P4381 Predicting the risk of falls in patients with COPD: Does age matter?
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Introduction: The extrapulmonary manifestations of COPD have been associated with deficits in mobility and balance, which potentiate the risk of falls. This is more evident in advanced COPD. However, research in the risk of falling in this population is scarce. Furthermore, deterioration of balance increases with age. It is important to understand how age influences the fall risk in these patients.

Aim: To assess the risk of falls in different age groups of patients with advanced COPD.

Methods: Fifty-five outpatients with COPD (GOLD III and IV) were recruited. The risk of falling was assessed using the Timed Up & Go (TUG) test. Two TUG tests were performed and the best performance was considered. Participants (39 males) were divided into 4 groups according to their age: <60 (n=11; G1), 60-69 (n=11; G2), 70-79 (n=20; G3) and 80-99 years old (n=13; G4).

Results: The mean TUG time for each group was G1 11.03 ± 6.80; G2 10.73 ± 3.11; G3 10.59 ± 1.36; G4 11.36 ± 2.35; G5 11.86 ± 2.35; G6 11.22 ± 1.35; G7 14.34 ± 4.87 seconds. No statistical significant differences between groups were found. However, all groups presented worse values than the average performance of their age-matched healthy peers.

Conclusions: Patients with advanced COPD exhibit changes in balance and are at risk of falling, regardless of their age. The results suggest that pulmonary rehabilitation, a recommended standard of care for patients with COPD aimed at risk of falling, regardless of their age. The results suggest that pulmonary rehabilitation, a recommended standard of care for patients with COPD aimed at risk of falling, regardless of their age.


P4382 Does the incremental shuttle walking test (ISWT) require maximal effort in healthy subjects of different ages?
Cristiane Gonçalves1, Rafael Mesquita1,2, Daniela Hayashi1,2, Josiane Marques Felcar1,3, Fábio Pitta3, Karen Barros Parron Fernandes1,2, Vanessa Suziane Probst1,3. 1Centro de Pesquisa em Ciências da Saúde (CPCS), Centro de Ciências Biológicas e da Saúde (CCBS), Universidade Norte do Paraná (UNOPAR), Londrina, Brazil; 2Programa de Mestrado Acelerado UEL-UNOPAR em Ciências da Reabilitação, Universidade Estadual de Londrina (UEL), Londrina, Brazil; 3Laboratório de Pesquisa em Fisioterapia Pulmonar (LFP), Universidade Estadual de Londrina (UEL), Londrina, Brazil.

Background: It is unknown whether the ISWT requires maximal effort in subjects of different ages.

Objective: To evaluate if the ISWT requires maximal effort in healthy subjects of different ages.

Methods: 331 individuals (158 men) performed two ISWT, allowing more than 12 levels of the test, if necessary. The participants were separated into six groups according to their age: G1: 18-28, G2: 29-39, G3: 40-50, G4: 51-61, G5: 62-72 and G6: 73-83 years. Heart rate (HR) and symptoms of dyspnea and fatigue were recorded. HR achieved at the end of the test was expressed as a percentage of the maximum heart rate (HRmax).

Results: 31% of the subjects achieved more than 12 speed levels. The majority of subjects reached HR values greater than 90% max at the test with a median [interquartile range] of: G1: 90[95-104]; G2: 92[96-105]; G3: 102[97-107]; G4: 99[91-105]; G5: 95[87-106] and G6: 95[90-109]%HRmax.

Regarding symptoms, all groups showed higher values of dyspnea and fatigue at the end of the test (p < 0.05). A multivariate analysis (logistic regression) identified that female gender (odds ratio: 3.3 [95% confidence interval:1.4-8.1]), worse performance in the ISWT (low: 4.2 [1.7-10.2]; normal: 2.6 [1.3-5.4] versus high performance) and older age (4.7 [1.7-12.9]) increased the chance for not achieving 90% of HRmax at the end of the ISWT.

Conclusions: The Incremental Shuttle Walking Test is a field test that requires maximum effort for most healthy individuals, and for that it is necessary to extend the test beyond twelve speed levels. Female gender, older age and worse performance in the test are the determinants for not reaching maximal effort during the ISWT.
Methods: This prospective observational study included 389 patients aged 40-75 yrs, with clinically stable COPD in GOLD stage II-IV. Measurements at baseline and after 1 and 3 yrs included (6MWD, spirometry, body mass index (BMI), and assessment of smoking habits and exacerbations) by questionnaires. Adjusted generalized estimating equations (GEE) regression analyses were used to analyze predictors for change in 6MWD.

