328. Measuring physical activity and exercise performance in chronic lung disease: implications for rehabilitation

P2990

Predicting peak cycle work rate from the incremental shuttle walk test in COPD

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Equations predicting peak work rate (W_{peak}) on an incremental cycle test (ICT) from an incremental shuttle walk test (ISWT) have been developed but often overestimate W_{peak}. Since peak oxygen consumption (VO_2) from the ISWT and ICT have been shown to be equivalent in moderate to severe COPD, it may be possible to use VO_2 as the common measure between ISWT and ICT to improve the accuracy of the predictive equations. The study aimed to develop equations to estimate the W_{peak} of an ICT from an ISWT using VO_2 as the common link. In a prospective study 45 participants with COPD (mean [SD] FEV_1 = 57 [18]%predicted) performed an ICT and two ISWTs. Data from the better ISWT were used for analysis. Gas exchange during exercise tests was measured by a portable gas analyser. The analyses performed were: 1) Stepwise multiple regression analysis with independent variables of gender, age, height, FEV_1 and ISWwork (product of ISWdistance and weight) used to develop an equation predicting peak VO_2 ($VO_{2peak(ICT)}$); 2) The slopes and intercepts of the relationship between $VO_{2(ICT)}$ and work rate for each participant were averaged to create an equation relating $VO_{2(ICT)}$ and work rate. The mean peak VO_2 measured in the ISWT and ICT were not significantly different. From the stepwise analysis, the regression equation was $VO_{2peak(ICT)}$ = 0.016∗ISWwork + 9.28∗Ht – 831.6 (r=0.79). A linear relationship between $VO_{2(ICT)}$ and work rate was found, thus an equation to predict peak work rate was developed as: W_{peak} = ($VO_{2peak(ICT)}$ – 425)/10.3. The calculation of a $W_{peak(ICT)}$ from a clinically available ISWT via these equations may aid prescription of cycle training intensity when an ICT is unavailable.

P2991

Predicting peak cycle work rate from the six-minute walk test in COPD

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Equations predicting peak work rate (W_{peak}) on an incremental cycle test (ICT) from a six-minute walk test (6MWT) have been developed but often overestimate W_{peak}. Since peak oxygen consumption (VO_2) from the 6MWT and ICT have been shown to be equivalent in moderate to severe COPD, it may be possible to use VO_2 as the common measure between 6MWT and ICT to improve the accuracy of the predictive equations. The study aimed to develop equations to estimate the W_{peak} of an ICT from a 6MWT using VO_2 as the common link. In a prospective study, 50 participants with COPD (mean [SD] FEV_1 = 57 [18]%predicted) performed an ICT and two 6MWTs. Data from the better 6MWT were used for analysis. Gas exchange during exercise tests was measured by a portable gas analyser. The analyses performed were: 1) Stepwise multiple regression analysis with independent variables of gender, age, height, FEV_1 and 6MWwork (product of 6MWdistance and weight) used to develop an equation predicting peak VO_2 ($VO_{2peak(ICT)}$); 2) The slopes and intercepts of the relationship between $VO_{2(ICT)}$ and work rate for each participant were averaged to create an equation relating $VO_{2(ICT)}$ and work rate. The mean peak VO_2 measured in the 6MWT and ICT were not significantly different. From the stepwise analysis, the regression equation was $VO_{2peak(ICT)}$ = 0.018∗6MWwork + 7.57∗Ht – 737.3 (r=0.77). A linear relationship between $VO_{2(ICT)}$ and work rate was found, thus an equation to predict peak work rate was developed as: W_{peak} = ($VO_{2peak(ICT)}$ – 429)/10.2. The calculation of a $W_{peak(ICT)}$ from a clinically available 6MWT via these equations may aid prescription of cycle training intensity when an ICT is unavailable.

