RESEARCH ARTICLE

Effect of yoga (unilateral nostril breathing) on autonomic nervous system activity in medical students – A randomized parallel group study

Pulkit Mutreja¹, Bhawana Thapa², Saumen Gupta³

¹Medical Intern, Sikkim Manipal Institute of Medical Sciences, Sikkim Manipal University, Gangtok, Sikkim, India, ²Department of Physiology, Sikkim Manipal Institute of Medical Sciences, Sikkim Manipal University, Gangtok, Sikkim, India, ³Department of Community Rehabilitation, Sikkim Manipal College of Physiotherapy, Sikkim Manipal University, Gangtok, Sikkim, India

Correspondence to: Bhawana Thapa, E-mail: bhawana.devarya@gmail.com

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ABSTRACT

Background: Practice of Pranayama and “swara” have been found to affect cardiovascular, respiratory, and autonomic functions. The regulation of autonomic functions in a positive direction helps reduce anxiety and stress. Studies have suggested that right and left nostril breathing produce specific autonomic changes. Aim and Objectives: The aim of the study was to find the relationship between right unilateral nostril breathing (RUNB) and sympathetic arousal and that between left unilateral nostril breathing (LUNB) and parasympathetic arousal. Materials and Methods: This is a randomized parallel-group study. Fifty consenting students were chosen by simple random sampling technique and divided into two groups of 25 each, randomly. One group was made to practice RUNB and the other, LUNB for ten minutes daily for 2 months. Systolic blood pressure (SBP), diastolic blood pressure, mean arterial pressure, heart rate (HR), and respiratory rates were measured before and after the intervention. Results were analyzed using SPSS version 21. Comparisons were made by conducting a repeated-measures ANOVA. Results: The RUNB intervention contributed statistically significant changes in SBP and HR after 2-month practice. LUNB did not result in statistically significant changes in the studied parameters. Conclusions: RUNB was found to have significant sympathetic arousal but LUNB could not be linked to parasympathetic arousal.

KEY WORDS: Right Unilateral Nostril Breathing; Left Unilateral Nostril Breathing; Sympathovagal Shift

INTRODUCTION

Pranayama is a practice in the ancient Indian science of yoga in which breathing is regulated voluntarily in a rhythmic way and has been found to make our mind calmer.¹,² The practice of Pranayama produces particular physiological responses in normal healthy adults. The slow breathing exercises have been found to affect cardiovascular, respiratory, and autonomic functions and reduce mental stress and anxiety³⁻⁵ whereas fast breathing exercises have been found to cause sympathetic activation.⁶ The physiology of the nasal cycle is known as the science of “Swara” in the science of yoga and has been widely analyzed by Indian yogis with great expertise.⁷ The right and the left nostril do not function together. One of the nares is more congested than the other under normal conditions irrespective of the presence or absence of any obstruction due to mucus.⁸ The nasal cycle is related to autonomic arousal and its relationship with the autonomic nervous system has been widely studied.¹ The practicing of exclusive right or left nostril breathing has not only physiological but psychological effects as well.⁹ Many studies have been conducted to study the effect of yogic breathing practices on autonomic parameters but data...
regarding the effect of unilateral nostril breathing in this regard is rather limited. The present study is an attempt to find out whether changes in diastolic blood pressure (DBP), systolic blood pressure (SBP), mean arterial blood pressure along with changes in respiratory rate and heart rate (HR) are influenced by the practice of Unilateral Nostril Breathing.

Objectives
The objective of the study is to find out the relation between Right Unilateral Nostril Breathing (RUNB) and sympathetic arousal and that between left unilateral nostril breathing (LUNB) and parasympathetic arousal.

MATERIALS AND METHODS
This is a randomized parallel-group study and was conducted after obtaining clearance from the Institutional Ethics Committee. Simple random sampling was done using a lottery system to choose 50, 1st year medical students out of the strength of 100 students.

Inclusion Criteria
Consenting students.

Exclusion Criteria
Students suffering from tuberculosis, asthma, chronic obstructive pulmonary disease, cardiac arrhythmia, on alpha-blockers, beta-blockers, and bronchodilators and smokers (>ten cigarettes/week). The subjects were asked to fill up a proforma with personal details and medical conditions. Complete anonymity of the subjects and their proforma answers was maintained. An informed written consent of the participants was obtained. They were then randomized into two groups of 25 participants each again by lottery system.

The study was conducted in three phases:

Phase I
Baseline data regarding SBP, DBP, Respiratory Rate (RR), and HR were collected before the intervention. The Mean arterial pressure (MAP) was calculated as DPB+1/3 pulse pressure.

Phase II
The subjects of groups 1 and 2 were instructed for the procedure of RUNB and LUNB respectively to be done in the Sukhasana pose. The first step was to exhale deeply and slowly with both nostrils open. In the next step, the RUNB group was asked to close the left nostril with the thumb of the left hand and inhale slowly and quietly through the right nostril and the LUNB group was asked to close the right nostril with the thumb of the right hand and inhale slowly and quietly through the left nostril. They were then asked to hold the breath for two to four seconds. Then, the RUNB group was asked to exhale through the right nostril slowly and quietly keeping the left nostril closed while the LUNB group were asked to exhale through the left nostril slowly and quietly keeping the right nostril closed. This was to be repeated for 5 minutes. All the parameters in consideration were measured again.

Phase III
Group 1 and Group 2 were made to practice RUNB and LUNB, respectively, in the yoga lab for a duration of 10 min for a period of 2 months with same procedure as described above. The physical parameters under consideration were measured once at the end of the 1st month and finally, at the end of the 2 months again.