Results: There was no significant change in 6MWD from baseline to 1 yr for any GOLD stage, or from baseline to 3 yrs for patients in GOLD II. For GOLD III (β = -36 m, 95% CI = -55, -17) and IV (β =86 m, 95% CI = -138, -33) 6MWD decreased (β). In the multivariate GEE forced expiratory volume in one second (FEV1) (p<0.001), forced vital capacity (p<0.001), age (p<0.001), exacerbations (p=0.018), BMI (p=0.001) and pack years (p=0.003) were predictors for 6MWD, though only FEV1 predicted change over time (p=0.003).

Conclusion: Patients in GOLD stage II maintained 6MWD at 3 yrs, while patients in GOLD III and IV reduced 6MWD significantly. FEV1 was a strong predictor for longitudinal change in 6MWD.

P4385

Twelve-minute walking distance predicts COPD mortality

R. Hans Arnoldottir,1,2 Chirsten Janson,1 Hans Hedenström1

Background: Patients in pulmonary rehabilitation (PR) suffer from poor lung function, exercise capacity and health-related quality of life (HRQoL). Some of these factors have been shown to relate to mortality in COPD. Drop-out from clinical PR-studies is often high and might indicate worse prognosis in that group.

Aims: To measure the five-year survival of 89 COPD-patients enrolled in a four-month PR at Uppsala University Hospital and investigate if the 12 min walking distance (12MWD), peak exercise capacity (Wpeak), HRQoL and being able to fulfill the training period had prognostic value for survival.

Methods: Long function (FEV1; VC), 12MWD. Wpeak and HRQoL (SF-36) were measured at baseline. Of 89 included patients, 53 fulfilled the PR-program.

Results: Mean baseline FEV1 was 34±12 % pred. and most patients had GOLD stage III or IV. Mean follow-up time was 1732±324 days. Twenty patients (22%) died during follow-up. Causes of death were cancer (n=9), COPD (n=6) and limited incremental cycle ergometry (CE), and to test the reliability of the IStT in decreased (fig.1). In the multivariate GEE forced expiratory volume in one second (FEV1) (p<0.001), forced vital capacity (p<0.001), age (p<0.001), exacerbations (p=0.018), BMI (p=0.001) and pack years (p=0.003) were predictors for 6MWD, though only FEV1 predicted change over time (p=0.003).

Conclusion: Patients in GOLD stage II maintained 6MWD at 3 yrs, while patients in GOLD III and IV reduced 6MWD significantly. FEV1 was a strong predictor for longitudinal change in 6MWD.

P4386

A symptom-limited incremental step test determines maximal physiological responses in patients with COPD

Simone Dal Cogal1,2, Carla Malaguti1,2, Anderson Alves de Camargo1,2, Maria Isabel Waeber3

Results: Despite significant differences in peak VO2 (1.18±0.36 L. f. 1.26±0.43 L, respectively), no differences were observed for VE, VE/min 42±17.4 vs 42±17.3, respectively) and for heart rate expressed as a percentage of the predicted rate (89±12, 90±13, 88±11, respectively). The desaturation was significantly lower for CE compared to IStT-1 or IStT-2 (3.4±3.4%, 3.4±3.4%, 3.4±3.4%, respectively). Both IStTs showed highly reproducible VO2 peaks (intraclass correlation coefficient (ICC)=0.99) and number of steps (ICC=0.98). A strong correlation was found between the work performed on the ISt (step height (m) x number of steps x weight (kg) x 0.16357) and peak VO2 on CE (r=0.93).

Conclusion: A symptom-limited incremental step test, externally paced, elicits maximal cardiopulmonary and metabolic responses, and is well tolerated and reproducible in patients with COPD.

P4387

The impact of MRC classification on daily physical activity and physical health-related quality of life in mild to moderate COPD

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Dyspnea, reduced physical activity (PA) and impaired health-related quality of life (HRQoL) are common features in COPD. This study aimed to investigate the impact of dyspnea on PA and HRQoL in mild/moderate COPD. Fifty-three subjects with COPD and 60 smoking controls were recruited. Medical Research Council (MRC) classified patients by symptoms of dyspnea. The SomaticEnearmnbard was worn for 7 days and time spent in at least moderate intense PA and amount of steps served as PA estimates. HRQL was assessed by the SF-36 physiological functioning score and the EQSD general health VAS score.

