

310. Exercise and physical activity: towards evidence-based benefits in different populations

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Exercise training is beneficial in patients with non-cystic fibrosis bronchiectasis – A multi-centre, randomised controlled trial

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Background: Non-cystic fibrosis (CF) bronchiectasis is characterised by chronic cough and sputum production, exercise limitation and reduced quality of life (QOL), but the role of exercise training in this patient group is unclear. The aim of this study was to determine the effects of exercise training on cough-related symptoms, QOL and exercise capacity.

Methods: Participants with non-CF bronchiectasis with a modified Medical Research Council dyspnoea score ≥ 1 were randomised to receive eight weeks of twice-weekly supervised exercise training or twice-weekly telephone support. The incremental shuttle walk distance (ISWD), 6-minute walk distance (6MWD), the Chronic Respiratory Disease Questionnaire, Leicester Cough Questionnaire and Hospital Anxiety and Depression Scale were measured by a blinded assessor at baseline and following intervention.

Results: Eighty-five participants, aged (mean [SD]) 64 (13) years, FEV₁ 74 (22)% predicted and median modified Medical Research Council score of 1 (IQR 3) were included. Of those in the exercise training group (n=42), 35 (83%) completed the program. There was a greater magnitude of change in the ISWD (mean difference 62m, 95% CI 24 to 101m) and the 6MWD (mean difference 41m, 95% CI 19 to 63m) in the exercise training group compared to the control group. Exercise training significantly reduced dyspnoea (p = 0.009) and fatigue (p = 0.01) but there was no difference in cough-related QOL or mood between groups.

Conclusions: Exercise training in non-CF bronchiectasis improves exercise capacity and symptoms of dyspnoea and fatigue. Ongoing follow up will assess changes in these effects over time.

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Effects of exercise training and neuromuscular electrical stimulation on symptoms, muscle strength, exercise capacity, activities of daily living, and quality of life in COPD

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Purpose: Chronic obstructive pulmonary disease (COPD) have systemic consequences affecting exercise capacity and quality of life. The purpose of this randomized controlled study was to evaluate effects of neuromuscular electrical stimulation (NMES) on symptoms and function in COPD patients undergoing exercise training.

Materials and methods: Twenty-seven clinically stable COPD patients (62.8±7.5 years, FEV₁: 40.0±16.4%) were included. The NMES group (n=13) underwent endurance and quadriceps resistance training plus NMES, 2 days/week for 10 weeks. Control group (n=14) was applied the same exercise regimen plus placebo NMES. Incremental (ISWT), and endurance (ESWT) shuttle walk tests, quadriceps strength (1 repetition maximum), Medical Research Council (MRC) dyspnea scale, Fatigue Severity Scale, London Chest Activities of Daily Living Scale (LCADL), and St George Respiratory Questionnaire (SGRQ) were evaluated before and after the treatment.

Results: In both groups, quadriceps strength, ISWT and ESWT distance increased, and MRC, LCADL and SGRQ scores decreased significantly after the treatment (p<0.05). Increase in ISWT distance in the control group was significantly more than that of NMES group (69.28±33.61 m vs 38.46±41.80 m, p<0.05). There were no significant differences in any of the other parameters (p>0.05).

Conclusion: Increase in exercise capacity was more evident when endurance and quadriceps resistance training was applied without NMES. Inclusion of NMES have no additional effects beyond exercise training on muscle strength, symptoms, activities daily living, and quality of life in stable COPD.

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Physical activity in daily life in COPD after exercise training: Are there responders, and who are they?

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Background: Previous studies have shown that patients with chronic obstructive pulmonary disease (COPD) generally do not increase their level of physical activity in daily life (PADL) after short-lasting exercise programs. However, as PADL is influenced by several factors, there are individual patients who respond positively becoming more active in daily life.

Aims: To study the proportion and profile of patients with COPD who become more active in daily life after a 12-week exercise training program (responders).

