>73.73 ± 9.239*</td>
</tr>
<tr>
<td>RR (beats/min)</td>
<td>17.23 ± 1.22</td>
<td>18.33 ± 1.81*</td>
</tr>
</tbody>
</table>

Analysis done by Student’s paired t-test. *P<0.05, **P<0.01, ***P<0.001.
DISCUSSION
Pranayama involves manipulation of breath movement and the breath is a dynamic bridge between the body and mind. The psychosomatic effects of different pranayama 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. Resting HR is determined mainly by parasympathetic tone and decrease in HR and BP indicates a decrease in sympathetic activity and / or increase in parasympathetic activity. Our results demonstrate that there was a significant reduction in RR in pranayama group. On the contrary, there was a significant increase in RR in the control group. There was statistically insignificant, but definite trend towards decrease in HR, SBP and DBP in the pranayama group. According to the traditional wisdom of yoga, pranayama is the key for bringing about psychosomatic integration and harmony. By voluntarily controlling breathing pattern, it is possible to influence ANS functions. Very few references are available on the effect of fast pranayama training on cardio-respiratory parameters in individuals. Our results are in agreement with that of Raghu raj et al in 1998 found practicing fast pranayama like Kapalabhati for 12 weeks lead to decrease in sympathetic activity and are not in agreement with observations of few other studies. Madanmohan et al in 2005 evaluated short-term effect of three weeks of fast pranayama (bhastrika) practice on cardio-respiratory variables and reported an increase in sympathetic activity whereas Pal et al in 2004 found no change in autonomic activity by the practice of 12 weeks of Kapalabhati pranayama. Another study conducted by Kullok et al in 1990 explained changes in autonomic activity by breathing exercises on the basis of known anatomical asymmetries in the respiratory, cardiovascular and nervous system and that the coupling mechanisms between each of these systems: lung-heart, heart-brain and lungs-brain are also asymmetrical. We propose that
these changes may have occurred by pranayama practice due to improved autonomic tone towards parasympathodominance resulting in hypo metabolic state, relaxed state of mind and improved cardiac vagal tone. When the mind is relaxed and resting, parasympathetic activity increases and RR decreases. Increase in parasympathetic activity decreases resting HR and decrease in sympathetic tone in skeletal muscle, blood vessels, decreases peripheral vascular resistance and hence, decrease in DBP and improved tissue perfusion. Further our study substantiates the claim that Kapalabhati pranayama practice is beneficial on cardio-respiratory function in healthy, volunteers.

CONCLUSION

12 weeks of Kapalabhati pranayama training showed improvement in the cardio-respiratory parameters with significant decrease in RR may be attributed to a calm and stable mind-emotion complex in our subjects. Hence we conclude that pranayama training is useful in reducing RR through psycho-somatic mechanisms and that this enhances the health and well being of young subjects.

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REFERENCES


