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THE EFFECTS OF RIGHT AND LEFT NOSTRIL BREATHING ON CARDIORESPIRATORY AND AUTONOMIC PARAMETERS

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Abstract : The responses of right nostril breathing (RNB) and left nostril breathing (LNB) on cardio-respiratory and autonomic functions were investigated in healthy student volunteers of both sexes. The RNB and LNB groups comprised of 10 males and 10 females in each in age range of 17–22 years. Initially, in both groups control values of respiratory rate (RR), heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBF), peak expiratory flow rate (PEFR) and galvanic skin resistance (GSR) were recorded. The same parameters were recorded after 15 min (acute exposure) and 8 wks of training in RNB and LNB.

In males RR ($P<0.0001$), SBP ($P<0.05$) and DBF ($P<.05$) fell significantly after 15 min of RNB. After 8 wks training in RNB, HR ($P<0.01$) decreased, SBP ($P<0.001$) declined more profoundly and RR ($P<0.0001$) and DBP ($P<0.05$) decrement was maintained. After 15 min of LNB, RR ($P<0.01$), HR ($P<0.01$), SBP ($P<0.001$) and DBP ($P<0.01$) declined significantly, on 8 wks training, RR ($P<0.0001$) and HR ($P<0.001$) decreased further, the decrement in SBP ($P<0.001$) and DBP ($P<0.01$) was the same.

In females, RR alone fell significantly ($P<0.05$) after 15 min RNB. After 8 wks RR decrement was more profound ($P<0.0001$) and DBP also declined significantly ($P<0.01$). Similarly, 15 min LNB resulted in significant reduction in RR ($P<0.001$) and HR ($P<0.05$) only. Following 8 wks, of training in LNB, in addition to RR ($P<0.0001$) and HR ($P<0.05$) decrement, SBP ($P<0.01$) and DBP ($P<0.05$) also fell significantly.

Both in males and females, GSR did not change significantly ($P>0.05$) either after RNB or LNB (15 min/8 wks). PEFR rose significantly ($P<0.05$) only in females after 8 wks of LNB.

The results suggest that there are no sharp distinctions between effects of RNB and LNB either acute exposure (15 min) or after training (8 wks). However, there is a general parasympathetic dominance evoked by both these breathing patterns.

Key words : right nostril dominance left nostril dominance blood pressure PEFR heart rate

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INTRODUCTION

In our bodies, the right and left nostril do not function simultaneously (1). One of the nostrils is always more congested than the other even when the nasal passages are clean and unobstructed by mucus (1). This congestion alternates between the right and left nostril through the day and night (1).

In the yogic system of breathing the right nostril dominance corresponds to activation of 'Pingala' subtle energy channel of yoga; related to sympathetic arousal and left nostril dominance to 'Ida' svara with parasympathetic activation (1).

Prolonged unilateral nostril breathing as a result of complete or partial nasal obstruction is correlated with a number of chronic disorders such as unilateral migraine, hyperthyroidism, asthma, peptic ulcer, dysmenorrhoea, lack of libido, cardiac symptoms (2–4), fever, inadequate oral intake and electrolyte imbalance (5). There is activation of contra lateral cerebral cortex with unilateral nostril breathing as evident from rise in EEG amplitude (6). Left nostril breathing increases intraocular pressure (IOP) by 4.5% while right nostril breathing decreases IOP significantly (7). The rise in oxygen consumption (8) also varies in right (37%) and left nostril breathing (24%).

The influence of right nostril breathing (RNB) and left nostril breathing (LNB) on cardio respiratory and autonomic parameters has been studied only lately (1, 8–10) with highly conflicting results; the authors describing increment, decline and no change in RR, HR, and GSR (8–10). Further ,to the best of our knowledge, the effects of RNB/ LNB on SBP, DBP and PEFR have not been investigated. The present study was, therefore, planned to investigate the effects of training in RNB or LNB given over an 8 wks period.

METHODS

The present study was conducted on 40 healthy, first year medical student volunteers. These students were divided in two groups doing RNB (males n = 10; females n = 10) and LNB (males n = 10; females n = 10). Their ages ranged from 17–22 yrs. The experimental protocol was explained to them and written consent obtained. The study protocol was approved by Ethics committee of Himalayan Institute of Medical Sciences. Their height, weight, age and dietary habits were recorded and body surface area (BSA) calculated by 'Dubois Nomogram' (11). All the subjects were healthy and free from any cardio - respiratory ailments and were not taking any medication. The subjects were of same socio - economic and nutritional status, as they hailed from upper middle class and upper class of society sharing common hostel accommodation and food. Poor socio-economic and nutritional status is known to adversely affect PEFR (12, 13) and autonomic responses (14, 15).