Table 1. Patient characteristics

<table>
<thead>
<tr>
<th>MRC1 COPD</th>
<th>MRC0 COPD</th>
<th>MRC1 smokers</th>
<th>MRC0 smokers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (y)</td>
<td>64±7</td>
<td>63±6</td>
<td>63±5</td>
</tr>
<tr>
<td>Gender/Sm</td>
<td>83</td>
<td>75±5</td>
<td>62</td>
</tr>
<tr>
<td>BMI</td>
<td>27±4:3</td>
<td>26±5:4</td>
<td>27±5:4</td>
</tr>
<tr>
<td>FEV1 (%)</td>
<td>79±16°</td>
<td>93±15</td>
<td>106±15</td>
</tr>
<tr>
<td>GOLD III</td>
<td>15±14°</td>
<td>204</td>
<td></td>
</tr>
<tr>
<td>Daily step</td>
<td>705±3117</td>
<td>9153±4586</td>
<td>8607±2870</td>
</tr>
</tbody>
</table>

*p<0.05 MRC1 vs MRC0, **p<0.05 MRC1 COPD vs MRC1 smokers.

Moderate intense PA was significantly reduced in MRC1 COPD compared to MRC1 smokers and tended to be lower versus MRC0 COPD (p=0.10). A trend for reduced daily steps in MRC1 COPD was observed versus MRC1 smokers and MRC0 COPD (p=0.09). MRC1 COPD reported reduced physical functioning and role physical scores versus MRC1 COPD smokers and MRC0 COPD, with 81±13 vs 91±2 for physical functioning. p<0.01 and 71±12 vs 77±17 vs 81±10 for VAS score, p<0.05.

PA levels are reduced in symptomatic patients with mild to moderate COPD. MRC classification, as proposed by the new GOLD guidelines, is useful in identifying reductions in PA (and physical) HRQoL, even in the early stages of COPD.

P4388

Does the energy expenditure of patients with COPD reflect their time spent walking and intensity of walking in daily life?

Thais SantAnna, Carlos Augusto Camillo, Renato Vitorasso, Anaia Cortez Vercece, Victoria Cristina Escobar, Nuida Aparecida Hernandez, Fabio Pitta

Introduction: The level of physical activity in daily life (PADL) is frequently expressed by energy expenditure (EE) measurement. However, patients with chronic obstructive pulmonary disease (COPD) often present high EE due to increased work of breathing, systemic inflammation and other factors. Thus, EE might not be a good outcome to characterize PADL in this population.

Aim: To verify the influence of time spent walking, movement intensity and other PADL variables on EE of patients with moderate to severe COPD.

Methods: The PADL of 53 patients (55±11 yrs, 38±15%M) was evaluated by two activity monitors (DynaPort MiniMod and SenseWear). The DynaPort mainly registers time spent walking (TW), sitting, standing, lying (TL), and other movement intensity (MI).

Results: Despite significant differences in peak VO2 (1.18±0.36 L. f. 1.26±0.43 L, respectively), no differences were observed for VE, VE/min 42±17.4 vs 42±17.3, respectively) and for heart rate expressed as a percentage of the predicted rate (89±12, 90±13, 88±11, respectively). The desaturation was significantly lower for CE compared to IStT-1 or IStT-2 (3.4±3.4%, 3.4±3.4%, 3.4±3.4%, respectively). Both IStTs showed highly reproducible VO2 peaks (intraclass correlation coefficient (ICC)=0.99) and number of steps (ICC=0.98). A strong correlation was found between the work performed on the ISt (step height (m) x number of steps x weight (kg) x 0.16357) and peak VO2 on CE (r=0.93).

Conclusion: A symptom-limited incremental step test, externally paced, elicits maximal cardiopulmonary and metabolic responses, and is well tolerated and reproducible in patients with COPD.

Moderate intense PA was significantly reduced in MRC1 COPD compared to MRC1 smokers and tended to be lower versus MRC0 COPD (p=0.10). A trend for reduced daily steps in MRC1 COPD was observed versus MRC1 smokers and MRC0 COPD (p=0.09). MRC1 COPD reported reduced physical functioning and role physical scores versus MRC1 COPD smokers and MRC0 COPD, with 81±13 vs 91±2 for physical functioning. p<0.01 and 71±12 vs 77±17 vs 81±10 for VAS score, p<0.05.

PA levels are reduced in symptomatic patients with mild to moderate COPD. MRC classification, as proposed by the new GOLD guidelines, is useful in identifying reductions in PA (and physical) HRQoL, even in the early stages of COPD.
Results: Only TW (r=0.41) and TL (r=0.31) significantly explained TEE (r=0.40, p<0.001). AEE was explained only by TW (r=0.19, p<0.001). MI did not help explain TEE (p=0.16) or AEE (p=0.24).