P2992

Prognostic variables for the incremental shuttle walking test in patients with COPD

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Introduction: The incremental shuttle walking test (ISWT) is used to assess exercise capacity in patients with chronic obstructive pulmonary disease (COPD) and is responsive to pulmonary rehabilitation.
Aims: This study was designed to examine the prognostic variables for the ISWT in patients with COPD in pulmonary rehabilitation.
Methods: 188 patients (94 men) performed an ISWT before a pulmonary rehabilitation program. Lung function, nutritional status and depression and anxiety symptoms were assessed.
Results: The mean (SD) age was 61.1 (10.2) years, FEV_1 1.16 (0.54) l, RV/TLC ratio 50.9 (10.4)%, BMI 26.0 (6.6), fat free mass index (FFMI) 18.9 (4.7), depression symptoms (HADS) 6.1 (4.2), anxiety symptoms (HADS) 6.9 (4.2). The ISWT distance was 209.6 (144.7) meters. The total variance explained by the model was 48.2%. R^2 change: FEV_1 (l) 28.5%, age 7.6%, depression symptoms 7.0%, BMI 3.8% and RV/TLC 1.3%. Sex, FFMI, smoking behavior and anxiety symptoms were not significant.
Conclusions: Prognostic variables for the ISWT are both physical (pulmonary and non-pulmonary) and psychological.

P2993

Does breathlessness and leg discomfort indicate different exercise limiting mechanisms in COPD?

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Introduction: The last step in the complex cascade of patho-physiological mechanisms leading to exercise intolerance in COPD is the (prematurely) generation of symptoms, mainly dyspnea and leg discomfort. From a clinical perspective it is of

great interest whether these 2 distinct symptoms would point to different exercise limiting mechanisms.
Aim of the present study was to evaluate potentially differences in dynamic hyperinflation and peripheral muscle strength between patients stopping exercise because of intolerable dyspnoea (D) or leg discomfort (L).
Methods: 496 patients with COPD (GOLD II-IV) performed a constant work rate cycle test at 75% of maximal power output till exhaustion. Ventilatory variables including inspiratory capacity (IC) were measured during this test. In addition, maximal peripheral muscle strength of the quadriceps (QF) was measured using a hand-held dynamometer. Because the prevalence of exercise limiting factors related to FEV1, analysis of variance was performed for each GOLD class separately.

Results

Variable	GOLD II (n=156)		GOLD III (n=237)		GOLD IV (n=101)	
Stop reason	D (n=95, 61%)	L (n=44, 28%)	D (n=189, 80%)	L (n=35, 15%)	D (n=89, 88%)	L (n=9,9%)
FEV1 % pr	60±8	60±7	38±6	42±6*	25±5	29±10
DLco % pr	55±16	56±14	45±14	45±17	37±11	37±14
QF % pr	81±23	69±24*	83±21	74±24*	88±23	66±17*
Δ IC	–0.56±0.38	–0.37±0.32*	–0.61±0.34	–0.40±0.35*	–0.63±0.37	–0.39±0.32*
Borg D	6.5±2.0	5.0±1.7*	7.0±2.1	4.6±2.4*	7.2±1.8	5.6±1.8*
BORG L	6.3±2.0	6.0±1.9	6.3±2.3	5.9±2.4	6.5±2.3	5.8±2.2

*P<0.05.

Conclusion: In patients stopping exercise owing to dyspnoea, significant severe dynamic hyperinflation was observed compared to patients forced to stop exercise due to leg fatigue. The opposite was found for QF.

P2994
The minimal important difference in treadmill endurance test in COPD patients after a comprehensive pulmonary rehabilitation program (PRP)
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Backgroud: As treadmill exercise testing is more representative of daily activity, our aim was to determine the minimal important difference (MID) for treadmill endurance test (TET) capable to detect improvement in functional capacity in patients with COPD after a a 24 sessions PRP.
Material and methods: 100 COPD patients (mean age: 66.6±9.5 years old; FEV1: 44.8±20% pred) were enrolled. Patients performed a 6MWT and a symptom-limited TET at 90% of maximum grade achieved in an incremental test before and after the PRP. The St Georges Respiratory Questionnaire served as anchors for anchor-based MID estimates. Work rate (W), walked distance, endurance time and patients velocity in both tests were calculated.
Results: The TET minimal important difference found for W was 14,337 Joules or 37% increase and for endurance time an increase of 340 s or 77%.

