

Does nostril dominance affect post-exercise recovery of cardiovascular parameters? – An observational study in young males

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Abstract

Background: The nasal cycle, an ultradian rhythm, leads to an alternating lateralized vasodilatation and vasoconstriction of the nasal mucosa. Left nostril predominance is associated with parasympathetic activity and right nostril with sympathetic activity. The heart rate and blood pressure recovery times after exercise are dependent on modulation by the autonomic nervous system and it could be influenced by the dominance of nostril.

Material and methods: This observational study was done on healthy male volunteers between 18 and 30 years of age. On the day of the test, after obtaining consent, the baseline blood pressure and heart rate were measured following 5 minutes of rest in supine position using a digital monitor. The area of condensation produced by expired air on a cool plastic surface was used to see the nostril dominance, after which he was instructed to walk on a flat treadmill for 15 minutes at a speed of 6 km/hr. Following this, heart rate and blood pressure were monitored every minute until they reached the baseline and the time taken for this was noted.

Result: The mean post exercise recovery time of heart rate and blood pressure in subjects with initial dominant left nostril was significantly shorter as compared to those with initial dominant right nostril.

Conclusion: Thus this study demonstrates that nostril dominance does have an effect on the autonomic nervous system even in conditions of simulated tachycardia and systolic hypertension, as in the post-exercise period.

Keywords: Nasal cycle, nostril dominance, left nostril, post exercise recovery time

1. Introduction

Physical exercise involves increased metabolic activity of skeletal muscles and is accompanied by adaptive changes in the body, brought about mainly by the cardiovascular and respiratory systems. This is necessary to meet the augmented energy needs of the exercising muscles, to maintain blood flow to essential organs and to prevent the development of hyperthermia.

Tachycardia during relatively mild exercise is due to withdrawal of parasympathetic restraint on the sino-atrial node, and, at higher levels, due to an increase in sympathetic activity.[1] Impulses from higher centers and sensory inputs from mechanoreceptors and chemoreceptors in blood vessels, joints and muscles also contribute to exercise induced tachycardia. Systolic blood pressure is always raised during exercise and the change in diastolic pressure depends on the total peripheral vascular resistance, and may increase slightly, remain unchanged or even decrease. Consequently, dynamic exercise is often characterized by an increase in the mean arterial pressure consequent to an increase in the pulse pressure. Inputs from the metabo- and mechanoreceptors from

the exercising muscles as well as central commands from the higher centres are responsible for an increased sympathetic activity that leads to a rise in blood pressure. Fall in these parameters in the immediate post exercise period is considered to be due to reactivation of the parasympathetic nervous system.[2]

The alternating congestion and decongestion of the nostrils - the nasal cycle, is an ultradian rhythm lasting approximately for 2 to 3 hours.[3] This serves to prevent excessive drying and crusting of the nasal mucosa, thereby fulfilling its functions of humidifying, filtering and warming the inspired air.

During any phase of the nasal cycle, the cerebral hemisphere contra lateral to the more patent nostril is more active.[4] It has also been shown that the right cerebral hemisphere has predominantly parasympathetic activity and the left cerebral hemisphere has predominantly sympathetic activity.[5,6] This suggests that autonomic function can be influenced by the patency of nostril during the nasal cycle.

The time taken for heart rate and blood pressure to reach baseline values after exercise is dependent on modulation by the autonomic nervous system, which in turn can be influenced by the nasal cycle. This prompted us to address the question - will breathing with a dominant left nostril shorten the post exercise recovery times of blood pressure and heart rate?

2. Material and Methods

2.1 Study design

A cross sectional observational study was done in a controlled environment in the exercise physiology lab of the Department of Physiology, Pondicherry Institute of Medical Sciences, Puducherry. Ethical clearance was obtained from the Institute Ethics Committee before the study was initiated.

Sixty clinically normal, non-smoking male volunteers in the age group of 18 to 30 years were included in the study. Female participants were not included so as to avoid the effects of various phases of menstrual cycle, if any, on autonomic functions. Those who were trained athletes (those who did any repeated patterns of physical activity regularly) or were practitioners of yoga were excluded from the study. The participants did not have any systemic illnesses that would affect the autonomic nervous system, nor were they on any autonomic nervous system modifying drugs. They were screened for any localized inflammatory, infective or mechanical blockage of the nostrils that would affect the patency of nostril.

The volunteers were instructed to avoid coffee, tea, other caffeinated beverages and alcohol for at least 12 hours prior to the test. They were also asked not to engage themselves in any additional physical exercise for a period of 48 hours prior to the study.