Conclusions: Time spent walking and lying in daily life explained together 40% of the variation in TEE, whereas time spent walking explained only 19% of AEE. Furthermore, movement intensity did not affect significantly any variation in EE. This suggests that assessment of time spent actively and inactively, movement intensity and energy expenditure in daily life do not provide similar or related information on the assessment of PAL in patients with moderate to severe COPD.

P4389
Comparison of outcomes of the Actigraph and the Dynaport activity monitor in patients with COPD; results from PROactive
Juliana Maria Sousa Pinto1, Thierry Troosters1, Laurence Vranken1, Miek Hermink1, Heleen Demeyere1, Wim Janssens1, Marc Decramer1, Judith Garcia-Aymerich2, 1Rehabilitation Sciences and Respiratory Division, KU Leuven and UZ Leuven, Leuven, Belgium; 2Center for Research in Environmental Epidemiology, CREAL, Barcelona, Spain

Activity monitors are increasingly used to assess physical activity. We aimed to compare wearing time and walking between two activity monitors in COPD. Fifty-four patients (FEV1 62 ±22%pred. (64WD 49 ±138min) were included in the Actigraph (AG) and Dynaport (DP) twice for 14 days with 14 days in between, in the frame of the PROactive project. Wearing time (h/d); walking time(min/d) of DP (DPWT) and step/day of AG (AGsteps) were retrieved. Calculations were done on the mean wearing and walking variables obtained over 28 days (Inter-patient correlations). Intra-patient correlations were calculated over the 28 days obtained in each patient, as well as between mean weekly values of the 4 weeks (6 contrasts).

Results: Wearing time of the AG and DP were strongly related (R=0.80 p<0.001). Despite being worn on the same belt the DP reported 83 ±69min more wearing time (p<0.001). Mean DPWT and AGsteps related strongly (R=0.90 p<0.001). Median day-by-day correlations between AGsteps and DPWT was 0.88 (IQR 0.75 to 0.95). Week-to-week variability was large (AGsteps range 424 range -8412 to 8083; DPWT 6 range -.79 to 120min). Median correlations of differences in 6 weekly PA levels, (n=39) was good (median R=0.88 IQR 0.71 to 0.98).

Conclusion: These data show that both monitors provide comparable outcomes and are capable of measuring differences between separate weeks of assessment. The difference in wearing time needs clarification.

P4390
Cell phone based physical activity monitoring: A validation study
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Background: Accelerometers are accurate and useful for monitoring Physical Activity (PA) in people with chronic lung disease (e.g. COPD) and can help motivate clients to comply with rehabilitation. However, they are expensive and largely limited to research. Similar motion sensors are embedded within the majority of newer mobile phones, which are widely accessible.

Aim: This study investigated whether the built-in accelerometers within mobile phones may be valid and reliable for monitoring PA.

Method: A mobile phone application to record real time tri-axial acceleration was developed. The accelerometer integrated within 2 mobile phones (HTC Wildfire and HTC Desire HD) was compared to a validated accelerometer (ActiGraph GT3X). Wearing all 3 devices, 7 healthy adults performed 7 different activities, paced with a metronome, each repeated 7 times. Absolute values of 3D acceleration signals were summed and averaged over each time period. Reliability was evaluated using Intra-class Correlation Coefficients (ICCs). Concurrent validity was assessed using a general linear model for repeated measures (GLM) and Pearson correlation.

Results: The ICC for both phone devices ranged between 0.82 and 0.98. GLM and Pearson coefficient confirmed good correlation between phones and ActiGraph in all activities (Figure 1).

Conclusion: Mobile phone accelerometers appear to be reliable and valid for measuring PA. Further research is needed to confirm these data in a patient population.

P4391
Walking speed and muscle strength are determinants of physical activity level (PAL) – A cross-sectional study in COPD
Mikael Andersson1,2, Frode Slinde3, Anne Marie Grønberg1,3, Ulla Svantesson1,3, Mårten Silvert3,4, Emmanuel Stamatakis2, Christer Janson2, Laurence Vranken1,2, 1Department of Medical Science, Respiratory Medicine and Allergology, Uppsala University, Uppsala, Sweden; 2Department of Internal Medicine and Clinical Nutrition, Sahlgrenska Academy at Gothenburg University, Gothenburg, Sweden; 3Department of Clinical Neuroscience and Rehabilitation, Sahlgrenska Academy at Gothenburg University, Gothenburg, Sweden; 4Department of Respiratory Medicine and Allergology, Sahlgrenska Academy at Gothenburg University, Gothenburg, Sweden

Introduction: Physical activity level (PAL) is a strong predictor of mortality in patients with COPD, only explained to a small degree by lung function. If simple measures that contribute in determining PAL were identified, this might be a valuable addition to the routine assessment of patients.

