ORIGINAL ARTICLE

The Effect of Playing Flute on Respiratory Physiology

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Abstract:

Background*:*It has been observed that playing a wind instrument (e.g. flute) does have an effect on lung physiology.***Aims &Objectives****:*To study the effect of playing flute on lung function and vitals.***Material and Methods:*** The study was conducted on 60 males (30 flautists and 30 normal subjects) ranging from 10-40 yrs. The procedure included estimation of Peak Expiratory Flow Rate (PEFR) by Peak Flow Meter (PulmoPeak PEF meter) and measurement of pulse rate, respiratory rate and breath holding time.*Results:*It was found that the flautists had no significant variation in their vitals and PEFRs. But they did have a positive correlation between PEFR and their period of learning. ***Conclusion***:Our study concluded that the period of learning flute plays a vital role in remodelling respiratory system. So, this technique if exercised in childhood or in early cases of lung diseases(COPD, obstructive sleep apnoea etc.), it would probably benefit them.

Keywords: Accessory muscles of respiration, Circular breathing, Flute, PEFR

Introduction:

During quiet breathing, inspiration is an active process whileexpiration is a passive process due to the elasticity of lungs and chest wall. But this breathing becomes more vigorous while exercising or when the respiratory system is diseased andexpiration no longer remains a passive function. The act of playing a wind instrument (e.g. flute) does make expiration a controlled active workout. This is achieved by simultaneous breathing in through the nose & pushing out airstored in the cheeks through mouth. This technique used by some wind instrument players produces an uninterrupted continuous tone, this is known as circular breathing. The changes in mechanics of respiration during circular breathing are; recruitement of accessory muscles of respiration, the sternocleidomastoid actions as fixator, scalenes as antagonists for elastic recoil of the respiratory system when playing occurs over functional residual capacity(FRC) whenever possible. The rectus abdominis seem to be mostly used as agonist for specific large pressure requirements[2].

It is hypothesized that such respiratory strategy is expected to improve lung function and vitals over a period of time. Hence, the presentstudy was conducted to compare peak expiratory flow rate (PEFR) and breath holding time (BHT) of flautists and controls, to evaluate the correlation between pulmonary function with vitals- pulse & respiratory rate.

PEFR, the expiratory flow rate during the peak of Forced Vital Capacity (FVC) was studied because it primarily reflects large airway flow and depends on the voluntary effort and muscular strength of the individual [3].BHT reflects the subject's breathing pattern and respiratory endurance [4].

Material and Methods:

The study was conducted on flautists in the flute class & on non-flautists in a secondary school and a college and written informed consent was taken from each subject. The approval of Institutional Ethics Committee (IEC) was taken. The method was explained to the subjects.

The study comprised of asymptomatic 60 subjects divided into 2 groups: (30 flautists and 30 non flautists).The groups were matched for age by considering 3 age groups: (10-17yrs, 18-24yrs and 25-40yrs) and for sex by excluding females.Males with the history of any major respiratory illnesses, cold, cough were excluded. An average period of learning was 2.5-3 years with daily *riyaz*of about 2-3 hrs. Material included Peak flow meter (PulmoPeak PEF meter) with European scale (Range: 60-900 EU or Litres/Minute), Measuring Tape.

Respiratory history was taken initially.Height of all the subjects was measured in centimetres in standing position.Pulse rate and respiratory rate were taken in sitting position.The subject was asked to blow forcibly after taking a deep breathe through the mouth piece attached to the flow meter and the volume was read.Three readings were taken for the subject and the highest reading of PEFR was considered.The instrument was cleaned with Dettol sanitizer for every subject.For breath holding time measured in seconds, the subject was allowed to sit quietly for 15 minutes. He was instructed to exhale maximally followed by maximum inspiration & then hold his breath till breaking point. Karl Pearson's Correlation Coefficient and t-testwere the statistical tools applied.