Table 1. Changes and minimal important difference (MID) in 6 minute walk test (6MWT) and treadmill endurance test (TET), pre and post pulmonary rehabilitation program

Variables	6MWT			Treadmill Endurance Test		
	Pre-Rehabilitation	Post-Rehabilitation	p	Pre-Rehabilitation	Post-Rehabilitation	p
Distance (m)	503.5	528.2	<0.001	674.2	1,388.6	<0.001
Time (s)	–	–	–	526.9	1,135.6	<0.001
Velocity (m/s)	1.40	1.47	<0.001	1.40	1.26	NS
Work (J)	35,140	36,609	<0.001	47140	93,906	<0.001
MID Work (J)		Not found			14,337 or 37%	
MID time (s)		Not found			340 or 77%	

Conclusion: Treadmill endurance test is more representative of changes in functional capacity than 6MWT in COPD patients after a PRP. In addition, work rate seemed to be a good variable to evaluate improvement in exercise capacity after a pulmonary rehabilitation program.

P2995
Predictors of six-minute walk distance at baseline and after three years in COPD patients
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Association between six-minute walk distance (6MWD) and COPD systemic markers overtime is unclear. The aim of this study was to verify the predictors of 6MWD at baseline and after three years in 53 COPD patients (66% male, age= 63±9 years, FEV1=56±21%). The following evaluations were undertaken at baseline and after three years: body mass index (BMI), six-minute walk distance (6MWD), Modified Medical Research Council dyspnea scale (MMRC) and Interleukin-6 (IL-6). Information on exacerbations was not available at baseline and was collected during the study period. At baseline, FEV1, MMRC, BMI, and IL-6 were included in a multiple linear regression analysis with the baseline 6MWD value as the dependent variable. After three years, we included the final values of the same variables with the final 6MWD value as the dependent outcome. In another model, we evaluated the influence of the number of exacerbations in the previous model. At baseline, FEV1 and IL-6 were selected as predictor of 6MWD (R2=0.44; p<0.001); however, after three years, only MMRC was selected as predictor of the walking distance (R2=0.54; p<0.001). The number of exacerbation did not influence 6MWD overtime. In conclusion, airway obstruction and inflammation are predictors of 6MWD at baseline. However, maintenance or improvement of exercise tolerance overtime in COPD patients is related to the control of dyspnea perception.
Research supported by FAPESP (2010/08527-0). R. Ferrari is the recipient of a fellowship from FAPESP (2010/08557-6).

P2996
The influence of O_2 on exercise capacity (6-minute-walking-distance, 6MWD) in COPD
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We investigated the additional effect of supplemental oxygen on 6MWD in severe COPD-patients. The aim of the study was to find out if the response to nasal oxygen during 6-minute-walking-test (6MWT) depends on the level of exercise capacity.
To identify characteristics of patients with high oxygen response, we defined patients as "O_2- Responder" if they increase their 6MWD by ≥ 35m due to oxygen supply.
111 COPD-patients (age: 63,5y±8,7; FEV_1: 35,9%pred.±11,6; m:f=65:46) took part in a randomized, single-blinded, prospective study.
The patients underwent a 6MWT pretest followed by 2 6MWT either on 2L oxygen or on medical air (MA). After 3 week rehabilitation including resistance- and endurance-training both tests were repeated. We measured lung function before and after rehabilitation, SpO_2, paO_2, $paCO_2$ and BORG-scale before and after every 6MWT.
The difference between $6MWD_{O2}$ and $6MWD_{MA}$ (O_2-response) was greater pre (Δ=7,16%) than post rehabilitation (Δ=3,25%). Separating patients in 2 groups, O_2-response was significantly higher in patients with 6MWD<349m (p<0,05). With increasing 6MWD from pre to post rehabilitation O_2-Response decreases (r=0,52, p=0,001).
"O_2-Responders" were characterized by: lower FEV_1% pred. (p<0,01), higher $paCO_2$ (before and after 6MWT; p<0,01), higher levels of dyspnea (p=0,01) and lower SpO_2 (after 6MWD).
We detected a negative relationship between O_2-response and exercise capacity. "O_2-Responders" showed lower FEV_1 and higher limitations during exercise.
We speculate that training therapy improves muscle oxygen-efficiency and increases exercise capacity even without oxygen supply with the consequence that supplemental oxygen becomes less important.