Aims and objectives: The aim was to describe PAL and potential determinants in a sample of COPD patients. Furthermore these predictors were used as independent variables in a hierarchical multiple regression model to investigate their ability to determine PAL (dependent variable) beyond that of lung function (FEV1, % pred.).

Methods: In 69 patients (FEV1% pred. 43±16) resting metabolic rate (RMR) was assessed by indirect calorimetry, and total energy expenditure (TEE) by activity monitor (ActiReg) during a 7-day period. PAL was derived from TEE/RMR. Walking speed (30-meter Walk Test, m/s) and isometric quadriceps strength (Sveistrong, N) were assessed.

Results: (Preliminary data) Mean PAL was 1.47±0.18, self-selected walking speed 1.01±0.23m/s and quadriceps strength 305±110N. The overall fit of the final model was R2=0.34 (p<0.001).

Multiple regression model

<table>
<thead>
<tr>
<th>Step</th>
<th>Constant</th>
<th>FEV1 (%-predicted)</th>
<th>30mWT (self-selected speed)</th>
<th>Quadriceps strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>1.259</td>
<td>0.005</td>
<td>0.272</td>
<td>0.000</td>
</tr>
<tr>
<td>Step 2</td>
<td>1.028</td>
<td>0.001</td>
<td>0.087</td>
<td>0.000</td>
</tr>
<tr>
<td>Step 3</td>
<td>0.968</td>
<td>0.001</td>
<td>0.087</td>
<td>0.262*</td>
</tr>
</tbody>
</table>

R2 = 0.17 for step 1, R2-change = 0.03 for step 2, R2-change = 0.06 for step 3 (p<0.001).

Conclusion: Measures of physical capacity and/or function are valuable complements to lung function in understanding PAL in COPD.

P4392
Upper limb strength and lung function as determinants of upper limb work capacity in COPD
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Aim: To determine the relationship between upper limb strength, lung function and physical activity level (PAL) in patients with COPD.

Results: Only TW (r=0.41) and TL (r=0.31) significantly explained TEE (r=0.40, p<0.001). AEE was explained only by TW (r=0.19, p<0.001). MI did not help explain TEE (p=0.16) or AEE (p=0.24).

Conclusions: Time spent walking and lying in daily life explained together 40% of the variation in TEE, whereas time spent walking explained only 19% of AEE. Furthermore, movement intensity did not affect significantly any variation in EE. This suggests that assessment of time spent actively and inactively, movement intensity and energy expenditure in daily life do not provide similar or related information on the assessment of PAL in patients with moderate to severe COPD.

P4389
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Juliana Maria Sousa Pinto1, Thierry Troosters1, Laurence Vranken1, Miek Hermink1, Heleen Demeyere1, Wim Janssens1, Marc Decramer1, Judith Garcia-Aymerich2, 1Rehabilitation Sciences and Respiratory Division, KU Leuven and UZ Leuven, Leuven, Belgium; 2Center for Research in Environmental Epidemiology, CREAL, Barcelona, Spain

Activity monitors are increasingly used to assess physical activity. We aimed to compare wearing time and walking between two activity monitors in COPD. Fifty-four patients (FEV1 62 ±22%pred. (64WD 49 ±138min) were included in the Actigraph (AG) and Dynaport (DP) twice for 14 days with 14 days in between, in the frame of the PROactive project. Wearing time (h/d); walking time(min/d) of DP (DPWT) and step/day of AG (AGsteps) were retrieved. Calculations were done on the mean wearing and walking variables obtained over 28 days (Inter-patient correlations). Intra-patient correlations were calculated over the 28 days obtained in each patient, as well as between mean weekly values of the 4 weeks (6 contrasts).

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Conclusion: These data show that both monitors provide comparable outcomes and are capable of measuring differences between separate weeks of assessment. The difference in wearing time needs clarification.
and upper limb exercise capacity in people with chronic obstructive pulmonary disease (COPD).

