Effect of Yoga Practice on Lung Capacity in Adolescent Girls

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ABSTRACT

To get an answer to this topic, a study titled “Effect of Yoga Practice on Lung Capacity in Adolescent Girls” was carried out. A randomized controlled trial was used to conduct this study. For the research, Sevabharati Balika Sadanam in Moozhikkal, Kozhikode, selected sixty children and teenagers between 12 and 17. There were 60 participants, with 30 participants participating in the experiment and 30 serving as controls. A methodical yoga sequence that includes pranayama, meditation, and several other techniques in addition to Yin and Yang poses. The ‘paired two-tailed t-test’ was used to conduct a statistical analysis of the influence of the yoga program. At the 0.05 level of statistical Significance, there was a difference that might be considered statistically significant between the control and experimental groups. In comparison, there was no discernible improvement in the group that served as the control. The study’s findings and limitations make it possible to conclude that the one-month Yoga intervention is responsible for the improvement shown in the experimental group. Consequently, the Yoga Program efficiently increases adolescent females’ lung capacity and how long they can breathe.

INTRODUCTION

Yoga is a holistic practice that combines physical postures, breathing exercises, and meditation techniques. It has been practised for centuries and is known for its numerous health benefits, including improved flexibility, strength, stress reduction, and overall well-being. One area that has gained attention in recent years is the potential impact of Yoga on lung capacity. Lung capacity refers to the air that can be inhaled and exhaled simultaneously. It is an essential indicator of respiratory health and function [1-3]. Adequate lung capacity is essential for supplying oxygen to the body’s tissues and removing carbon dioxide, promoting efficient oxygen exchange. During adolescence, individuals experience significant physical, emotional, and physiological changes. This period is crucial for developing various organ systems, including the respiratory system.

Adolescent girls, in particular, may face unique challenges related to lung capacity due to factors such as hormonal changes, growth spurts, and lifestyle habits [4,5,6].

While there is substantial research on the benefits of Yoga for adults, limited studies have explicitly focused on the effects of yoga practice on lung capacity in adolescent girls. Understanding the potential impact of Yoga on lung capacity during this critical developmental phase could have significant implications for respiratory health promotion and disease prevention. This study investigates the effect of yoga practice on lung capacity in adolescent girls [7,8]. By examining lung capacity before and after a yoga practice, we can gain insights into whether Yoga positively influences respiratory function in this population. The findings of this study may contribute to evidence-based recommendations for
integrating Yoga into the lives of adolescent girls to enhance their lung capacity and overall respiratory well-being.

**Background**

Yoga is a centuries-old practice from ancient India that combines physical postures, breathing exercises, and meditation techniques. It has gained popularity worldwide to promote physical and mental well-being. Numerous studies have demonstrated the positive effects of Yoga on various aspects of health, including flexibility, strength, stress reduction, and cardiovascular fitness [9,10,11]. However, limited research specifically examines the effects of yoga practice on lung capacity, especially in adolescent girls. During adolescence, individuals undergo significant physiological, emotional, and physical changes. This transitional period is crucial for developing various organ systems, including the respiratory system. Adolescent girls may face unique challenges related to lung capacity due to factors such as hormonal changes, growth spurts, and lifestyle habits. Understanding the potential impact of yoga practice on lung capacity during this critical developmental phase can provide valuable insights into promoting optimal respiratory health.

**Methodology**

The study, conducted at Sevabharati Balika Sadanam, Moozhikkal, Kozhikode, involved 60 randomly assigned adolescent girls (12-17 years) distributed into Experimental and Control groups. Following a Randomized Controlled Study design, the Experimental group underwent a structured Yoga Programme for one month, emphasizing lung capacity, breathing efficiency, and chest muscle strength. Practices were categorized into Primary, Secondary, and Advanced Levels, applying a progressive approach. Outcome measures included Peak Expiratory Flow Rate (PEFR) and Breath Holding Time (BTH), which were assessed using a Peak Flow Meter and stopwatch. Pre- and post-intervention data were collected from both groups—the Yoga interventions, inspired by B.K. Iyengar’s “Light on Yoga” was implemented daily from April 20, 2022, to May 19, 2022, approximately one hour per day. Inclusion criteria encompassed adolescent girls aged 12-17 physically capable of yogic practices, while exclusion criteria included those below 12 or above 17 years and those physically incapable. Ethical considerations and rigorous statistical analysis ensured the study’s integrity and meaningful insights into the impact of yogic interventions on respiratory parameters in adolescent girls.

**Result**

**Statistical Analysis :**

To determine the statistical Significance of the Yoga intervention, a paired two-tailed t-test was applied, with a predetermined significance level of d” 0.05. The analysis, conducted using SPSS Software (version 26.0), revealed statistically significant results in the Experimental Group, as detailed in Table 1. In contrast, the Control Group exhibited non-significant results, as outlined in Table 2.

**RESULTS:**

**Experimental Group:**

PEFR: Pre-test mean of 243.66, post-test mean of 275.66, with a significant mean difference of 32 (p = 0.01).

BTH: Pre-test mean of 15.36, post-test mean of 21.03, with a significant mean difference of 5.67 (p = 0.01).

**Control Group:**

PEFR: Pre-test mean of 236.33, post-test mean of 233, with a non-significant mean difference of -3.33 (p = 0.076).

BTH: Pre-test mean of 13.76, post-test mean of 13.2, with a non-significant mean difference of -1.967 (p = 0.060).