P2997
Are the benefits of pulmonary rehabilitation sustained after 6 months?
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While Pulmonary Rehabilitation (PR) improves health status and exercise capacity in the short term, there is a lack of consistent evidence that daily physical activity increases after PR and if this is sustained.
17 stable COPD patients (mean (sd) age 67.7 (9.6)yrs, FEV_1 1.1 (0.4)l, 47 (16)% pred) were assessed before and after 8 weeks' PR and 6 mths later. St George's Respiratory Questionnaire (SGRQ), hospital anxiety and depression (HADa, HADd), London Chest ADL (LCADL), quadriceps force (QF), endurance shuttle walk (ESWT) and physical activity (DynaPort accelerometer) were measured.
Paired analysis showed significant improvements in QF, ESWT, HADd,% time moving and walking after PR. Most of these benefits were lost 6 months later, with significant declines in SGRQ, LCADL,% time weightbearing and moving, although ESWT was reasonably well maintained.

Mean (sd)	Pre PR	Post PR	6 months later	p value
QF (kg)	29.3 (12.9)	32.3 (12.3)	30.5 (10.2)	<0.05
ESWT (m)	118 (82)	322 (342)	304 (364)	NS
SGRQ	63.7 (13.7)	62.5 (19.0)	67.3 (16.5)	<0.05
LCADL	31.7 (11.9)	33.3 (12.4)	39.0 (12.8)	<0.05
HADa	8.6 (5.5)	6.8 (3.9)	8.1 (4.8)	NS
HADd	8.8 (3.7)	5.8 (3.7)	7.9 (3.9)	<0.05
% Weight bearing	25.9 (6.9)	31.3 (6.7)	18.8 (6.8)	<0.05
% Moving	11.4 (4.1)	13.1 (4.1)	11.0 (2.9)	<0.05
% Walking	4.5 (2.2)	5.8 (1.9)	3.8 (1.9)	NS

While PR leads to an increase in daily physical activity, this subsequently declines along with health status, depression score and functional status. The preservation of exercise capacity suggests that patients retain the ability to carry out increased activity, but do not actually do so. More effective, possibly behavioural, interven-

tions are needed to maximise and sustain the immediate benefits seen immediately after active PR.

P2998

Comparison of the Duke activity status index and the incremental Shuttle walk test in COPD

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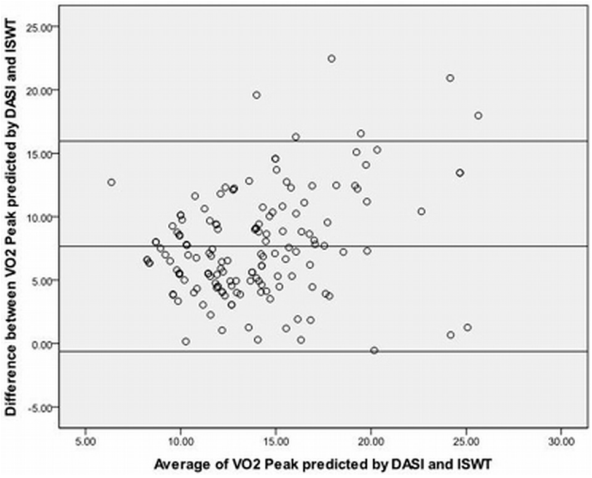
The Duke Activity Status Index (DASI) was developed as a simple tool of assessment of functional status for people with congestive heart failure (CHF)and correlated well with VO_2max derived from cycle ergonometry and 6-minute walk distance in patients with COPD. Peak oxygen uptake correlates well with the Incremental Shuttle Walk Test (ISWT) which is commonly used to prescribe exercise in pulmonary rehabilitation. The aim was to establish whether VO_2max predicted by the DASI compares well with that predicted by the ISWT and therefore whether the DASI could be used to support prescription of a training programme.
153 COPD patients (75 male; mean (SD) Age 70 (9.36)yrs; FEV_1 1.34 (0.57)l; BMI 28.36 (6.75)) completed the DASI and the ISWT. Mean VO_2max predicted from the DASI was 17.69 ml/min/kg and 10.03ml/min/kg from the ISWT, a significant difference of 7.67 (95%CI= 7.0-8.32)p<0.001. A Bland and Altman plot shows that there is poor agreement between the 2 measures (Fig1). There was moderate correlation between VO_2max predicted by the DASI and ISWT (r=0.55,p<0.001).



