98. Exercise capacity: from elite athletes to severe impairment

P839
Factors predicting exercise-induced oxygen desaturation in stable COPD
Khaled Hussein1, Atef Farouk Alkarn1, Samiaa Hamdi1, Raafat El-Sokkary1, Hamdy Shams2.
1Department of Chest Diseases, Faculty of Medicine, Assiut University, Assiut, Egypt; 2Cardiology Department, Faculty of Medicine, Assiut University, Assiut, Egypt

Background and objective: Some resting pulmonary function and blood gas parameters might predict exercise-induced oxygen desaturation in patients with stable COPD. We aimed at studying these factors.

Patients and methods: We tested 55 patients with stable COPD (FEV1/FVC%: 54.31). Resting pulmonary function, arterial blood gases, echocardiography, and incremental cardiopulmonary exercise testing were done for all patients. We diagnosed exercise-induced oxygen desaturation if O2 saturation decreased ≥ 4% with exercise. We compared desaturated (DS) with non-desaturated (NDS) patients.

Results: Exercise induced oxygen desaturation (DS) occurred in 28 subjects while 27 were non-desaturated (NDS). FEV1% of predicted was significantly lower in DS (33.75 ± 9.28) than NDS patients (49.49 ± 19.86, P < 0.001). Diffusing capacity DLCO % predicted was significantly lower in DS (47.54 ± 20.25) than NDS (67.35 ± 19.62, P < 0.001). Resting O2 saturation SaO2% was significantly lower in DS (91.9 ± 2.88) than NDS patients (95.94 ± 2.9, P < 0.001). Resting PaCO2 mmHg was significantly higher in DS (63.46 ± 11.58) than NDS patients (38.97 ± 6.38, P < 0.001). Pulmonary artery systolic pressure mmHg was significantly higher in DS (42.21 ± 11.90) than NDS (34.15 ± 12.14, P < 0.01). Medical Research Council MRC dyspnea score was significantly higher in DS (3.54 ± 0.69) than NDS patients (2.44 ± 0.97, P < 0.001). On the other hand, there were no statistically significant differences in FEV1/FVC%, total lung capacity, residual volume, and resting heart rate between the DS and NDS patients.

Conclusion: FEV1%, DLCO, resting SaO2, resting PaCO2, pulmonary artery systolic pressure and MRC dyspnea score can predict exercise-induced desaturation in stable COPD.

P840
A 4-min, self-paced step test to assess exercise impairment in COPD patients GOLD I-to-IV
Department of Medicine, Division of Respiratory Diseases, Federal University of Sao Paulo, SP, Brazil

Background: There is a long-standing interest in developing “field” exercise tests for patients with chronic obstructive pulmonary disease (COPD) which can be easily performed in the consulting room with a minimum of technical support.

Objectives: To investigate whether a 4-min, self paced step test (4MST) would be useful to assess exercise tolerance and oxyhemoglobin desaturation by pulse oximetry (SpO2) in a large group of outpatients with COPD.

Methods: 191 patients (GOLD stages: I= 16, II= 63, III= 79, IV= 33) prospectively underwent the 4MST. Patients were allowed to stop the test as needed and re-start it within the allowed 4-min.

Results: There were no significant test-related complications. There was a large variability in the steps climbed (ranging from low 20’s to more than 100). Based on the tertiles of steps climbed, patients were separated into sub-groups of progressive impairment (Group A, N= 62; Group B, N= 61; Group C, N= 68).
A patients were significantly younger than those of Group B and C (p < 0.05). The number of interruptions during the tests increased from Group A to C. In addition, this variable and the steps climbed were significantly correlated (r = 0.53; p < 0.01). 11/16 GOLD IV patients were on Group B or C (p = 0.05). In addition, from 36 patients with disabling breathlessness (MRC scores IV to V) 30 of them were on Groups B or C (p < 0.05). Decreases in SpO2 corrected by steps climbed decreased as exercise tolerance diminished (p < 0.05).

Conclusions: A 4-min, self-paced step test (4MST) was useful in discriminating COPD patients into progressive levels of exercise and pulmonary gas exchange impairment.