Experimental protocol : The two groups doing RNB and LNB comprised of 10 males and 10 females in each. The control RR/min, HR/ min, SBP mm Hg, DBP mm Hg, PEFR (L/ min) and GSR (μV) were recorded in the males and females following 3 to 4 students/ day schedule. The students then practiced RNB/LNB for 15 min sequentially and then parameters were again recorded one student (male/female) at a time. Each student (male/female) started practicing RNB/LNB for 15 min daily for 8 wks, from the day next to completion of his control and acute exposure (15 min) recording. Post training parameters were again recorded as each student (male/female) completed his/her 8 wks training in RNB/LNB. Again parameters were recorded in same order only 3 to 4 students/day and one student at a time.

Measurements and Recording devices: Respiratory rate (RR) was recorded by movement of abdominal wall in lying down position. Heart rate (HR) was calculated from RR interval of ECG in lead II. Electrocardiogram (ECG) was recorded by ECG machine, (BPL model number T-108, Bangalore) in supine rest. Three standard limb leads were recorded and lead II was analysed for calculating heart rate and other changes. Blood pressure (BP) was recorded by Digital BP monitor, AND model No. UA-767 (Vatsalya Trading Co., Dehradun) in supine position. Peak expiratory flow rate (PEFR) was recorded by Wright's peak flow meter (INCO, Ambala) in standing position. Galvanic skin resistance (GSR) was recorded by EDG machine, J & J model No. T-68 (Medicaid Systems, Chandigarh) in lying down position in air-conditioned room by applying electrodes on index and ring fingers of right hand, which has been found more appropriate by previous workers (8, 10). Readings were taken in microvolts (µV). The methodology for doing two types of nostril breathing is as follows.

Method for unilateral nostril breathing (RNB/LNB) (1):

It was done in sitting posture. The subjects were asked to practice the following. To sit in a calm, quiet, airy place in an easy and steady posture with the head, neck and trunk erect and in a straight line and to keep the body still.

- To bring the right hand upto the nose and close left/right nostril with the finger and then breathe through one nostril only.

During this unilateral breathing the exhalation and inhalation were of equal duration and without any pause. Breathing was diaphragmatic and slow and controlled with no sense of exertion.

Analysis of data: Mean and standard deviation of the observation for all the parameters were calculated and comparisons were done by applying Student's 't'-test (paired). Analysis was done by computer programming of "Microsoft Excel". Statistical significance was assigned at $P<0.05$. P values were obtained by comparison of parameters of control with 15 min and control with 8 wks training.

RESULTS

The anthropometric parameters are summarised in Table I and the results of RNB and LNB in Tables II and III.

In males, RR ($P<0.0001$), SBP ($P<0.05$) and DBP ($P<0.05$) fell significantly after 15 min of RNB. After 8 wks, HR ($P<0.01$) decreased, SBP ($P<0.001$) declined more profoundly and RR ($P<0.0001$) and DBP ($P<0.05$) decrement was maintained. After 15 min of LNB, RR ($P<0.01$), HR ($P<0.01$), SBP ($P<0.001$) and DBP ($P<0.01$) declined significantly. After 8 wks training, RR

TABLE I: The anthropometric parameters of the subjects.

Groups	*Ht(cms)*	*Wt(Kg)*	*BSA(/m^2)*	*BMI(Kg/m^2)*
		Male		
RNB (n=10)	172.8±5.9	64.7±6.6	1.77±0.1	21.5±2.4
LNB (n=10)	174.3±6.8	61.1±8.1	1.74±0.1	20.1±2.5
		Female		
RNB (n=10)	158.7±4.9	51.8±6.0	1.52±0.1	20.6±2.3
LNB (n=10)	156.1±3.6	51.8±6.8	1.50±0.1	21.3±2.6

The values are means and ±SD.

TABLE II: Effects of Right Nostril Breathing (n=10) and Left Nostril Breathing (n=10) on different parameters in males.

	RR (breaths/min)	*HR (beats/min)*	*SBP (mm Hg)*	*DBP (mm Hg)*	*PEFR (L/min)*	*GSR (μv)*
				RNB		
Control	17±2	72±9	117±9	69±8	563±48	10±4
After 15 min	14±2****	71±8	114±8*	64±6*	561±37	9±4
After 8 wks	11±2****	60±7**	111±9***	64±7*	574±47	10±5
				LNB		
Control	17±1	80±12	115±6	72±4	537±54	15±6
After 15 min	14±1**	68±10**	108±6***	65±4**	530±42	15±6
After 8 wks	13±1****	64±9***	106±6***	65±4**	544±42	14±5

The values are means ±SD.
*P<0.05, **P<0.01, ***P<0.001, ****P<0.0001).
P values are comparisons between control and 15 min and control with 8 wks of RNB/LNB.