Although there is a correlation between the DASI and the ISWT, poor agreement indicates that the measures cannot be used interchangeably and that the DASI cannot be used to prescribe a training programme for individuals with COPD.

P2999

Relation between daily physical activity and exercise capacity in patients with COPD

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Background: A change in exercise capacity, achieved with an exercise programme, does not necessarily lead to a change in daily physical activity. This is due to a lack in behavioural change and can subsequently lead to loss of an initial gain in exercise capacity.
Objectives: Is daily physical activity level related to exercise performance in patients with COPD?
Is change in exercise capacity related to change in physical activity in patients with COPD who participated in an exercise programme, or who received usual care?
Methods: 153 Patients with COPD were included. Patients in the exercise group (n=77) participated in a 6-month physiotherapeutic exercise programme. At baseline and 7 months, daily physical activity was measured with a pedometer (steps/day), and exercise capacity was measured with the Incremental Shuttle Walk Test (ISWT; meters) and Endurance Shuttle Walk Test (ESWT; meters, seconds). Pearson's correlation coefficients were calculated.
Results: At baseline, the correlation coefficients between steps/day and ISWT (m), ESWT (m) and ESWT (s) were 0.59, 0.44, and 0.34 respectively (all $p < 0.01$). From baseline to 7 months, in the exercise group the correlation coefficients between change in steps/day and change in ISWT (m), ESWT (m) and ESWT (s) were 0.48, 0.41, and 0.38, respectively (all $p < 0.01$). Correlation coefficients between change in exercise capacity and daily physical activity in the control group were non-significant.
Conclusions: Change in daily physical activity is only weakly correlated with change in exercise capacity in COPD patients. This indicates that exercise programmes for these patients should specifically aim at increasing daily physical activity.

P3000

Can we change the activity behaviour of COPD patients using a telemedicine feedback intervention?

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Background: Better insight in activity behaviour of COPD patients is needed to enable a tailoring of treatment. Our objective was 1) to measure the daily activity pattern of COPD patients and 2) to investigate whether this pattern can be altered by a telemedicine intervention in which feedback is provided on the activity level during the day.
Methods: Thirty-seven COPD patients (66.3 yrs; FEV_1%: 46.5%) and 21 healthy controls (55.4 yrs) were monitored for four days in their own environment to establish a baseline activity pattern, using accelerometry, in counts per minute (cpm). Of these, 9 patients participated in the feedback intervention. Patients had to deploy the same activity pattern as displayed on a PDA, for three weeks. Patients received text messages every hour with advice about their activity.
Results: COPD patients (n=37) are less active than controls (1189±320 vs 829±219 cpm, p=0.003). The COPD activity pattern shows a clear dip in the afternoon. In the intervention group (n=9), activity levels slightly increase during the feedback period (baseline: 870±175, week 1: 898±207, week 2: 883±229, week 3: 922±213 cpm). The dip in activity pattern is strongly modified (figure 1).

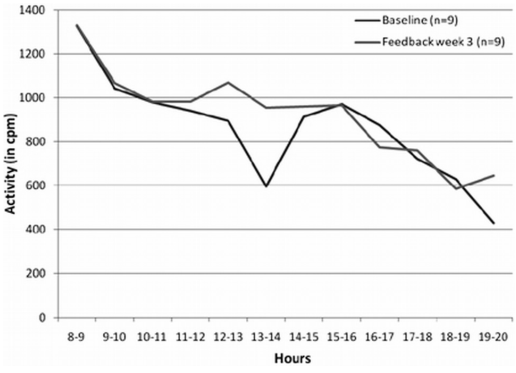

Figure 1

Conclusions: COPD patients show lower activity levels compared to controls and a less distributed pattern. First experiences with a telemedicine feedback intervention show that activity levels can be increased and the pattern can be changed.