**P841**

Factors associated with aerobic fitness in adolescents with asthma

Sveinung Berntsen1, Karin C. Ludvig Carlsen2,3, Sigmund Alfred Andersen4, Peter Mowinckel2, Kai-Håkon Calrsen2,3,4, 
1Department of Public Health, Sport and Nutrition, University of Agder, Kristiansand, Norway; 2Department of Paediatrics, Oslo University Hospital, Oslo, Norway; 3Faculty of Medicine, University of Oslo, Norway; 4Department of Sports Medicine, Norwegian School of Sport Sciences, Oslo, Norway

Background: In adolescents with asthma, information on factors associated with aerobic fitness levels is limited. The present study aimed to determine if physical activity as well as skin fold thickness, asthma exacerbations, use of inhaled corticosteroids or lung function influences direct measurements of peak oxygen uptake (VO2peak) in adolescents with asthma.

Methods: From the general population based birth cohort, Environment and Child- hood Asthma study in Oslo, Norway, in a nested case-control study 86 13-years-old adolescents with and 76 without asthma performed maximal running on a treadmill with VO2peak measured. The sum of four skin fold thicknesses was recorded, fol- lowed by wearing an activity monitor for four consecutive days. Lung function was measured by maximum forced expiratory flow-volume curves and body plethysmography. Asthma exacerbations and use of medication were registered by parental questionnaire. Results: In the 162 subjects included, VO2peak was 1.73 (0.32, 3.14) and body fat -0.35 (-0.41, -0.28) were significantly associated with VO2peak in adolescents with asthma. Neither use of inhaled corticosteroids, lung function nor number of asthma exacerbations was associated with VO2peak when taking physical activity and skin fold thickness into account. In the adoles- cents without asthma only skin fold thicknesses was associated with VO2peak.

Conclusions: VO2peak appears to be determined by vigorous physical activity level and skin fold thickness in Norwegian adolescents with asthma and not by asthma-related factors such as use of inhaled corticosteroids, lung function nor number of asthma exacerbations.

**P842**

Predicting VO2max in elderly: Could equations established in younger subjects be used?

Cristina Pires1, Evelyne Lendorsdorfer1, Stéphane Doureller1, Irena Enache1, 
1Medicine, Hopitaux Universitaires de Strasbourg, France; 2Metropolitan, 3Geriatric Medicine, Hopitaux Universitaires de Strasbourg, France, Metropolitan

Background: Equations recommended by the ERS/ATS for estimating maximal oxygen consumption (VO2max or peak) have been established in population sam- ples with few subjects > 70 years. As a result, predicted values (pred) for elderly are largely extrapolated from linear models. We aimed to determine if VO2max values measured in people aged >70 years diverged from pred using recommended equations.

Methods: We measured VO2peak in 184 subjects (40% women and 60% men) aged 69-89 years and used Hansen’s equations for estimating VO2max.

Results: There were 49 non-diseased (ND) males and 62 with at least one disease (D) (COPD, cancer, coronary disease). In females, 34 were ND, and 39 had at least one D. VO2peak was 1.82 (0.44) L/min, 106% of pred, in ND males and 1.34 (0.45) L/min, 82% of pred, in D males. In ND females, VO2peak was 1.17 (0.29) L/min, 111% of pred, and was 1.07 (0.26) L/min, 102% of pred, in D females (NS). 4% of ND males and 3% of ND females had VO2peak < 70% of pred. The mean difference between pred VO2max and measured VO2peak was -0.09 L/min in ND males and -0.11 L/min in ND females. 90% of (predicted-measured VO2max) differences ranged between -0.77 and +0.58 L/min in ND males, and -0.57 and +0.36 L/min in ND females. Subjects with higher level of activity/week had higher VO2max (p < 0.001).

Conclusions: These results support the use of Hansen’s equations in elderly in populations comparable to ours.

**P843**

Reference values for cardiorespiratory fitness in a 20 – 85 year old population

Elisabeth Edvardsson1,2, Bjarke H. Hansen1, Ingar M. Holme1,3, Sindre M. Dyrdal4, Sigmund A. Andersen4,1, 
1Department of Pulmonary Medicine, Oslo University Hospital, Ullevål, Oslo, Norway; 2Department of Sports Medicine, Norwegian School of Sport Sciences, Oslo, Norway; 3Department of Education and Sport Science, University of Stavanger, Norway

Background: Existing reference values used during clinical exercise testing have been obtained with rather small none randomly sample sizes, lack of women and elderly or poor maximal end-criteria. The aim was to establish reference values during maximal exercise in a representative sample of men and women.