TABLE III: Effects of Right Nostril Breathing (n=10) and Left Nostril Breathing (n=10) on different parameters in females.

	RR (breaths/min)	*HR (beats/min)*	*SBP (mm Hg)*	*DBP (mm Hg)*	*PEFR (L/min)*	*GSR (μv)*
				RNB		
Control	18±1	71±9	105±6	67±5	404±42	12±8
After 15 min	17±1*	69±12	104±6	67±6	417±47	11±7
After 8 wks	13±1****	68±7	102±5	62±6**	416±44	10±5
				LNB		
Control	17±2	79±16	109±7	70±6	385±48	09±4
After 15 min	15±2***	64±8*	105±12	68±6	397±42	10±4
After 8 wks	12±2****	66±13*	101±9**	65±5*	402±42*	9±4

Values are means ±SD.
*P<0.05, **P<0.01, ***P<0.001, ****P<0.0001).
P values are comparisons between control and 15 min and control with 8 wks of RNB/LNB.

($P<0.0001$), and HR ($P<0.001$) decreased further, SBP ($P<0.001$) and DBP ($P<0.01$) decrement was same.

In females, RR alone fell significantly ($P<.05$) after 15 min RNB. After 8 wks RR decrement was more profound ($P<0.0001$) and DBP also declined significantly ($P<0.01$). Similarly, 15 min LNB resulted in a significant reduction in RR ($P<0.001$) and HR ($P<0.05$) only. Following 8 wks, in addition to RR ($P<0.0001$), and HR ($P<0.05$) decrement, SBP ($P<0.01$) and DBP ($P<0.05$) also fell significantly.

Both in males and females GSR did not change significantly ($P>0.05$) either after RNB or LNB (15 min/8 wks). PEFR rose significantly ($P<0.05$) only in females after 8 wks of LNB.

DISCUSSION

The anthropometric values of the two groups (RNB and LNB) were comparable (Table I). The results of RNB in males and females are rather inconsistent while HR, RR, SBP and DBP decreased significantly and PEFR and GSR were elevated insignificantly in males (Table II), only RR and DBP declined significantly in females (Table–III).

These results with RNB are not suggestive of sympathetic activation or else, the sympathetic activation could be masked by activation of vagally mediated lung baroreceptor activity, which is likely to be enhanced by voluntary breathing effort. Telles et al. (8) using male subjects observed increment in O_2 consumption by right (37%), left (24%) and alternate (18%) nostril breathing and tried to explain this by increase in sympathetic discharge to adrenal medulla. However, their observation contradicts the proposition that left nostril effects are mediated by parasympathetic alteration because parasympathetic activation is anabolic in nature and should decrease O_2 consumption (16). Almost parallel result in females with significant decrement of DBP again mitigates sympathetic activation hypothesis. Although, GSR showed individual variations but its mean was insignificantly affected both in males and females. Other investigators (8-10) have reported decline in GSR in RNB. Respiratory rate (RR) and HR both declined in our study but is contradicted by another group (8), who reported increment in HR by RNB and RR was unaltered. In general, both in males and females, LNB significantly reduced RR, HR, SBP and DBP both on acute exposure and after training (Table II, Table III). PEFR was significantly elevated only in females and GSR was again unchanged. Previous authors (8) did not find any change in HR by LNB. Although, by presumption of parasympathetic activation by LNB, HR should have decreased in their study.

Highly significant decrement in RR in males and in females, both after acute exposure and training in RNB and LNB (Table II, Table III) could be due to certain amount of hypocapnoea and also the persistent voluntary effort of breathing may produce an inhibition of involuntary mechanism of breathing by a phenomenon akin to over drive suppression. The rise in PEFR in females after training in LNB can only be explained from the fact that females don’t indulge in much physical exercise perse, necessitating enhanced throaco-pulmonic performance. Therefore, in them, breathing exercises will lead to a greater compliance of thoracic cage and lungs over basal levels. The reverse holds good for males.

The results suggest that there are no sharp distinctions between effects of RNB and LNB either acute (15 min) or after training (8 wks). However, there is a general parasympathetic dominance evoked by both manoeuvres.

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