These findings indicate a significant positive impact of Yoga intervention on PEFR and BTH in the Experimental Group, highlighting the potential therapeutic benefits of Yoga on respiratory parameters in adolescent girls. However, no statistically significant changes were observed in the Control Group, reinforcing the specificity of Yoga’s influence on the measured outcomes.
Table 1
Details of Statistical Analysis of Experimental Group

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Mean Pre-test</th>
<th>Mean Post-test</th>
<th>Standard Deviation Pre-test</th>
<th>Standard Deviation Post-test</th>
<th>Mean Difference</th>
<th>t-stat value</th>
<th>p-value</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak Expiratory Flow Rate</td>
<td>243.66</td>
<td>275.66</td>
<td>54.42</td>
<td>53.9</td>
<td>32</td>
<td>-9.22</td>
<td>0.01</td>
<td>Significant</td>
</tr>
<tr>
<td>(lit/Min)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breath Holding Time</td>
<td>15.36</td>
<td>21.03</td>
<td>3.53</td>
<td>4.11</td>
<td>5.67</td>
<td>-17.55</td>
<td>0.01</td>
<td>Significant</td>
</tr>
<tr>
<td>(Seconds)</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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</tr>
</tbody>
</table>

The level of Significance is p d” 0.05

Table 2
Details of Statistical Analysis of Control Group

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Mean Pre-test</th>
<th>Mean Post-test</th>
<th>Standard Deviation Pre-test</th>
<th>Standard Deviation Post-test</th>
<th>Mean Difference</th>
<th>t-stat value</th>
<th>p-value</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak Expiratory Flow Rate</td>
<td>236.33</td>
<td>233</td>
<td>39.60</td>
<td>40.52</td>
<td>-3.33</td>
<td>1.836</td>
<td>0.076</td>
<td>Not Significant</td>
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<tr>
<td>(lit/Min)</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breath Holding Time</td>
<td>13.76</td>
<td>13.2</td>
<td>2.44</td>
<td>2.733</td>
<td>-1.967</td>
<td>1.951</td>
<td>0.060</td>
<td>Not Significant</td>
</tr>
<tr>
<td>(Seconds)</td>
<td></td>
<td></td>
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</tbody>
</table>

The level of Significance is p d” 0.05
Discussion

This study aimed to evaluate the impact of a one-month yoga intervention on lung capacity in adolescent girls, focusing on peak expiratory flow rate and breath-holding capacity. The experimental group demonstrated significant improvements in both parameters, starkly contrasting with the control group. This substantiates the hypothesis that the structured yoga program significantly enhances lung capacity.

Scientifically, the peak expiratory flow rate increase reflects improved breathing efficiency, a vital facet of lung function. The substantial positive effect, supported by a significant t-stat value of -9.22 and p-value of 0.01, underlines the program’s profound impact on respiratory health. The breath-holding capacity improvements are equally noteworthy, with a significant increase from a mean pre-test value of 15.36 seconds to 21.033 seconds post-intervention, supported by a t-stat value of -17.55 and p-value of 0.01. This suggests the yoga program enhances respiratory endurance and breath-holding capacity, indicating potential benefits for overall lung function.

Exploring the mode of action of Yoga reveals its profound influence on the respiratory system. Kartik S 2014 observed that “Pranayama” techniques, such as Nadishuddhi and Bhramari Pranayama, contribute to a fivefold increase in oxygen intake. This enhanced oxygenation, coupled with improved lymphatic system flow, facilitates detoxification and addresses various respiratory issues; for instance, it echoes the positive impact of Yoga on respiratory effectiveness and its role in alleviating respiratory issues like asthma and allergies [18].

Furthermore, Steps of Alternate Nostril Breathing, 2019 from this article explained that the incorporation of physical yoga poses, especially backbends and standing postures like Ushtrasana, Purvottanasana, Tadasana, Vrikshasana, and Marjjalasana, aligns with findings, emphasizing how these poses naturally support the respiratory system [19]. Chanarivut R 2006 observed that inverted poses, altering circulation, have been similarly highlighted as beneficial for enhancing blood supply to areas above the heart [20].

Conclusion

Adolescence is a period of drastic changes in a person’s life. They no longer belong to the children category and are not yet welcome to the adult category. There will be changes in the body’s development, mental development, hormones, etc. So adolescence, indeed, is a confusing and stressful period of life, especially for girls. It will be more tiring if they are staying in an orphanage with no one to explain what is happening to their life. Also, there is a higher chance of being affected by transmittable diseases as they all live under one roof and share every activity. I need to think clearly, focus on my studies, actively participate in all activities, stay healthy, etc. They need a solid respiratory system. So that every cell in the body gets enough oxygen, which enhances the ability of every organ and system to work at its optimum level and maintain good health; based on the data obtained and analyzed and the above discussion, the present study can conclude that the structured yoga program used in the study is an efficient training method for improving lung capacity and breath-holding time in adolescent girls.

Limitation

The study is limited in its focus on physiological outcomes, and the absence of subjective measures and extended follow-up periods could restrict a comprehensive assessment of the holistic impact of Yoga on respiratory health.

Recommendation

To enhance the robustness of future investigations, it is recommended that larger-scale studies be conducted with diverse populations and extended intervention periods. Including qualitative measures such as participant feedback or perceived changes in well-being could offer a more comprehensive understanding of the subjective experiences related to yoga practice. Furthermore, exploring the sustained effects of yoga interventions over an extended follow-up period would contribute valuable information for implementing yoga programs to improve respiratory health in adolescent populations, contributing to the study’s credibility.

References