P3001

Long-term impact of exercise adherence in COPD

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There're scarce studies evaluating long-term impact of exercise adherence after a respiratory rehabilitation program (RR) in Chronic Obstructive Pulmonary Disease (COPD) patients.
Objectives: To compare impact on BODE, mortality, health-related quality of life (HRQL) and health-resources consumption in two groups of COPD patient: intense physical activity (IPA) and low physical activity (LPA) at long-term.
Methods: COPD patients (GOLD definition) were followed up after a RR program completed (from 1997 to 2009). Patients were evaluated by BODE, HRQL (SGRQ), pulmonary function, health-consumption and survival on 2009. Patients were classified according to García Aymerich questionnaire (Thorax 2006): IPA

Long-Term Impact of Exercise Adherence

After follow up	LPA (N=71)	Δ after/before	IPA (N=28)	Δ after/before	p (LPA vs.IPA)
BODE	6,66±1,49	+0.63	4,56±2,04	–1.36	0,00007
SGRQ total, units	59,96±7,72	(p=0.07)	50,26±7,61	(p=0,03)	0,0000323
No. Exacerbations	2.03±1,01	–2.05	0,79±0,77	–2,71	0,00001
Ward consults	0,54±0,56	–3.85	0,08±0,28	–5.87	0,000523
No. Hospitalizations	0,06±0,34	0	0	0	NS
Survival, %	58%		89%		p<0.000001

(>2 hours/week of physical activity) and LPA (<2 hours/week). Survival was calculated by Kaplan-Meier curve.
Results: 99 COPD patients were analyzed after follow-up: 66 patients were alive and 33 died (33.33%). 71 patients were in LPA and 28 in IPA group respectively. Both groups are comparable at the start of follow up, except in sex (40% was female in LPA and 60% was male in IPA; p=0.00004). They have severe airway obstruction (38-40 FEV1% predictive) and 66 to 68 years.
Conclusion: Evaluated at long-term after a RR, only 30% of patients were with IPA. IPA group had better outcomes in survival, BODE, HRQL and health-resources consumption than LPA group.

P3002
Slow and fast walking time in daily physical activities in stable patients with COPD
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Purpose: The object of this study was to assess slow and fast walking time in daily physical activities and to evaluate the relationship between walking time, exercise capacity and pulmonary function in stable patients with COPD.
Methods: We assessed walking time according to the walking speed in daily physical activities in COPD with a newly developped triaxial meter (A-MES™ activity monitor, Kumamoto, Japan), which was able to quantify the time spent on slow walking (<2km/hour) and fast walking (>2km/hour) and also different body positions (standing, sitting, lying). Twenty COPD patients (Age 76.8±6.2 years; FEV_1 52.9±16.3% pred) and 20 healthy elderly (Age 73.0±4.2 years; FEV_1 123.9±22.3% pred) were evaluated by this activity monitor in 3 consecutive day. Pulmonary function, quadriceps muscle force (QF), exercise capacity (6-min walking distance; 6MWD), and health-related QOL (CRQ) were evaluated in these COPD patients.
Results: Patients showed higher slow walking time (70±38 vs 157±48 min/day), lower fast walking time (15±12 vs 78±35 min/day) and longer sitting time (481±89 vs 316±69 min/day). Daily fast walking time was highly correlated with 6MWD and QF.
Conclusions: These data suggest that patients with COPD are markedly inactive in daily life. Slow and fast walking time and 6MWD is the strongest correlate of physical activities in daily life.