Methods: 904 randomly sampled healthy men and women (20 – 85 yr old) from the general population (Incor) - University of Sao Paulo Medical School, Sao Paulo, Brazil performed pulmonary function tests (PFT) and symptom-limited incremental cycle exercise on a modified Balke protocol to exhaustion.

Results: 759 patients met the criteria for an acceptable VO2max, based on RER=1.10 or BORG>17. In the age group 20-29, the VO2max (ml kg-1 min-1) was 40.3 (SD 7.1) and 48.6 (SD 9.6) in women and men, respectively. A linear decline (6% per decade) was observed after the age of 30 in both genders.

Physiological responses at maximal exercise, mean (SD)

<table>
<thead>
<tr>
<th>Age (yr)</th>
<th>20–29</th>
<th>30–39</th>
<th>40–49</th>
<th>50–59</th>
<th>60–69</th>
<th>70–85</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heart rate (beat/min)</td>
<td>192 (7.7)</td>
<td>187 (8.8)</td>
<td>181 (11.2)</td>
<td>173 (11.0)</td>
<td>164 (13.6)</td>
<td>155 (14.0)</td>
</tr>
<tr>
<td>Oxygen pulse (ml/kg)</td>
<td>17.0 (4.2)</td>
<td>17.2 (4.3)</td>
<td>16.2 (4.5)</td>
<td>15.5 (4.1)</td>
<td>14.3 (3.6)</td>
<td>12.1 (3.7)</td>
</tr>
<tr>
<td>Minute ventilation</td>
<td>119 (28)</td>
<td>118 (30)</td>
<td>106 (33)</td>
<td>97 (27)</td>
<td>88 (23)</td>
<td>68 (23)</td>
</tr>
<tr>
<td>(L/min)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heart rate reserve (%)</td>
<td>58 (12)</td>
<td>58 (13)</td>
<td>52 (15)</td>
<td>43 (14)</td>
<td>37 (13)</td>
<td>25 (11)</td>
</tr>
<tr>
<td>Duration (s)</td>
<td>16 (4)</td>
<td>16 (4)</td>
<td>15 (4)</td>
<td>14 (4)</td>
<td>12 (3)</td>
<td>10 (3)</td>
</tr>
<tr>
<td>RER</td>
<td>1.02 (0.20)</td>
<td>1.00 (0.20)</td>
<td>1.01 (0.20)</td>
<td>1.05 (0.20)</td>
<td>1.06 (0.21)</td>
<td>1.14 (0.21)</td>
</tr>
<tr>
<td>(min/ml)</td>
<td>169 (21)</td>
<td>174 (21)</td>
<td>182 (24)</td>
<td>194 (26)</td>
<td>195 (27)</td>
<td>197 (28)</td>
</tr>
<tr>
<td>HR (beat/min)</td>
<td>74 (5)</td>
<td>75 (5)</td>
<td>76 (6)</td>
<td>78 (6)</td>
<td>80 (7)</td>
<td>82 (7)</td>
</tr>
<tr>
<td>(L/min)</td>
<td>74 (15)</td>
<td>75 (16)</td>
<td>76 (17)</td>
<td>77 (18)</td>
<td>78 (19)</td>
<td>79 (20)</td>
</tr>
<tr>
<td>[Blood lactate] (mmol/L)</td>
<td>10.9 (2.6)</td>
<td>11.5 (2.8)</td>
<td>10.3 (2.9)</td>
<td>8.6 (2.8)</td>
<td>7.4 (2.5)</td>
<td>5.9 (2.2)</td>
</tr>
<tr>
<td>BORG scale (0-20)</td>
<td>17.9 (1.3)</td>
<td>17.9 (1.2)</td>
<td>17.6 (1.4)</td>
<td>17.5 (1.3)</td>
<td>17.6 (1.2)</td>
<td>17.6 (1.0)</td>
</tr>
</tbody>
</table>

Conclusions: The present study establishes VO2max, and other typical cardiorespiratory variables during maximal exercise and may be used as reference values.

