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# Ergospirometry Findings in Wind Instrument Players and Opera Singers

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**R**esearch studies about lung function in wind instrument players and opera singers are inconclusive. Some studies show improved respiratory function,<sup>1</sup> while others do not.<sup>2</sup> We conducted this study to assess the cardiopulmonary exercise testing in wind instrument players and opera singers and compare it with a control group of healthy individuals.

The experimental group included seven men and eight women, all volunteers. All the men were wind instrument players; five of the women were opera singers and three were wind instrument players with at least five years of experience of systematic performance. All men in the experimental group were smokers (at least 10 cigarettes per day). The comparison group included 15 persons—8 men and 7 women—grossly matched for age with the experimental group. They were all healthy non-smokers. The participants exercised on an electronically cycle ergometer (Ergoselect 100, Ergoline, Germany). The incremental increase of load was done with ramp method so as to determine the maximum load (Watts), in anaerobic ventilation threshold (AVT) and the maximum oxygen uptake ( $VO_{2peak}$ ). Each trial was terminated by participant fatigue,<sup>3</sup> or maximal tolerable exercise level<sup>4</sup>. Despite the small sample size, variables studied followed a normal distribution (Shapiro-Wilk test). The study was approved by the University of Thessaly Bioethics Committee.

The mean age of participants was 33.6 (SD 7.4) years in the comparison group, and 36.0 (SD 7.7) years in the experimental group. The men in comparison group did significantly better than wind players/singers in some parameters indicating better exercise performance ( $O_2$  uptake,  $CO_2$  production, load, and duration). However, there was no difference in spirometry findings (Table 1). In women, the mean  $FEV_1\%$  was significantly ( $p=0.031$ ) higher in wind players compared to the comparison group (Table 1). There was no significant difference between the two groups in terms of other variables measured. The men in the comparison group had a significantly higher mean oxygen uptake than wind players/singers ( $p=0.043$  for maximum oxygen uptake per kg). The comparison group did also better in all other ergospirometric values (Table 1).

The findings of the present study, compared with a comparison group, indicated a worse exercise performance in male and a better performance in female wind players/singers. The higher total  $O_2$  uptake and  $CO_2$  production values indicated better performance and exercise endurance, compatible with longer exercise duration. Regarding spirometry findings, in spite of smoking and older age, men in the experimental group had spirometry parameters similar to those observed in younger non-smoker men in the comparison group.

As ergospirometric findings in musi-

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**Table 1:** Comparative presentation of major ergospirometry findings in the experimental and comparison groups. Data are presented as mean (SD).

Parameters	Men			Women		
	Wind players (n=7)	Comparison (n=8)	p	Wind players (n=8)	Comparison (n=7)	p
FVC (%)*	101.28 (9.91)	99.00 (7.65)	0.623	107.87 (12.7)	99.43 (10.16)	0.170
FEV <sub>1</sub> (%)*	99.42 (6.75)	101.50 (9.28)	0.634	108.00 (9.44)	97.42 (7.04)	0.031
FEV <sub>1</sub> /FVC (%)*	85.20 (9.56)	85.41 (5.48)	0.960	86.85 (4.54)	83.04 (4.88)	0.159
O <sub>2</sub> UPKGAT (mL/min/kg)	20.31 (4.45)	22.10 (4.12)	0.434	19.24 (4.25)	16.99 (3.72)	0.298
O <sub>2</sub> UPKGMAXW (mL/min/kg)	29.07 (5.75)	36.33 (6.76)	0.043	28.83 (3.68)	28.79 (5.88)	0.988
O <sub>2</sub> threshold %*	63.00 (16.11)	57.63 (8.85)	0.429	68.38 (13.70)	59.57 (5.62)	0.138
CO <sub>2</sub> MAXW (mL/min)	2941.29 (409.15)	3483.13 (303.11)	0.011	2115.75 (202.26)	2123.00 (345.35)	0.961
LOAD (Watts)	198.86 (23.58)	229.13 (17.22)	0.013	142.38 (7.78)	131.71 (24.89)	0.269
Time duration (min)	10.54 (0.61)	11.18 (0.31)	0.031	10.57 (0.78)	9.60 (0.64)	0.021

\*Percent predicted values

FEV<sub>1</sub>: Forced expiratory volume in 1 second; FEF: Forced expiratory flow; FVC: Forced vital capacity; O<sub>2</sub>UPKGAT: Oxygen uptake/kg-anaerobic threshold; O<sub>2</sub>UPKGMAXW: Maximum oxygen uptake/kg; CO<sub>2</sub>MAXW: CO<sub>2</sub> maximum exhalation

cians/singers are lacking, comparison with previous studies was not possible. Results in females, if confirmed in a longitudinal study, may support previous speculations about beneficial effect of wind instrument playing or opera singing on respiratory function.<sup>5,6</sup> On the contrary, the deteriorating effect of smoking on respiratory function may exert any beneficial effects of playing in men. The fact that all men in the experimental group were wind instrument players, while five out of the eight women were opera singers should also be taken into account, as they receive different training for their respiratory muscles.

The results of this preliminary study were indicative of the necessity of further studies on the cardiorespiratory function of wind players and opera singers in large cohorts. A detailed examination of musicians' cardiorespiratory function may provide valuable information on how certain physical exercises may affect respiration and physical fitness.

**Conflicts of Interest:** None declared.

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