P3003
Activity monitoring in pulmonary rehabilitation in patients with COPD
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Introduction: The quality of life and the risk of hospitalization are partially related to the activity level of patients with COPD. The effectiveness of pulmonary rehabilitation can be characterized by exercise physiologic variables and daily activity.
Methods: 12 patients with COPD (FEV_1: 55±17%pred, age: 60±9 year, BMI: 21±4 kg/m^2) performed 30-minute high intensity cycling 3 times per week for 8 weeks supervised by physiotherapists. Exercise physiologic variables and 12-hour daytime activity monitoring (Dynaport MiniMode, McRoberts BV) were measured before and after rehabilitation.
Results: None of the patients was hospitalized in this rehabilitation period. There was no change in maximal exercise capacity (WRmax: 75±17 vs. 82±21 Watt), but oxygen uptake (VO_2:1,06±0,33 vs. 1,32±0,08 L/min.; p<0,05) and lactate threshold (LAT: 0,68±0,18 vs. 0,88±0,20 L/min.; p<0,05) improved significantly. Patients with COPD were more active after rehabilitation (lying: 26±16 vs. 12±11%; locomotion: 7±5 vs. 14±3%, p<0,05). Energy expenditure was reduced at rest after rehabilitation (lying: 22634±15352 vs. 12736±16514 Watt, p<0,05). Step counts improved significantly (3257±2267 vs. 5688±2920, p<0,05). The time of locomotion modestly correlated with post-rehab WRmax (r^2=0,40, p<0,05) and FEV_1 (%pred) (r^2=0,25, p<0,05).
Conclusion: Activity monitoring contributes to the complex evaluation of rehabilitative interventions. Compared to maximal exercise capacity, change in activity level proved to be more sensitive to detect improvement in the status of COPD patients in this pilot study.

P3004
Activity in contemporary healthy people and COPD
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Quality of life represents a crucial aspect for the assessment of COPD patients. The level of daily activities is a determining factor and the degree of autonomy in movement is an important component that influences quality of life. Pedometry represents an alternative tool for estimating the degree of this activity.
Aims: To compare the values, obtained by pedometry of COPD patients (GOLD stage III and IV) with the values of healthy subjects from the Euroregion Banat.
Material and methods: We used pedometers to monitor 14 patients with COPD (not included in pulmonary rehabilitation) and 32 healthy subjects for a week, registering daily level and intensity of movement and detecting aerobic effort. Both groups had comparable demographic data and similar occupations.
Results: Healthy individuals showed a significantly higher average of steps over a full week compared with COPD patients (6497±1866 vs. 3992±295, p <0.05). In both groups the number of steps was lower during the week-end compared with working days: 4754±2322 vs 7185±2396 steps for the control group, and 2135±697 steps vs 4736±175 steps in COPD patients (p <0.05). 52.77% of the normal subjects have made an aerobic effort at least one day in a week and only 13.88% performed a constant aerobic effort. Patients with COPD couldn't perform an aerobic exercise at all.
Conclusions: We found a decrease in intensity of daily activity in healthy subjects, compared with data from literature, suggesting an increase of the sedentary style in general population. The degree of physical activity is significantly reduced in COPD compared with healthy people on both levels: aerobic and anaerobic effort. For both groups, periods of week-end reveal the lowest activity level.

P3005
Does resistance training improve physical activity in patients with COPD?
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Introduction: Quadriceps (quads) weakness is a functional problem for patients (pts) with COPD. Resistance training (RT) can increase quads strength. The translation of increased strength to physical activity (PA) is less clear.
Aim: To determine if RT in isolation (outside of pulmonary rehabilitation) can increase PA in pts with COPD.
Method: PA was measured before & after an 8week RT course. RT was 5×30 bilateral knee extensions; 3 times/week on an isokinetic dynamometer (Cybex: speed = 180°/sec). Pts were enrolled in a trial of protein supplementation (PS) during RT. PS did not augment the benefits of RT & PA results are therefore pooled.
20 pts [mean (SD) age 69.2 (9.4) yr, BMI 25.6 (4.4), FEV_1 48.8 (14.3)%pred, 11 men] had PA measured using the DUKE Activity Status Index [DASI (range 0-58.2)] & ActiTrac accelerometer [IM Systems: mean acceleration/min, average activity for 7 days]. Isometric quads strength [Cybex: Newton metres (Nm)], thigh lean mass [DEXA: grams (g)] & cycle ergometry peak work (W) were also recorded.
Results: Mean values (SD) & change (95% CI) from baseline are shown in table 1. PA changes were not significant at 8 weeks.