**P844**

Exercise in patients with lymphangioleiomyomatosis: Performance and the prevalence of dynamic hyperinflation

André Albuquerque, Bruno Baldi, Suzana Pimenta, Joao Marcos Salge, Ronaldo Kattalic Carlos Carvalho. Respiratory Department, Heart Institute (Incor) - University of Sao Paulo Medical School, Sao Paulo, Brazil

Introduction: Previous studies suggested multiple factors for exercise cessation in LAM. Although airflow limitation is frequent in LAM, the dynamic hyperinflation (DH) and its repercussions during exercise have not been evaluated yet.

Objectives: To evaluate the prevalence and repercussions of DH in LAM and also the dynamic responses during maximal exercise, on cycling, but also greater desaturation and dyspnea intensity during 6MWT, compared with non-DH subgroup.

Methods: 42 patients performed pulmonary function tests (PFT) and symptom- limited incremental cycle exercise, in comparison to ten age-matched healthy women. Dyspnea intensity, inspiratory capacity, oxygen saturation (SpO2), car- diac, metabolic and respiratory variables were obtained during exercise. 6MWT was performed by LAM patients indeed.

Results: Compared to controls, LAM had higher baseline dyspnea, obstructive pattern, air trapping and lower DLCO in PFT. In LAM, maximal exercise perfor- mance was reduced, associated with ventilatory limitation, greater desaturation and dyspnea. DH occurrence was higher in LAM than controls (55 vs. 0%), with a significant correlation to airflow obstruction, an inspiration and DLCO. Patients who developed DH had not only a ventilatory contribution to exercise cessation on cycling, but also greater desaturation and dyspnea intensity during 6MWT, compared with non-DH subgroup.

Conclusions: Ventilatory limitation is an important reason for exercise cessation in LAM, compared with controls. DH was prevalent and had association with severity of disease, higher dyspnea and lower SpO2. On 6MWT, desaturation and increased dyspnea were greater in DH subgroup. Future interventions to reduce DH might contribute to improve dyspnea and exercise tolerance in LAM.
Exercise respiratory cycle time components in patients with emphysema

The data confirm that distinct physiologic response pattern can be observed also between TeM and PETCO2 and VE/VCO2 (r = 0.64; p = 0.004 and r = 0.63; p = 0.003). Results: Both TeM and TeM-end had a good linear correlation with % of E (r = 0.61; p = 0.004 and r = 0.65; p = 0.003).

Kazuyuki Tabira
1, Jum Horie 2, Hiro masa Fuji 1, Tos hishi Aida 3. 1Department of Physical Therapy, Faculty of Health Science, Kio University, Kitakatsuragi-gun, Nara, Japan; 2Department of Rehabilitation Science, Kobe International University, Kobe, Hyogo, Japan; 3Department of Respiratory Medicine, Osaka Prefectural Medical Center of Respiratory and Allergic Disease, Osaka, Japan

Background: Muscle oxygenation correlates with systemic oxygen uptake (VO2) in normal subjects, however whether this relationship exists in chronic respiratory failure (CRF) patients remains unclear.

Objectives: The purpose of this study was to investigate the influence of skeletal muscle oxygenation on VO2 during exercise in CRF patients.

Methods: Ten chronic obstructive pulmonary disease and two sequelae of pulmonary tuberculosis patients performed an incremental cycle ergometer exercise (CPET) with moderate to severe E (quantified by lung HRCT as % voxels < -940 HU) were evaluated with incremental cardiopulmonary exercise testing (CPET). Mean inspiratory time (TiM), mean total respiratory cycle time (TotM), mean expiratory time during exercise (TeM) and mean expiratory time during the last third of exercise (TeM-end) has been calculated.

Results: Both TeM and TeM-end had a good linear correlation with % of E (r = 0.61; p = 0.004 and r = 0.65; p = 0.003).