Methods: 23 patients (15 men, 66±8 yrs, FEV₁ 42±16% pred) completed an exercise training protocol (endurance and strength exercises, 3x/week, 12 weeks). PADL was assessed by an activity monitor (Sensewear®, BodyMedia) which registered the time spent in physical activities of at least moderate intensity (TPA >mod). Other assessments were socio-economic and functional status, quality of life, exercise capacity, respiratory and peripheral muscle force. Responders were those who increased TPA >mod after the protocol.

Results: 12 patients (52%) were responders (TPA >mod 10 [3-28] min/day pre vs. 32 [10-38] min/day post; p=0.002; median [IQR]). The proportion of physically active patients (i.e. TPA >mod ≥ 30 min/day) increased after the protocol (26% vs. 39%, p=0.01). Although responders and nonresponders had similar physical and functional capacity, responders tended to present exertional desaturation (p=0.076), lower age (p=0.055) and live alone (p=0.089).

Conclusions: These preliminary findings suggest that around half of patients with COPD increase their level of PADL after a 12-week exercise training program. Responders tend to be younger, live alone and desaturate during exertion.

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Symptom experience in patients with COPD and their level of physical activity. Is there a good association?

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Rationale: Several instruments including physical activity monitors and questionnaires are used to assess the functional status in patients with COPD. The relation between objectively measured physical activity (PA) and questionnaires assessing functional status and symptoms is poorly studied.

Methods: 54 patients with COPD (age 66m7, FEV₁ 62m22% pred) were included. PA was assessed during 2 periods of 14 consecutive days in 6 weeks, by the dynaport movemonitor and actigraph. The amount of steps per day and movement intensity during walking (MI) were used for this analysis. Symptom experience was measured by the MRC scale for dyspnea (MRC), COPD Assessment Test (CAT), functionality subscale of the CCQ (CCQ-f) and the dyspnea subscale of the CRQ (CRQ-d), every 2 weeks. The correlations with PA were measured, both with and without inclusion of the weekends.

Results: The univariate correlations are shown in table 1. All questionnaires were significantly correlated with both the steps per day and the MI. Excluding weekends did not increase the correlation between 'functional status' and steps per day and slightly enhanced the correlations with MI.

Table 1 Univariate correlations (p<0.05)

	Steps/day		MI	
	WE incl	WE excl	WE incl	WE excl
MRC	r = -0,49	r = -0,50	r = -0,62	r = -0,64
CCQ-f	r = -0,44	r = -0,44	r = -0,47	r = -0,50
CRQ-d	r = 0,44	r = 0,44	r = 0,45	r = 0,47
CAT	r = -0,32	r = -0,32	r = -0,31	r = -0,34

WE incl = PA data including weekends, WE excl = PA data excluding weekends.

Conclusion: The symptoms experienced by the patients and functional status are only modestly related to the amount and intensity of PA. Interventions that improve symptoms may therefore not automatically sin off in enhanced physical activity levels.

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Physical training for asthmatics: Which patients obtain most clinical benefits?

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Background: Recent studies have shown that exercise training improves exercise capacity, health related quality of life (HRQoL) and clinical control in asthmatics; however, not all obtain clinical relevant benefits and can be considered responders.

Objective: To investigate baseline characteristics that determines the improvement after an exercise training program in asthmatics patients.

Methods: Forty-three adults with moderate or severe asthma performed an aerobic training (35min/twice a week/3 months). It was considered exercise responders those patients that increased $\geq 10\%$ in maximal aerobic capacity (VO₂peak) and HRQoL responders those patients that improved $\geq 20\%$ in a specific-asthma HRQoL questionnaire. Discriminant analysis was used to distinguish responders from non-responders based on patient's baseline data.

Results: Twenty-eight patients (65.1%) were considered responders in exercise capacity and baseline depression symptoms, ventilatory reserve (VE/VVM) and FEV₁ were significant predictors to training response (accuracy 86%, p<0.001). Twenty-eight patients (65.1%) were considered HRQoL responders and worst baseline HRQoL score, increased free-days asthma symptoms and lower depression score were significant predictors to HRQoL improvement (accuracy 81%, p<0.001). Twenty-one patients (48.8%) were considered responders in both parameter and lower ventilator reserve, worst depression and lower HRQoL were significant predictors (accuracy 79%, p<0.001).

