EFFECT OF SLOW BREATHING EXERCISE PRACTICE ON ANTHROPOMETRIC PARAMETERS IN HEALTHY VOLUNTEERS

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Abstract
Introduction: Regular practice of slow breathing technique shows improvement in the cardio respiratory functions. It is well known to decrease the effect of stress which, in turn, improves the physical and mental health of an individual.

Objectives: To assess the effect of slow breathing exercise practice on anthropometric parameters in healthy volunteers.

Materials and Methods: A total of 60 young, healthy volunteers of both genders participated in this study. The subjects were allocated to the study group (n = 30) and control group (n = 30) based on simple random technique. Slow breathing exercise training was given to the study group for 20 minutes daily in two sessions for 12 weeks. Heights, weight, body mass index (BMI), were recorded at the start of the study and after 12 weeks in both the groups. Comparison between the study group and control group was done by Student’s unpaired t-test. P < 0.05 was considered as statistically significant.

Results: The average age of the study group and control group participants was 19.7 ± 1.7 years and 19.4 ± 1.9 years, respectively. BMI was significantly decreased in the study group from 21.72 ± 4.12 to 19.56 ± 3.92 (P < 0.05). There was a trend toward decrease in the waist–hip ratio from 0.78 ± 0.62 to 0.74 ± 0.58 (P > 0.05) which was not statistically significant.

Conclusion: Slow breathing exercise training improve the anthropometric parameters in the study group. This indicates that regular, long-term slow breathing exercise training helps in weight reduction among the obese population.

Keywords: Obesity, Anthropometry, Slow Breathing Exercises, body mass index, stress.

Introduction
Anthropometry is dealt with the measurement of an individual anatomical structure and its application in the form of proportions, composition, and shape and body maturation. It transforms, and build upon the material for any purpose, even commercially, provided the original work is properly cited and states its license uses non-invasive, portable instruments to calculate height, weight, and body circumferences which can be performed in a large sample size.¹ Regular practice of slow breathing technique shows improvement in the cardio respiratory functions. The previous studies have reported that it is well known to decrease the effect of stress which, in turn, improves the physical and mental health of an individual. Slow and deep breathing is economical which reduces dead space ventilation. Breathing with maximum contraction of diaphragm and intercostal muscles massages abdominal viscera, improves venous return, and stretches all parts of the thorax and lung. Effect of 12 weeks slow breathing exercises on anthropometric parameters deep breathing renews air throughout the lungs in contrast with shallow breathing which renews air only at the base of the lungs.²,³,⁴ Breathing with concentration improves mind-body coordination which helps to cope up with stress, anxiety, and depression making one feels relaxed and calm.⁵,⁶ In view of the above background, this study is aimed to assess the effect of 12 weeks of slow breathing exercise practice on anthropometric parameters in healthy volunteers.

Materials and Methods
It was an interventional study performed in the Human Physiology Laboratory, Government Medical College, Datia (M.P.) for 2 months between August-September 2019. The sample size was 60 medical students (females: 32 and males: 28) who were recruited after meeting inclusion and exclusion criteria. The volunteers were exposed about the purpose, procedures, and benefits of the study. They
were informed that they have freedom to withdraw from the study at any time. After getting informed written consent, the willing participants were allocated into study group (n = 30) and control group (n = 30) based on simple random technique generated through computer.

**Inclusion Criteria**

Healthy volunteers of both the gender of age group between 18 and 25 years

**Exclusion Criteria**

The following criteria were used to exclude subjects from the study:

- History of chronic respiratory ailments
- Subjects taking drugs/medication
- Smokers
- Alcoholics
- Sports or athletic personnel
- History of previous yoga training within 1 year.

**Methodology**

**Height**- Wall-mounted stadiometer (easy care, Hong Kong) was used to measure the height of the study participants. The calibration of stadiometer was done using standardized measuring rod. The subjects were instructed to stand erect on a flat surface with feet flat, heels almost together, legs straight and knees together, with arms at the side and looking horizontally straight ahead. Heels, hip, shoulder blades, and occiput pressing against the vertical bar, then the slider were brought down to rest on the top of the head pressing hairs. It is an arrow which accurately measures height in centimeters.

**Weight**- Weighing machine with spring balance (to avoid zero and parallax errors) (Crown, India) was used to measure weight of the study participants. The accuracy of the machine was checked routinely with other weighing machines available. Subjects were asked to wear light clothing with no footwear. They were instructed to stand erect on the foot bar. The legs were positioned on each side of the digital scale and weight was measured in kilograms.

**Body mass index (BMI)**- BMI is the indirect measurement of nutritional status of the individual. Quetelet formula is used to calculate BMI = Weight in Kg/ (Height in m)^2

**Breathing exercise training**- The volunteers were practiced for the breathing technique as per Pal et al.7 in comfortable sitting posture and well-ventilated room. The following are the steps:

- The subjects were instructed to close one of the nostrils (e.g., right nostril) by thumb and to slowly inhale through the opposite nostril (left nostril) in 6 counts.
- Volunteers were asked to close the left nose by little finger and to hold the respiration for 6 counts. Then, they were instructed to open the right nose to slowly exhale for 6 counts.
- They were asked to performed inspiration through the right nostrils over the period of 6 s, close the right nose and hold the respiration for 6 s after that open the right nostril to exhale for 6 s.