Table 1

	Baseline	Week8
DASI	23.7 (16.4)	24.1 (13.2)
Mean change (Δ) from baseline		0.4 (–11.2–12.1)
ActiTrac	11.4 (9.9)	12.5 (9.9)
Mean Δ from baseline		1.1 (–3.0–5.2)
Isometric strength	81.3 (28.2)	103.1 (41.9)
Mean Δ from baseline		21.8 (10.2–33.4)**
Thigh lean mass	3487.6 (951.2)	3701.7 (949.8)
Mean Δ from baseline		214.1 (48.2–380.1)*
Peak cycle work	46.4 (21.4)	59.1 (24.1)
Mean Δ from baseline		12.8 (3.7–21.9)*

*p<0.05; **p≤0.001 change from baseline.

Conclusion: Our findings suggest that increases in strength are not routinely translated into PA changes when RT is done in isolation. Our intervention did not include aerobic training/PA advice.

P3006
Stanford Seven-Day Physical Activity Recall questionnaire as a screening tool for physical inactivity in chronic obstructive pulmonary disease
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Background: Quantification of daily physical activity (PA) is of clinical interest

in COPD as low levels are associated with increased hospital admissions and mortality. Objective measurements require motion sensors (e.g. SenseWear Armband: SWA), but several days are needed to obtain reliable data. We evaluated a previously unstudied tool in COPD, the Stanford Seven-Day Physical Activity Recall questionnaire (PAR), as a screening test for physical inactivity. As a control, three self-completed PA questionnaires were simultaneously evaluated.
Methods: 45 COPD patients wore the SWA for 7 days. Patients, blinded to the armband output, then completed the PAR and 3 other questionnaires in randomised order. Spearman rank correlation and ROC curves were used to assess the relationship between questionnaires output and SWA-derived physical activity indices, and the ability of the questionnaires to predict very inactive COPD patients.
Results: With the PAR, total energy expenditure ($r=0.83$, $p<0.001$), physical activity level ($r=0.52$, $p<0.001$) and time spent in at least moderate physical activity ($r=0.54$, $p<0.001$) correlated significantly with equivalent measure from SWA. No relationship was seen between the other questionnaires' output and any SWA-derived PA index. The PAR compared favourably with the other questionnaires in predicting very inactive COPD patients with an area under the curve of 0.79 (95%CI 0.63-0.94). A PAR-derived PAL < 1.40 had a sensitivity of 0.65 and a specificity of 0.89 in predicting very inactive COPD patients.
Conclusion: The PAR is a useful screening tool to predict physical inactivity in COPD patients.

P3007
Hypoxia induces differential acute and chronic adaptations in regulation of skeletal muscle protein turnover
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Hypoxia may be a trigger of skeletal muscle atrophy in acute and chronic respiratory disease. To test this hypothesis, short- and long-term regulation of muscle mass in response to normobaric hypoxia was investigated in mice.
During 48h, O_2– levels were reduced stepwise to 8%, which was maintained for 21 days. Food intake was monitored daily and mice were sacrificed at days 4 and 21. mRNA and protein expression levels were determined in gastrocnemius muscle.
Food intake was affected during short- (day (d) 4: -50%) and long-term (d21: -20%) hypoxia. Compared to normoxia, gastrocnemius muscle weight decreased (d4: -7.5% and d21: -11.9%). The reduced food intake was partially responsible for this effect. Hypoxia increased expression of *Atf4* (d4: +52%, d21: +31%) and *Gadd34* (d4: +148%, d21: +73%) indicative for acute and chronic ER stress signaling. Protein synthesis regulation was differentially affected by short- and long-term hypoxia (p-eIF2α d4: -29% and d21: -23%, p-4EBP1 d4: not significant (ns) and d21: +36%). *Atrogin-1* as proteasomal protein degradation marker was activated during acute and chronic hypoxia (d4: +128%, d21: +60%), whereas *MuRF1* only at day 4 (d4: +102%, d21: ns) and was explained by reduced food intake. short- and long-term hypoxia induced markers of lysosomal protein degradation *Bnip3* (d4: +95%, d21: +74%) and *Lc3* (d4: +18%, d21: +26%) which could be attributed in part to the reduced food intake.
In conclusion, these data suggest that acute adaptation of muscle mass to hypoxia reflects an increased protein degradation, whereas chronic adaptation may involve increased protein turnover.
Supported by the Dutch Top Institute Pharma (project # T1-201).