Methods: Repeated measures design. Participants were included if they had a diagnosis of COPD, FEV₁/FVC ratio < 0.7. Exclusion criteria were an acute infection in the prior month, or neurological, musculoskeletal or cardiovascular conditions that limited upper limb exercise. Participants completed the following assessments: spirometry, incremental supported arm exercise (SAE) to peak work capacity on an arm ergometer, incremental unsupported arm exercise (UAE) to peak capacity using an unsupported arm test (Takahashi, T. et al. JCRP 2003;23:24-30), isometric upper limb strength measurements using a hand held dynamometer. Dominant arm strength was calculated by the mean of the following strength measurements: shoulder flexion & extension, horizontal abduction & adduction, internal & external rotation and elbow flexion. SAE and UAE were performed in random order based on concealed allocation sequence.

Results: 68 participants completed the study, mean (SD) age 65(8) yrs, FEV₁ %predicted 50 (17%), FVC %predicted 77 (17%), FEV₁/FVC 0.48 (0.1). Peak oxygen consumption (VO₂peak) for SAE and UAE was 0.80 (0.28) L/min and 0.71 (0.31) L/min respectively. Dominant arm strength was 103 (29) Newtons. Multiple regression on VO₂SAE and VO₂UAE using combined dominant arm strength and FEV₁ %predicted as predictors, accounted for 66% (p<0.001) and 55% (p<0.001) of the variance, respectively.

Conclusion: Upper limb strength combined with FEV₁ %predicted are significant predictors of both supported and unsupported upper limb exercise capacity in COPD.

P4393
The VE/VCO₂ slope as a factor associated with the health status in patients with COPD
Mark Hoksma, Hans Vanmoerkerken, Helleen Demeure, Kristien Debets, Erica Bellagrand, Laurence Vranken, Marc Decramer, Rik Gosselink, Wim Janssens, Thierry Troosters, Rehabilitation Sciences and Physiotherapy, KU Leuven, Belgium; Respiratory Rehabilitation, University Hospital, Leuven, Belgium
Rationale: Submaximal exercise test outcomes are seldomly linked to health status in patients with COPD. Our aim was to explore whether a poor ventilatory efficiency is associated with symptoms, functionality and mental status in these patients.

Methods: 86 patients with COPD (FEV₁<70% predicted) underwent an incremental cardiopulmonary exercise test in order to determine the VE/VCO₂ slope. To identify symptoms, activity limitation and emotional dysfunction, the Chronic COPD Questionnaire (CCQ) was used.

Results: Data on ventilatory efficiency and the subscore of each of the three domains of the CCQ are presented in Table 1.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Mean±SD</th>
<th>Correlation Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>VE/VCO₂</td>
<td>29±6</td>
<td></td>
</tr>
<tr>
<td>CCQ_Symp (Points)</td>
<td>1.6±1.1</td>
<td>0.20</td>
</tr>
<tr>
<td>CCQ_Ment (Points)</td>
<td>1.5±1.2</td>
<td>0.20</td>
</tr>
<tr>
<td>CCQ_Function (Points)</td>
<td>1.3±1.1</td>
<td>0.30*</td>
</tr>
<tr>
<td>CCQ_Total (Points)</td>
<td>1.6±1.0</td>
<td>0.30*</td>
</tr>
</tbody>
</table>

The VE/VCO₂ slope is modestly related to functional status in COPD (R=0.30; p=0.005) (Figure 1).

Figure 1. Correlation between the functional status domain of the CCQ and the VE/VCO₂ slope in patients with COPD.

Multiple stepwise regression analysis showed the VE/VCO₂ slope to be the only significant variable explaining the variance in CCQ function.

Conclusion: Ventilatory efficiency is modestly associated with functional status in patients with COPD. Interventions, impacting on the VE/VCO₂ slope may potentially enhance the functioning of the patient.

P4394
Relationship between oxygen uptake kinetics and BODE index at the onset of high-intensity exercise in moderate-to-severe COPD patients
Audrey Borghi-Silva, Thomas Beltrame, Michel Silva Reis, Luciana Maria Malosa Sampaio Jorge, Ross Arena, Direceu Costa, Physiotherapy Department, UFSCar; Sao Carlos, SP, Brazil Physiotherapy Department, UFPR, Rio de Janeiro, RJ, Brazil Physiotherapy Department, UNP, Sao Paulo, SP, Brazil
Background: Patients with chronic obstructive pulmonary disease (COPD) present reduced exercise oxygen uptake delivery-utilization, caused primarily by pulmonary dysfunction and deleterious peripheral adaptations. Assuming that COPD patients present with slower VO₂ and heart rate (HR) kinetics, we hypothesized that this finding is related to degree of severity in according to BODE index.