Statistical Analysis
Results were summarized using descriptive statistics. Comparisons were made by conducting a repeated measures ANOVA. Data were analyzed taking 95% confidence interval and a significance level of \( P < 0.05 \). The Statistical software “SPSS version 21” was used.

RESULTS
The demographic and anthropometric profile of the participants are summarized in Table 1. The data on SBP, DBP, MAP, HR and RR followed normal distribution as ascertained by Shapiro-Wilk’s test \( (P < 0.05) \), for both the intervention groups. Repeated measures ANOVA was used to compare the variables. The assumption of sphericity was violated as assessed by Mauchly’s test of Sphericity for all the parameters. Therefore, a Greenhouse-Geisser correction was applied for all the parameters. The RUNB intervention contributed statistically significant changes in SBP \( (P = 0.018) \) and HR \( (P = 0.015) \) over time, as summarized in Table 2. Comparison was made between the SBP, HR before and after RUNB for 5 min, 1 month and 2 months, which is summarized in Figures 1 and 2, respectively. There was a statistically significant rise in the HR after 1-month of RUNB practice. There was a decrease in HR after 5 min. and an increase in the same after 2 months of RUNB practice but the change was not statistically significant. Changes in different

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<th>Table 1: Anthropometric parameters of subjects</th>
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All values are in mean and standard deviation unless stated otherwise. BMI: Body mass index, RUNB: Right unilateral nostril breathing, LUNB: Left unilateral nostril breathing
The LUNB intervention did not contribute statistically significant changes in SBP, DBP, MAP, HR, or BR over time.

**DISCUSSION**

According to the Yogic science, life energy, called “Prana” flows through a number of channels in our body called “Nadis”. “Ida” and “Pingala” are two such Nadis which get activated while breathing from the left and the right nostril, respectively. Ida Nadi is related to parasympathetic function while Pingala is related to Sympathetic function.

In our study, there was a statistically significant increase in the SBP following 2 months of RUNB which can be explained by sympathetic activation, which usually causes a marked increase in arterial pressure. There was a statistically significant rise in HR after 1-month RUNB practice. This can be explained by sympathetic dominance in the heart due to RUNB. There was a statistically insignificant decrease in HR and no change in SBP after 5 min and hence short-term effect of RUNB on these parameters could not be elicited. However, an increase in HR after 2 months of RUNB practice was seen though not statistically significant. No significant change could be seen DBP, MABP, or BR. In our study, although there was a decrease in all the measured parameters after 2 months of LUNB, the decrement in none of the parameters was statistically significant. The major reason is that arousal of the parasympathetic nervous system takes more practice and technique as compared to sympathetic arousal, which may very well be the reasons as to why a
In our study, and Dhungel et al. also reported that LUNB also practiced by the study participants. Another study by Vasanthan [17] has found that relaxing pranayama or LUNB. We could not elicit a similar observation for 8 weeks in our study. This is in line with the fact that the sympathetic activity was markedly reduced by LUNB. We also observed a decrease in the RR (which was also not statistically significant) after 2 months practice of RUNB, similar to the RR observed by Jain et al. and Dhungel et al. in their study but this decrease was also not statistically significant.

In studies conducted by Jain et al. [15] and Bhavanani et al. [16] a decline in SBP, DBP, HR, and RR was observed after 2 months of LUNB. It was reported by Prakash et al. [17] that the sympathetic activity was markedly reduced by LUNB. Shannahoff-Khalsa and Kennedy [18] also reported that LUNB lowers the HR significantly, but such changes were not observed in our study. In a study done by Punita et al. [19] a significant decrease in SBP, DBP, and MAP was observed after 12 weeks of Yoga practice which included Chandranadi pranayam or LUNB. We could not elicit a similar observation as expected. This could be because in their study, the practice of LUNB was for 15 min for 12 weeks as against 10 min for 8 weeks in our study. This is in line with the fact that parasympathetic activation takes a longer time of practice. Moreover, along with LUNB, other Yoga asanas were also practiced by the study participants. Another study by Vasanthan et al. [20] has found that relaxing pranayama practice caused significant decrease in HR, SBP, DBP, and MAP in healthy volunteers wherein pranayama comprised of LUNB (Chandranadi) along with Pranav, Savitri, and Nadi shuddhi for 25 min for 6 days a week for 6 months. This finding correlates with the fact that the parasympathetic effect requires more duration of practice and also that a combination of relaxing pranayamas rather than LUNB alone may result in significant vagal shift.

**Strength and Limitation of the Study**

The strength of our study was that both the groups were anthropometrically matched. The intervention was done at the same time every day and hence the diurnal variation was taken care of. Compliance of the study participants was more than 98%. Daily attendance was taken. Intervention was done under continuous supervision of the investigators. Both pre and post-data were taken by the principal investigator using the same instruments which were calibrated from time to time. The limitations are that the sample size of the study was small and more parameters of autonomic function like could be studied.

**CONCLUSIONS**

We can conclude that breathing unilaterally through the right nostril (RUNB) causes arousal of the sympathetic nervous system. The underlying mechanism as to how breathing only through the right nostril leads to sympathetic stimulation is yet to be understood. LUNB, however, could not be shown to affect parasympathetic arousal. Thus, we can say that yogic breathing techniques should be practiced after proper training to ensure its optimal benefits. Moreover, further investigations should be performed, preferably with a larger sample size and other parameters of autonomic function evaluation to observe the effects with greater accuracy.

**REFERENCES**

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