These three steps complete one breathing cycle and this was repeated for 20 minutes. The subjects were motivated to practice this technique for 5 days in a week (both morning and evening session) for a total period of 12 weeks under our direct supervision. Rest of days the subjects were instructed to practice at their home. Attendance register was maintained for training sessions. The post-test parameters were collected only from the subjects with attendance percentage of at least 80%. The present study was carried out after obtaining clearance from the Institute Ethics Committee for human studies and the study carries less than minimal risks.

**Statistical Analysis**

Data for all parameters were collected and computerized in Microsoft Excel. Longitudinal changes in both the groups were compared by Student’s paired t-test. Comparison between the study group and control group was done by Student’s unpaired t-test. The statistical analysis was carried out at 5% level of significance and P < 0.05 was considered as statistically significant.
Results

**Table 1:** Anthropometric parameters and age wise comparison of study groups

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Study group (N=30)</th>
<th>Control group (N=30)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>19.7±1.7</td>
<td>19.4±1.9</td>
<td>0.21</td>
</tr>
<tr>
<td>BMI</td>
<td>21.7±4.12</td>
<td>19.56±3.92</td>
<td>0.01*</td>
</tr>
<tr>
<td>WHR</td>
<td>0.78±0.62</td>
<td>0.74±0.58</td>
<td>0.35</td>
</tr>
</tbody>
</table>

As per table 1 The average age of the study group and control group participants was 19.7 ± 1.7 and 19.4 ± 1.9. Comparison of anthropometric parameters at baseline between the study group and control group is given shows that there was no significant difference in the baseline values of age and anthropometric parameters (P > 0.05) except BMI. Therefore, both the groups can be considered comparable except in terms of BMI.

**Table 2:** Effect of Slow breathing Exercises training on Anthropometric parameters on study group (N=30)

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Pre-test</th>
<th>Post-test</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI</td>
<td>21.72±4.12</td>
<td>19.56±3.92</td>
<td>0.01*</td>
</tr>
<tr>
<td>WHR</td>
<td>0.78±0.62</td>
<td>0.74±0.58</td>
<td>0.35</td>
</tr>
</tbody>
</table>

Table 2 shows the effect of 12 weeks of slow breathing exercise training (n = 30) on anthropometric parameters in which BMI of the study group showed a statistically significant reduction from 21.72 ± 4.12 to 19.56 ± 3.92 (P = 0.01). Furthermore, there was a trend towards decrease in WHR from 0.77 ± 0.67 to 0.71 ± 0.58 (P > 0.05) which was not statistically significant.

**Table 3:** Effect of Slow breathing Exercises training on Anthropometric parameters on control group (N=30)

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Pre-test</th>
<th>Post-test</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI</td>
<td>21.52±4.12</td>
<td>19.36±3.92</td>
<td>0.21</td>
</tr>
<tr>
<td>WHR</td>
<td>0.74±0.61</td>
<td>0.76±0.58</td>
<td>0.35</td>
</tr>
</tbody>
</table>

Table 3 shows the changes in control group (n = 30) after 12 weeks of study period on anthropometric parameters. BMI of the control group was increased from 21.52 ± 4.12 to 19.36 ± 3.92 and WHR of the control group was increased and 0.74 ± 0.61 to 0.76 ± 0.58 which were not statistically significant (P > 0.05).

Discussion

Slow breathing exercises have a pacifying action and it relaxes the body. The possible mechanism is generation of inhibitory signals and hyperpolarizing currents within neural and non-neural tissue by mechanically stretching tissues during inspiration and holding the breath. This increases the parasympathetic activity and decreases sympathetic activity. The shift in autonomic balance towards parasympatho-dominance is proposed due to the generation of hyperpolarization current which initiates the synchronization of neural elements in the central nervous system, peripheral nervous system, and surrounding tissues. WHR is used as an important indicator for the anthropometric component in all the subjects or patients with risk of cardiometabolic conditions, for example, prediabetes and cardiovascular disease. After 12 weeks of slow breathing exercise training, BMI was decreased significantly in the study group (P < 0.05). It is proposed that regular slow breathing exercise practice produces reduction in body weight due to reduction in stress as well which ultimately causes sense of well-being and reduces overeating to the individual. These results are also in concordance with the previous research results by Desika et al. in which Nadi shuddhi pranayama intervention produced a significant difference (P ≤ 0.05) in the BMI, WHR, heart rate (HR), systolic blood pressure, and diastolic blood pressure in both phases of menstrual cycle at the end of the study period when compared with the control group. However, they have mentioned that the reason for this reduction might be due to their change in diet as well as increased physical activity which did not correlate with their reduction in anthropometric parameters with pranayama practices. Anthropometric parameters provide indirect assessment of physical fitness of the individual and it should be carried out in a multidisciplinary level. Regular weight reduction sessions include low-fat/carbohydrate diets, cognitive behavioural therapy programs, and regular exercise. These are given in an individualized way to maintain anthropometric parameters within normal range. The yoga-based lifestyle modification sessions include asana, pranayama, and lifestyle interventions.

Conclusion

Regular practice of slow breathing exercises improves the psychosocial and physiological well-being in healthy as well as obese individuals along with diet and other lifestyle modifications. Therefore, slow breathing exercise and relaxation techniques can be prescribed along with conventional weight reduction techniques to restore homeostatic set point in obese and overweight individuals.
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References