On the day of the test, after a general physical examination and anthropometric measurements (height, weight), the participant was made to lie comfortably in supine position. After 5 minutes of rest, base line blood pressure and heart rate were measured in the left upper arm using an OMRON digital automatic blood pressure monitor (Model M10-IT HEM-7080IT-E). The area of condensation produced by expired air on a cool plastic surface was used to see the

nostril dominance. He was then instructed to walk on a flat motorized treadmill (Model AFTON-ACP087) for 15 minutes at a constant speed of 6 Km/hr. Subsequently, blood pressure and heart rate were recorded in the supine position, every minute, till they reached pre exercise levels. The time taken for recovery of each of the parameters was noted.

2.2 Statistical analysis

The recovery times of cardiovascular parameters after exercise, i.e., heart rate, systolic blood pressure and diastolic blood pressure were tabulated in two categories: as values when the participants had left nostril dominance and when they had right nostril dominance. The data was analyzed using GraphPad Prism software.

The Mann Whitney test was used for comparison of blood pressure values since the data was not normally distributed. Data pertaining to heart rate was analysed using Students t test. The level of significance was chosen as a p value less than 0.05.

3. Results

3.1 How the study participants were selected? [Fig. 1]

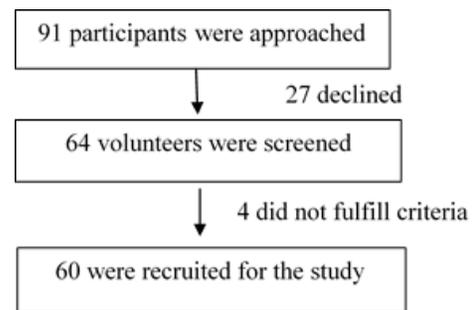


Figure 1: Selection protocol for study participants

Table 1: Anthropometric variables of the study participants

	Mean (n=60)	SD	Range
Age (yr)	23.38	3.46	18-30
Weight (kg)	70.87	10.27	50-96
Height (m)	171.37	5.34	162-185
BMI (kg/m ²)	23.91	2.85	16.0-31.6

Table 2: Comparison of post exercise recovery times of Systolic BP with left and right nostril dominance

Nostril Dominance	Mean	SD	Median	Interquartile range	p value #
Left	5.66	3.23	5	3-6	0.0004*
Right	8.25	2.95	8	6-9	

Mann Whitney Test

Table 3: Comparison of post exercise recovery times of Diastolic BP with left and right nostril dominance

Nostril Dominance	Mean	SD	Median	Interquartile range	p value #
Left	4	2.29	4	2-5.5	0.0001*
Right	7.79	4	7.5	6-11	

Mann Whitney Test

Table 4: Comparison of post exercise recovery times of Heart Rate with left and right nostril dominance

Nostril Dominance	Mean	SD	Median	Interquartile range	p value #
Left	8.84	3.91	9	6-11	0.0276*
Right	11.25	4.33	11.5	8.75-14.5	

Students t Test

4. Discussion

The present study showed a statistically significant reduction in the times taken for the recovery of systolic and diastolic blood pressures from the immediate post exercise values to the baseline, in those participants who had a more patent left nostril as compared to those with right nostril dominance. The heart rate recovery time also showed a similar reduction. These results put forth evidence that the parasympathetic dominance of left nostril breathing is strong enough to bring down the elevated cardiovascular parameters in the post-exercise state faster even while the participant breathes normally. The earlier observations that the left nostril patency causes an increased activity in the right cerebral hemisphere and the right cerebral hemisphere is found to have predominantly parasympathetic activity [4-6] may be used to explain these findings.

Drawing a parallel, the post-exercise period can be likened to a state of cardiac dysautonomia with increased sympathetic activity, with the cardiovagal compensatory mechanisms attempting to normalize the increased sympathetic activity. This allows us to consider studying the effect of forced left nostril breathing, a maneuver that allows to voluntarily manipulating the nasal cycle to make it left dominant, in a state of sympathetic over activity such as post exercise period. If found effective to hasten the recovery of blood pressure and heart rate, forced left nostril breathing can be developed into a non-pharmacological adjunct to therapy in conditions like supraventricular tachycardia and accelerated hypertension, which can be considered equivalent to the increased heart rate and blood pressure seen with exercise.

Further evaluation is necessary to see if such results are reproducible in subjects of other age groups, in female population and also in those with an already existing dysautonomia.

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