Result:

	CONTROL (n = 30)		FLAUTISTS(n = 30)		t value	significance
	Mean	SD	Mean	SD		
Age	23.1	9.68	22.13	8.61	0.68	NS
Height	171	9.20	166.58	11.78	0.11	NS
PEFR	441.33	130.32	488.33	130.86	0.17	NS
PR	75.13	6.62	73.33	6.96	0.31	NS
RR	17.97	2.61	16.9	2.43	0.11	NS
BHT	44.8	20.38	47.87	18.46	0.54	NS

Correlation coefficient for PEFR in flautists and months of learning: 0.627118

Table 1: Age-Group Wise Variation among Control

Age Group (years)	**Freq**	**PEFR (Lit/min)**		**PR (Beats/min)**		**RR (Breaths/min)**		**BHT (sec)**	
		Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**

10-17	10	342	113.71	77.8	9.26	18.3	2.41	37.7	14.24
18-24	10	509	126.88	74.6	3.5	18	3.16	43.7	25.24
25-40	10	473	92.38	73	5.48	17.6	2.41	49.91	19.14
Total	30	441.33	130.32	75.13	6.62	17.97	2.61	44.8	20.38

Table 2: Age-Group Wise Variation among Flautists

Age Group (years)	Freq	PEFR (Lit/min)		PR (Beats/min)		RR (Breaths/min)		BHT (sec)	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD
10-17	10	361	100.49	74.2	9.19	17.4	2.88	39.1	11.15
18-24	10	529	96.78	74	7.16	17	2.16	51.3	16.73
25-40	10	575	86.7	71.8	4.05	16.3	2.31	53.2	23.75
Total	30	488.33	130.86	73.33	6.96	16.9	2.43	47.87	18.46

Discussion:

The skilful act of prolonged expiration after deep inspiration thus utilising the entire vital capacity while playing a wind instrument increases FVC and thereby elevates PEFR among wind instrument players. Hence, the present study has found a positive correlation between PEFR in flautists and months of learning. But a higher PEFR in flautists is not statistically significant enough to support the hypothesis of improved lung function in wind instrument players. Few studies by Schorr-Lesnick et al(1985), Heller SS, Navratil M also found no difference in lung function [5-7]; but some studies by Cossette et al(2008), Fiz et al,Munn et alshowed that some wind instrument blowershave better pulmonary function because of good respiratory muscle strength.[2,8-10]. Primary factors which affect PEFR are expiratory muscle strength, elastic recoilpressure of the lungs & the airway size. But the other factors like age, height, weight, BMI may alter the result of PEFR. We also correlated PEFR with the height of subjects and found a linear relationship among both the groups; but it was not statistically significant to be considered a confounding factor. Height of an individual decides the lung size which ultimately is responsible for one's respiratory compliance. Da Costa and Goh (1973) also correlated peak flow with height and found a positive correlation [11]. Changes in breathing pattern modify various central & autonomic mechanisms along with mechanical & haemodynamic adjustments[12].

It causes parasympathetic predominance which reduces one's vitals over a period of time. Hence, it was hypothesized that playing a wind instrument would decrease pulse rate and respiratory rate and would improve breath holding time (BHT). But, in the present study no significant change in BHT or attributes of autonomic nervous system, pulse rate & respiratory rate were seen. This study did have a variation in breathing pattern but daily hours of learning and the total period till date also contribute in deciding the final outcome of ANS. Hence, if the study is extended further, we might get a positive result.

Conclusion:

Considering the facts, it can be opined that regular flute playing does cause a parasympathetic predominance like other slow breathing type (Pranayama) and also strengthen the oropharyngeal airway[1,13]. Hence, if the habit of playing flute or any wind instrument is inculcated in childhood then it will definitely strengthen the ventilatory muscle control. This would allow the lungs to function optimally even in diseased states. This will act as a primary prevention for asymptomatic healthy individuals and as a secondary prevention for the patients of 'early' bronchitis (lower airway), obstructive sleep apnoea (upper airway). In near future, it can also be considered as a supportive measure for COPD [14, 15].

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