Respiratory Medicine (2011) 105, 761–767

available at www.sciencedirect.com

ScienceDirect

journal homepage: www.elsevier.com/locate/rmed

Prolonged use of wind or brass instruments does not alter lung function in musicians

Anita G. Fuhrmann [a,b], Peter J. Franklin [a], Graham L. Hall [c,d,e,*]

[a] School of Population Health, University of Western Australia, Perth, Australia
[b] School of Music, University of Western Australia, Perth, Australia
[c] School of Paediatrics and Child Health, University of Western Australia, Perth, Australia
[d] Telethon Institute for Child Health Research, Centre for Child Health Research, University of Western Australia, Perth, Australia
[e] Respiratory Medicine, Princess Margaret Hospital for Children, Perth, Australia

Received 3 November 2010; accepted 29 January 2011
Available online 2 March 2011

KEYWORDS
Musician;
Respiratory function tests;
Occupational health;
Respiratory physiology

Summary
Purpose: Respiratory function impacts on musical expression for wind/brass (W/B) musicians. Investigation of musicians' respiratory health to date has rarely progressed further than assessments of flow limitation through spirometry. This study aimed to compare W/B musicians' respiratory function to a non-wind/brass (NW/B) group with a comprehensive respiratory function assessment.
Methods: Non-smoking, non-asthmatic participants aged 18–60 years completed a respiratory health questionnaire followed by spirometry, static lung volumes, respiratory mechanics, using forced oscillations, gas transfer and airway responsiveness (AR). Measurements were compared between participant groups using *T*-tests and linear regression modelling.
Results: Data from 102 participants (55 W/B musicians and 47 NW/B subjects) were included in the analysis. There were no differences between the two groups for any spirometry or lung volume outcomes, with the exception of RV/TLC which was decreased among W/B musicians ($p = 0.03$). Measures of gas transfer and AR were similar between participant groups. Resistance at 6 Hz, measured by forced oscillation, was increased among W/B musicians compared to NW/B musicians ($p = 0.02$) but reactance at 6 Hz was similar between the groups ($p = 0.10$).
Conclusions: The results suggest that W/B musicians' do not have altered respiratory function when compared to a non-musical control group. However, increased R_{rs6} may indicate inflammatory, remodelling or other pathophysiological processes associated with W/B playing. Although the difference between groups was small it warrants further investigation.

* Corresponding author. Telethon Institute for Child Health Research, Centre for Child Health Research, University of Western Australia, PO Box 855, West Perth, WA 6872, Perth, Australia. Tel.: +61 8 9489 7816; fax: +61 8 9489 7700.
E-mail address: grahamh@ichr.uwa.edu.au (G.L. Hall).

0954-6111/$ - see front matter © 2011 Elsevier Ltd. All rights reserved.
doi:10.1016/j.rmed.2011.01.017

Introduction

In order to play a wind or brass (W/B) instrument, one must learn to manipulate airflow with precision, creating and sustaining the pressures and flows required by the instrument. Breath control is an important aspect of W/B instrumental pedagogy.[1,2] Any condition which interferes with respiration control is a potential hindrance for W/B musicians.[3] The effect on respiratory function of playing a W/B instrument is uncertain. Studies have suggested that playing a W/B instrument is associated with 'better' lung function, for example, larger vital capacity (VC).[4–6] On the other hand, there are data to indicate such an activity may have deleterious impacts on the lungs.[7,8] In a small study, Plamenac and Niculin[8] observed "marked eosinophilia" in sputum samples of W/B musicians, while Deniz et al.[7] reported decreased spirometric measurements among Naval Band musicians compared to non-musicians in the Navy. In addition a significant negative correlation between duration of practice and forced vital capacity (FVC) was also reported in the latter study.[7] A number of other studies have not found any adverse or beneficial effect of W/B playing.[9–11]

It is feasible that the repeated deep inhalations, increased respiratory volumes and/or pressures and the prolonged expirations against a resistance required to play W/B instruments may lead to altered small airway or distal lung abnormalities. Therefore it is critical that studies aiming to document the impact of playing wind/brass instruments include assessments of respiratory function sensitive to the peripheral lung.

The majority of studies to date have restricted their assessments of musicians' lung function to that of spirometry[4,7,9–13] and/or static lung volumes,[4–6,9,10,13–16] and it is possible that subtle changes occurring in the peripheral lung may not be detected with these techniques. Conversely, the measurement of respiratory system resistance (R_{rs}) and reactance (X_{rs}) with the forced oscillation technique (FOT), the assessment of gas transfer with the diffusing capacity of carbon monoxide (DLCO) and inhaled histamine challenges to document airway reactivity will provide a comprehensive assessment of both central and peripheral lung function. To date there have not been any published studies of comprehensive lung function assessments of musicians and this approach may provide a broader picture of pulmonary physiology in W/B musicians. This study aimed to compare W/B musicians' respiratory function to a non-wind/brass (NW/B) comparison group using measures of flows and volumes, gas transfer, respiratory mechanics and airway responsiveness (AR).

Methods

Subjects

Subjects, musicians and non-musicians, were recruited through universities, professional music ensembles and community ensembles. All participants were non-smokers, aged between 18 and 60 years and had no current asthma or other respiratory conditions. A current asthmatic was defined as a person who had self-reported current asthma and/or had experienced asthma symptoms and/or had used asthma medications in the 12 months prior to the test. People who had smoked for a significant proportion of their lives (5 or more years with 10 or more cigarettes per day), or who had smoked at all within 12 months of the test, were considered to be smokers for the purpose of the study. At the time of testing all participants were healthy, being at least three weeks clear of any respiratory infection. Human Research Ethics Committees at both The University of Western Australia and Princess Margaret Hospital approved the testing protocol. All subjects gave written consent prior to commencing the study.

Participant categorisation

Participants were classified as W/B musicians if they played W/B instruments (including voice) for >5 h per week and for $>$ 2 years. Musicians who played only non-wind/brass instruments (e.g. string instruments and/or percussion) and subjects who did not play any musical instruments were classified as NW/B participants. The primary aim of the study was to investigate lung function in W/B musicians. However, this is, to some degree, a heterogeneous group and, therefore, a secondary aim was to determine lung function within the W/B players depending on the instrument. Sub-groups were formed based on the maximum pressure (MP) required to play each instrument using data from the research of Bouhuys.[4] The W/B musicians were divided into two subgroups as follows: *low*MP (MP $<$ 100 mmHg, including singers) and *high*MP (MP $>$ 100 mmHg).

Protocol

The participants made one visit to the respiratory medicine laboratory at Princess Margaret Hospital for testing. The visit involved an administered respiratory questionnaire,[17] height and weight measurement and lung function testing performed in the following order: FOT, static lung volumes using multiple breath nitrogen washout, gas transfer by DLCO, spirometry and histamine challenge testing. All static lung volumes, D_LCO, histamine challenge and spirometry measurements were performed on a SensorMedics Encore lung function system (VMax software version 20.5; SensorMedics, Viasys, Yorba Linda, USA). Atopic status was determined using a skin prick test (SPT). All lung function tests were done according to standard protocols (see below). All testing was conducted by the same investigator (AF) and the same instructions were provided to each of the participants.

Techniques

Forced oscillation test

Forced oscillation tests were performed on a commercially available system (I2M Chess Medical, Belgium) that used a pseudo-random forcing signal (4–48 Hz) and according to international guidelines.[18] The machine was fitted with a mouthpiece incorporating a bacterial filter (Suregard, Bird Healthcare, Melbourne, Australia) and measurements were adjusted for the impedance properties of this mouthpiece/filter set-up.