Conclusions: The impact of potential inspiratory muscle constraint on dynamic operating lung volumes response during symptom-limited incremental cardiopulmonary exercise testing (CPET) in patients with pulmonary arterial hypertension (PAH). Thirty-three young non-smoking PAH patients (idiopathic=26; heritable=7) with normal body mass index and no spirometric evidence of obstructive ventilatory defect (FEV1/FVC=115±10%) predicted performed a CPET to limit of tolerance. Ventilatory profile, operating lung volumes (derived from inspiratory capacity (IC) measurements) and inspiratory flow reserve (IFR), an indirect index of inspiratory muscle constraint/fatigue, were assessed throughout CPET. Twenty-two patients (67%) decreased IC (i.e., dynamic hyperinflation) throughout exercise by 0.50L (PAH-H), whereas the remaining patients (35%) increased IC by 0.50L (PAH-NH). V'E and V'O2 at peak exercise were comparable between the two groups. Despite these differences in operating lung volumes response, IFR at peak exercise was not statistically different between PAH-H and PAH-NH (1.9±1.0 vs 2.0±0.8L/s, p=0.7).

Both PAH-H and PAH-NH achieved inspiratory tidal flows that approached a similar percentage of the maximal available inspiratory flows (i.e., similar IFR), suggesting that the inspiratory flow-generating reserve of the inspiratory muscles at peak exercise was similar (but occurred at different operating lung volumes). The presence of inspiratory muscle constraint/fatigue and its contribution in modulating the dynamic operating lung volumes response to CPET is unlikely.

Support: 1) International Re-integration Grants (IRG), FP7-People-2010-RG; 2) PFIZER Investigator-Initiated Research (IR).
PS49 Determinants of exercise capacity in patients with COPD without other comorbidities
Gloria Samperiz, Laura Madre, Pablo Cubero, Marta Forner, Elena Forcen, Santiago Carrioz, Jose M. Martín. Respiratory Service, Hospital Universitario Miguel Servet, Zaragoza, Spain
Introduction: The 6 min walking test (6MWt) is frequently used to assess exercise limitation and exer
tional dyspnoea in COPD. Age, sex, metabolic, cardio
diastolic, neuromuscular and respiratory variables can contribute to determine the final individual value of the 6MWt.
Aims: To evaluate exercise performance with the 6MWt in COPD patients free of other co-morbidities.
Methods: From the Bode International Cohort Study we selected 148 men with COPD and no other cardiovascular, cerebrovascular, metabolic or neuromuscular disorder. In addition, patients who were taking beta-blockers or anti-hypertensives were also excluded at any complications. A pre-specified protocol including two standardized 6MWt was applied to all patients.
Results: The mean ± SD of the post bronchodilator FEV1% predicted and 6MWt was 62.0±21 and 396.9±95 meters respectively. Walked distance correlated signifi
cantly with age, height, weight, baseline dyspnoea (as assessed by the MRC scale), CAT questionnaire, spirometric parameters, lower heart rate (HR) and higher baseline O2 Saturation (O2 Sat). After forward stepwise multiple linear regression to evaluate the predictive value of the different factors to explain the 6MWt, four variables stay in the model: age, MRC score, change in O2sat and change in HR from baseline to the end of the test (adjusted r² = 0.33, p<0.001).
Conclusions: In COPD without comorbidities, age, exertional dyspnoea, and higher changes in O2 Sat and HR were the most important determinants of exercise capacity.
Funded by Instituto Carlos III, Madrid, Spain (FIS 09/02449).

P50 Exercise precipitates lung function derangement in early diabetes
Anupama Gupta, Neena Mishra, Rajesh Gupta, Sushma Sood. Physiology, Pt BD Sharma PGIMS, Rohtak, Haryana, India Physiology, Pt BD Sharma PGIMS, Rohtak, Haryana, India TB & Respiratory Medicine, Pt BD Sharma PGIMS, Rohtak, Haryana, India Physiology, Pt BD Sharma PGIMS, Rohtak, Haryana, India
Association between diabetes and pulmonary function has been inconsistent in various studies.
Aims: Our study aims 1. To find out minimal early changes in lung functions in diabetes patients. 2. To reveal abnormality of lung functions on minimal physical exertion (or exercise).
Methods: In 50 patients of type-2 DM without complication, nine spirometric parameters were recorded at rest, immediately after exercise (Mag cycle ergo meter, starting at 60 revolutions/minute against zero work load for a period of 5 minutes) and 5 minutes after stopping exercise and compared with matched healthy subjects as controls using paired & unpaired 't' test and 'p' values (non randomized).
Observations: 1. FEV1/FVC%, FEFP0 and FEFT5% were significant low in diabetics as compared to controls and further deteriorated on exercise indicating small airway and obstructive lung disease even in early diabetics i.e. Without complications. 2. Though FEV1, FVC & MVV in diabetics were comparable to controls but further deteriorated on exercise suggesting that diabetics fatigue early. 3. On 5 minutes of rest after exertion (exercise) FVC, FEV1/FVC%, FEF75 & MVV failed to recover hints that mild exercise precipitates underlying restrictive abnormality of lung in diabetics.
Discussion and conclusion: From the observations we can make out that early changes in lung functions are obstructive in early diabetics taken as uncompli
cated, with musculo-skeletal and connective tissue dysfunctions underlying, the restrictive abnormality is precipitated even on mild exercise.