Aim: To evaluate the relationship between oxygen consumption (VO₂) on kinetics during high intensity exercise and the BODE index in patients with COPD.

Methods: Twenty males with moderate to severe stable COPD and thirteen healthy control subjects matched by age and gender were evaluated. Initially, COPD patients were screening by BODE index and then, all volunteers were submitted to an incremental cardiopulmonary exercise testing, and subsequently, a constant speed on a treadmill at 70%, for 6 minutes. The on-transient (first 360 seconds) response of VO₂ and HR was modeled according to a monoexponential fit.

Results: VO₂ and HR on-kinetics were slower in the COPD group than controls. Additionally, VO₂ on-kinetic parameters revealed a strong correlation (rs=0.77, p<0.05) between BODE scores and negative and moderate correlation between walking distance (rs=-0.45, p<0.05).

Conclusion: Our data show that moderate to severe COPD is related to impairment of oxygen delivery and utilization during the onset of intense exercise. In addition, there is a relationship between walking distance as well as BODE index with VO₂ on-kinetic behavior. Thus, the severity of COPD is reflected by progressive slowing of VO₂ on-kinetics.

Financial support: FAPESP.

P4395
Quantifying the variability of physical activity in daily life caused by seasonality in smokers
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Background: The level of physical activity in daily life (PADL) depends on many factors, such as social, economical, physiological and demographic aspects. Despite these many causes of variability, the influence of the seasons of the year on PADL is unknown in smokers.

Aims: To compare changes in the level of PADL in apparently healthy smokers who started in different climatic conditions a protocol aiming at improving PADL, and to quantify the proportion of subjects who achieved 8000 steps/day before and after the intervention.

Methods: 20 smokers with normal lung function were submitted to a 5-month protocol using booklets and pedometers (or step counters) in order to improve PADL by aiming the increase of number of step/day. They had their baseline PADL assessed for 6 days with a pedometer during Spring/Summer (SS: n=10, 5 men, 22%) and Autumn/Winter (AW: n=10, 5 men, 53%) isometric upper limb strength measurements using a hand held dynamometer.

Results: Twenty smokers with moderate to severe stable COPD and thirteen healthy control subjects matched by age and gender were evaluated. Initially, COPD patients were screening by BODE index and then, all volunteers were submitted to an incremental cardiopulmonary exercise testing, and subsequently, a constant speed on a treadmill at 70%, for 6 minutes. The on-transient (first 360 seconds) response of VO₂ and HR was modeled according to a monoexponential fit.

Results: Both groups improved their PADL after the protocol (Δ step/day = SS: 3191[1888-4461] and AW: 2903[517-3577]; p=0.002 for both). There were no between-groups statistical differences concerning baseline PADL, changes after the protocol, and proportion of subjects who reached 8000 step/day before and after the protocol (SS: from 46% to 80%; AW: from 36% to 76%).

Conclusions: These preliminary results showed that climatic variation does not incur in significant impact in the level of PADL in apparently healthy smokers, since the same benefits could be achieved regardless of the seasonality.

P4396
Chest wall motion and volume changes with and without non-invasive ventilation in patients with amyotrophic lateral sclerosis
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In Amyotrophic Lateral Sclerosis (ALS), inspiratory, expiratory, and bulbar muscles are altered, leading to chronic respiratory failure. Non-invasive ventilation (NIV) can be used to improve gas exchange in this patient population.

Aims: To analyze the chest wall motion and operational volume changes in patients with ALS with and without NIV in the supine position.

Method: Ten patients with ALS, aged 54±13 years were included. Optoelectronic plethysmography (BTS, Milan, Italy) was used to measure: tidal volume of the chest wall (VtCW), tidal volume of the pulmonary rib cage (VtPCR), tidal volume of the abdominal rib cage (VtAC), tidal volume of the abdomen (VtAb),
end-inspiratory (Veicw) and end-expiratory (Vee cw) volumes of the chest wall, respiratory frequency (f) and minute ventilation (VE). All patients were evaluated in the supine position with and without NIV for five minutes (Triology 100, Respironics, USA) NIV was used in the spontaneous/semi-free mode, with inspiratory and expiratory pressures of 14 cmH2O and 4 cmH2O, respectively. Paired t-tests were used for statistical analyses (p < 0.05).

Results: See Table 1.

