The Effects of a Two week Yoga Program on Pulmonary Function

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INTRODUCTION

Studies on the ancient Hindu practice of Yoga have demonstrated an improvement in respiratory function (Udupa and Singh 1972). Yoga consists of a number of different practices, the most common of which are the pranayama, the control of diaphragm and breathing. The asanas or stretching exercises. yoga requires breath holding which may result in increased parasympathetic control of respiratory control centers (Makwana et al. 1988). In a study of ten males between the ages of 40 and 60 with no previous yoga experience, 80% showed improvement in breath holding time after the completion of an intensive yoga program (Courtney and Cohen 2006). Joshi et al. (1992) demonstrated improved ventilatory functions in the form of lowered respiratory rate (RR), increased forced vital capacity (FVC), and forced expiratory volume at the end of 1st second (FEV1) following six weeks of yoga intervention. Joshi and Joshi (1998) suggested that the improvement in vital capacity could be attributed in part to increased development and strengthening of respiratory musculature incidental to the regular practice of yoga exercise. A study by Yadav and Das (2001) on healthy females demonstrated a significant improvement in FVC, FEV1 and peak expiratory flow rate over a period of 12 weeks. The results of a study on patients with mild asthma indicated that practicing pranayama may assist patients with their management of asthma (Singh et al 1990). Mandomanohar et al. (2003) observed increased respiratory pressures in young adults as gauged by the maximum respiratory pressure test after a 6 months yoga training program.

RESULTS

The coefficient of variation of the spiromet spirogram was determined to be 2.3%. This level of reliability is considered acceptable for respiratory studies. The mean group FVC prior to yoga was 4233.57ml (1478.48) and the post yoga was 4767.86ml (4175.36). The p value was 0.03 indicating significant improvements among the group (Fig. 1). The group mean BHT at TLC before yoga was 51.78sec (427.23) and after yoga the BHT at TLC was 76.2sec (462.2). The p value of <0.001 indicated a highly significant improvement (Fig. 2). The mean group BHT at RV before yoga was 27.57sec (61.13) and after completion of yoga BHT at RV measured 31.6sec (8.35) with a p value of 0.193. These means were not significantly different (Fig. 3) The pre and post FVC measurement for males averaged 5172.86ml (3506.91) and FVC for females averaged 3305.57ml (583.68). The p value of <0.001 indicated a highly significant difference between male and female FVC values. The use of a 60.14 indicated no significant difference (Fig. 4). In Table 1, the pre and post BHT at TLC for males averaged 77.0sec (52.93) and females recorded 30.07sec (9.58). The p value measured 0.824.

DISCUSSION

After a continuous two week yoga program pulmonary function results showed significant improvement in FVC and Breath Holding Time at TLC. Breath holding time at residual volume did not change. These results suggest that practicing yoga for even a short period of time results in significant improvements in pulmonary function. These data are consistent with other studies (Joshi et al. 1992) that have found improvements in ventilatory function following a yoga program of longer duration. These results indicate that the duration of time practicing yoga may not be a critical factor in improving lung function.

Concurrently, performing a variety of asanas muscles of the thoracic cavity are constantly being recruited. This recruitment may lead to greater musculature and thereby result in improved FVC (Joshi et al.1992). Significant improvements in BHT could be attributed to the control of the neural respiratory centers during pranayama. While performing pranayama yoga participants were instructed to consciously be in control of their breathing, which may indicate that the autonomic neural responses were overridden resulting in increased breath holding time (Makwana et al. 1988). It is not clear if the improvement occurred at the level of neuronal recruitment or at higher centers in the brain. Improvements in Breath Holding Time at TLC point to a decreased responsiveness of the respiratory centers to CO2 levels along with an increased endurance of respiratory muscles with later signs of fatigue (Joshi and Joshi 1998).

Comparing males and females showed significant differences in FVC. This result suggests that normal males on average have a larger more muscular thoracic cavity enabling them to force more air out of the lungs resulting in higher volumes of FVC. However, males and females showed no significant differences in Breath Holding Time at TLC or at RV indicating that both responded similarly to the yogic breathing and stretching exercises.

CONCLUSIONS

In conclusion, this study suggests that a practice of yoga for only a short duration of time showed an overall improvement in respiratory function similar to those found in many long term studies, suggesting that beginners of yoga can also receive health benefits and improved lung function.

MATERIALS AND METHODS

• The research proposal was reviewed and approved by the Brigham Young University - Hawaii Human Subjects Committee.
• Seven male and seven female non-smoking individuals with normal lung function between the ages of 19 and 27 participated in the study.
• Test group performed yoga for 12 days and were asked not to engage in any other cardiovascular activity for the duration of the study.
• Individuals who had practiced any type of yoga prior to this experiment were excluded.
• The group began a daily one-hour yoga regime for a total of 12 days, led by a certified yoga instructor.
• The instructor led the class by performing each breathing and stretching exercise and directing the class to simultaneously observe and follow her direction for each pose and breathing exercise.
• The Subjects were tested at the beginning of the class and 12 days after the completion of the class.
• Forced vital capacity (FVC) were measured spirometry.
• Breath holding time (BHT) at total lung capacity (TLC) and at residual volume (RV) were measured using a stop watch.
• The data from the pre- and post- pulmonary function tests were compared statistically using repeated measure ANOVA and comparison between genders was tested by independent T test.
• The coefficient of variation was calculated to ensure the reliability and consistency of the spiromet spirogram.

Table 1: The pre and post mean of BHT at TLC between males and females

<table>
<thead>
<tr>
<th></th>
<th>Male (sec)</th>
<th>SD</th>
<th>Female (sec)</th>
<th>SD</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before</td>
<td>77.07</td>
<td>45.08</td>
<td>52.93</td>
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</table>

Table 2: The pre and post mean of BHT at RV between males and females

<table>
<thead>
<tr>
<th></th>
<th>Male (sec)</th>
<th>SD</th>
<th>Female (sec)</th>
<th>SD</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before</td>
<td>29.14</td>
<td>9.13</td>
<td>30.07</td>
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</tbody>
</table>

REFERENCES


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