P51 Daily physical activity in patients with chronic obstructive pulmonary disease
Stefania Zorzau1, 2, Selina Durr1, 2, Sabrina Maier1, 2, Esther Helen Steven1, 2, David Miedinger1, 2, Jörg Daniel Leuppi1, 2. 1Internal Medicine, University Hospital, Basel, Switzerland; 2Human Movement Sciences and Sport, Federal Institute of Technology Zurich (ETH), Zurich, Switzerland
Background: Patients with chronic obstructive pulmonary disease (COPD) are known to be significantly inactive in daily life. For these patients it is difficult adequate intervention strategies, it might be a good approach to quantify the amount of daily physical activity (PA).
Objective: The primary aim of this study was to examine PA levels across COPD stages and COPD risk groups.
Method: Stable patients with COPD Gold stages I-IV were recruited at the Uni
ersty Hospital of Basel, Switzerland. Participants were classified into four risk groups A to D according to the revised GOLD guidelines of December 2011. PA was measured by the validated SenseWear Mini Armband on seven consecutive days. Average daily number of steps, activity based energy expenditure (AEE) and time spent in PA above 3 METs (PA3) were chosen as primary outcomes.
Results: Complete data were available from 77 individuals (59.7% male, age 66.9±9.8yrs, Body Mass Index (BMI) 25.8±5.5kg/m², steps 4760±3383, AEE 436.1±381.5cal, PA3 96.8±84min). Steps (p<0.01), AEE (p<0.01) and PA3 (p<0.05) were all found to be significantly higher in COPD risk group A compared to B. In contrast, only steps were observed to be significantly lower in COPD stage IV compared to I and II (p<0.01). BMI showed a negative correlation with AEE (r=-0.27, p<0.01) and PA3 (r=0.44, p<0.01). Age was found to be inversely associated with steps (r=0.24, p<0.05), while gender was not found to correlate significantly with any of these measures.
Conclusion: This study provides evidence that daily PA is significantly impaired in severe COPD stages and risk groups compared to early ones. However, COPD risk groups seem to reflect disease severity more accurately than COPD stages do.

PS82 Effect of exercise training on ventilation in patients with COPD or chronic heart failure
Maria Gutiérrez-Sánchez1, 2, Egill Thoroddsen1, Arna E. Karlsson1, 2, Audur Kristjánsson1, 2, Magnús R. Jonasson1, 2, Magdalena Ageirsdottir1, 2
1Department of Physiology, University of Iceland, Reykjavik, Iceland; 2Department of Heart and Lung Rehabilitation, Reykjavikland, Rehabilitation Centre, Mosfellsbær, Iceland
Ventilatory efficiency is reduced in patients (pts) with COPD or chronic heart failure (CHF) resulting in abnormal dyspnoea during exercise. The aim of the study was to evaluate the effect of exercise training on ventilation in these pts.
Methods: 25 COPD pts (11 males; 64±9 years old, GOLD 3-4) and 25 CHF pts (11 males; 55±10 years old, NYHA class III-II, ejection fraction <35%) underwent maximal exercise test pre and post rehabilitation programme (RP) measuring oxygen uptake (V'O2), carbon dioxide output (V'CO2) and ventilation (V'E). The ventilatory efficiency was evaluated using the V'E/V'O2 slope. Breathing pattern was evaluated using iso-ventilation, i.e. maximal V'E, tidal volume (VT) and respiratory rate (RR) pre RP compared to the same parameters during iso-V'O2 post RP. Exercise training in the RP consisted of endurance and strength training 3 days a week for 6 weeks.
Results: Exercise endurance increased and ventilatory requirements reduced post RP. Breathing pattern improved in COPD pts but ventilatory efficiency was unchanged in both groups (Table 1).