Table 1. Chest wall motion and volume changes with and without NIV

<table>
<thead>
<tr>
<th>Variable</th>
<th>Supine without NIV</th>
<th>Supine with NIV</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vtcp (L)</td>
<td>6.9±2.5</td>
<td>0.6±1.3</td>
<td>0.003</td>
</tr>
<tr>
<td>Vtcw (L)</td>
<td>3.9±1.6</td>
<td>0.7±0.8</td>
<td>0.025</td>
</tr>
<tr>
<td>Vtcp%</td>
<td>32±15</td>
<td>11±6</td>
<td>0.180</td>
</tr>
<tr>
<td>Vtcw%</td>
<td>57±18</td>
<td>19.4±3.9</td>
<td>0.004</td>
</tr>
<tr>
<td>f (rpm)</td>
<td>19±9</td>
<td>21±11</td>
<td>0.212</td>
</tr>
<tr>
<td>VE (L/min)</td>
<td>10.7±4</td>
<td>10.1±3</td>
<td>0.05</td>
</tr>
</tbody>
</table>

Conclusion: NIV led to significant increases in tidal, end-inspiratory, and end-expiratory volumes, with no changes in the contributions of the three chest wall compartments.

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P4397
Can breathing pattern parameters be differentiated between healthy and severe asthma patients?
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Abnormal breathing patterns during acute episodes of asthma are common. However, little is known about breathing pattern parameters (BPP) in severe asthma (SA) patients during the asymptomatic phase, or how they relate to those in the healthy population.

Aim: To determine which BPP differentiate SA patients from healthy controls.

Method: Ten SA patients and 10 healthy controls were recruited. BPP were monitored over a 30 minute period by respiratory inductive plethysmography. Recorded BPP were: 1. Tidal volume (Vt); 2. Variability in tidal volume (VVt); 3. Expiration time (Tf); 4. Symptoms of hyperventilation (SH); 5. End-tidal carbon dioxide (ETCO2). Vt was assessed by coefficient of variation (CV). Time series of breath by breath Vt were inspected for abnormal pattern. SH were assessed by Nijmegen questionnaire (NQ). ETCO2 was monitored by capnography. Differences between healthy controls and SA patients were explored using one-way ANOVA.

Results: Mean NQ score was higher in SA patients than in healthy controls (p=0.00). ETCO2 levels were significantly correlated with NQ score (r=-0.8, p<0.01) in the SA patients but not in healthy volunteers (r= -0.6, p>0.01). Time series analysis revealed sporadic episodes of frequent sighs in both groups. No significant differences between groups for any BPP were identified.

Conclusion: The recorded BPP did not differentiate between the SA patients and healthy volunteers in our small study. The higher SH found in the SA group do not appear to be associated with differences in BPP. This study raised doubt that there is a ‘pattern’ that is common within the SA population and therefore BPP must be considered on an individual basis.

P4398
Respiratory occupational therapy (OT) within a community respiratory team: Referral and intervention patterns
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Introduction: OT aims to maximise independence, occupational performance and improve quality of life. Respiratory OT provides a specialist functional and psychological dimension to assess and manage respiratory patients. The psychological dimension is predominantly based on cognitive behaviour therapy principles in anxiety, depression and hyperventilation management.

Aim: To determine the relationship between the intervention requested (whether for psychological functioning (Psy F) and/or physical functioning (Phy F)) and the intervention provided by respiratory OT.

Method: All referrals to West Surrey respiratory OT between January and December 2011, and the reason for referral and intervention provided were recorded.

Table 1. Intervention requested

<table>
<thead>
<tr>
<th>Phy F</th>
<th>Psy F</th>
<th>Phy &amp; Psy F</th>
</tr>
</thead>
<tbody>
<tr>
<td>n=66 26%</td>
<td>n=141 59%</td>
<td>n=32 13%</td>
</tr>
</tbody>
</table>

Table 2. Intervention provided

<table>
<thead>
<tr>
<th>Phy F</th>
<th>Psy F</th>
<th>Phy &amp; Psy F</th>
</tr>
</thead>
<tbody>
<tr>
<td>n=45 22%</td>
<td>n=85 41%</td>
<td>n=76 37%</td>
</tr>
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</table>

Results: 239 OT referrals were recorded in 2011. 33 of these were excluded from the analysis, as OT was not required or the patient had died. Of the 206 patients who received OT, 47 required physical and psychological intervention, however the intervention requested for 32 of these had been for psychological and 15 for physical only.

Conclusion: We observe from the data that most referrals are for Psy F. However a noticeable proportion of these also required intervention to address Phy F (need identified at OT assessment).

Having received joint physical and mental health training, OT is well placed to identify and address the link between psychological and physical symptoms, which limit daily functioning, in this complex patient group. This supports the need for the specialist respiratory OT role.