<p>| Table 1 |</p>
<table>
<thead>
<tr>
<th>COPD patients</th>
<th>CHF patients</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pre</strong></td>
<td><strong>Post</strong></td>
</tr>
<tr>
<td>V'O2max (ml/kg/min)</td>
<td>9.8±4.3</td>
</tr>
<tr>
<td>V'E/CO2 slope</td>
<td>36.2±7.2</td>
</tr>
<tr>
<td>Iso-V'E/(ln/min)</td>
<td>30.9±1.6</td>
</tr>
<tr>
<td>Iso-VT (L)</td>
<td>1.17±0.33</td>
</tr>
<tr>
<td>Iso-RR (per min)</td>
<td>29.1±5.1</td>
</tr>
</tbody>
</table>
| Data are presented as mean ± SD. *p<0.05 post RP vs pre; **p<0.05 CHF vs COPD.

Conclusion: Exercise training did not improve ventilatory efficiency but reduced ventilatory requirements during heavy exercise giving prospect of less dyspnoea during effort in these pts.

PS83 Short-term ingestion of salbutamol increases isometric muscle power in endurance athletes
Anders Kalsen1, 2, Morten Husted1, 2, Jens Bangsbo2, Vibeke Backer2
1Respiratory Research Unit, Bispebjerg University Hospital, Copenhagen, Denmark; 2Department of Exercise and Sport Sciences, University of Copenhagen, Denmark
Rationale: Salbutamol is on WADA’s prohibited but is allowed by athletes in therapeutic dosages. Positive effects of oral salbutamol have been shown in active males and females. Yet, studies are needed examining the effects in athletes. Further, there are no studies have examined whether oral salbutamol improves isometric muscle power and endurance. We examined whether acute and short-term intake of oral salbutamol improved isometric muscle power and endurance, and submaximal exercise performance in endurance athletes.
Method: Twenty non-asthmatic endurance athletes (M), aged 25.8±4.4yrs, wattmax 440.9±29.3W, were enrolled in a randomized double-blinded parallel study, into either oral salbutamol 8 mg (SAL) or placebo (PLA). The protocol consisted of three tests. Isometric muscle power of m. quadriceps was measured by maximal voluntary contraction, followed by an isometric endurance test of m. quadriceps to exhaustion and a submaximal cycling test to exhaustion at 90% of V'02max (TTE@90%). The protocol was performed at baseline, after acute ingestion, and after 14 days of daily ingestion.
Results: Short-term intake of salbutamol significantly increased isometric muscle power, 70.9±11.5 versus 66.2±101 at baseline (p<0.05). Furthermore, there was a significant linear trend of increased isometric muscle power with SAL throughout the intervention (p<0.05). No differences were found in the PLA-group. Neither SAL nor PLA had any impact on isometric endurance or TTE@90%.
Conclusions: Short-term intake of salbutamol might augment training response and increase isometric muscle power in endurance athletes. Salbutamol had no effect on submaximal exercise at 90% of V'O2max or on isometric endurance.
Results: In all patients we observed a linear response of the $\Delta V'E/\Delta HR$ relationship; in COPD patients $S_0$ was steeper vs PAH and CHF and approached maximal voluntary ventilation (MVV). $S_0$ slope was observed mainly in CVD patients and approaching maximal predicted HR.

A good agreement (Bland-Altman test) for VCP detection was observed between $\Delta V'E/\Delta HR$ vs the ventilatory equivalent for CO$_2$ ($V'CO_2/VCO_2$) methods.

Conclusions: In patients with COPD and CVD, the $\Delta V'E/\Delta HR$ response during cycling incremental exercise can be utilized to discriminate between ventilatory and circulatory limitation.

References:

Conclusion: RMET significantly improves MIP and MVV in triathletes and increases exercise performance. Furthermore, the VE becomes more efficient as shown by the reduction of VE, RR and by the lower dyspnea Borg score; the new data is the lower trend of VO2 during incremental test.