Conclusion: Asthmatic patients with impaired HRQoL, better clinical control, fewer depression symptoms and lower ventilatory limitation are significantly more likely to improve physical fitness and HRQoL after a pulmonary rehabilitation program.

Methods: Muscle mass was estimated with the fat free mass (FFM) by bio-electrical impedance and the cross-sectional area (CSA) of skeletal muscle on a single 10-mm CT-scan slice. Muscle strength was estimated by the quadriceps force (QF). All variables were measured pre-treatment (M1), after radical treatment (M2) and after either 12w of rehabilitation (RA) or control (CON) (M3). Data are presented as medians with 95% CI.

Results: Of 29 consecutive pts, 18 were allocated to RA and 11 to CON. Both groups have comparable M1 characteristics. At M2, all pts showed a significant decrease in muscle mass and strength. At M3, only RA-patients improved significantly their muscle mass. There is a good correlation between muscle CSA and FFM (r: 0.70; p < 0.001).

	RA N=18				CON N=11			
	M1	ΔM2-M1	ΔM3-M2	ΔM3-M1	M1	ΔM2-M1	ΔM3-M2	ΔM3-M1
Age (years)	65 (54-76)				63 (47-77)			
FEV ₁ (%pred)	89 (47-112)				85 (53-109)			
QF (Nn)	119 (64-183)	-16* (-68-36)	2* (-29-81)	-19 (-68-68)	106** (28-219)	-14* (-80-44)	9 (-40-26)	-34 (-58-8)
Muscle CSA (sq. cm)	97 (87-124)	-3* (-9-(-11))	6* (-4-14)	0** (-4-20)	99 (79-124)	-6* (-14-(-4))	2 (-13-7)	-10** (-12-0)
Muscle:fat CSA	1.4 (1-1.8)	-0.9* (-0.3-(-0.3))	0.1 (0-0.5)	0 * (-0.5-0.5)	0.9 (0.7-1.8)	-0.2* (-0.3-0)	0 (-0.3-0.2)	0.2* (0-0.5)
FFM (% pred.)	72 (57-76)	-0.5 (-4-0)	-1* (-5-1)	-2* (-4-2)	70 (63-77)	-2 (-5-2)	-1 (-4-2)	-2 (-9-(-2))

p < 0.05; * differences within trial arm; ** differences in between trial arms

Conclusion: Muscle mass and strength significantly decrease with radical treatment in pts with lung cancer and mesothelioma. Muscle mass increases with rehabilitation. CT scan can substitute bioelectrical impedance for measuring muscle mass. Mature data will be presented at the meeting.

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Comparison of two strategies using pedometers to counteract physical inactivity in smokers

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Objective: To compare the effects of two different 5-month protocols using pedometers and informative booklets to increase physical activity in daily life (PADL) in smokers who reach or not 10000 steps/day in daily life.

Methods: PADL level was assessed at baseline (A1), and subjects were randomly assigned to two groups: booklet+pedometer (GB+P; n=13), which started the protocol receiving a booklet with encouragement to walk as much as possible in everyday life; or pedometer+booklet (GP+B; n=18) which started the protocol wearing a pedometer aiming to achieve 10000 steps/day; both for 1 month. PADL was re-assessed (A2), and the interventions were crossed-over for 1 month, followed by PADL reassessment (A3). After A3, both groups used pedometers for 3 months aiming to reach 10000 steps/day, and final PADL assessment was performed (A4). For the analysis, each group was subdivided according to baseline PADL as physically active or inactive, according to have reached or not 10000 steps/day at baseline.

Results: The physically active subgroups of GB+P and GP+B showed no change in steps/day. The physically inactive subgroup of GP+B significantly increased steps/day at A2 and maintained this increase until A4. The physically inactive subgroup of GB+P initially increased to a lesser extent, reaching borderline statistical significance at A2 and A3 (p=0.06) and statistically significant increase only at A4 (p=0.02).

Conclusions: Both strategies were effective in increasing the number of steps/day in physically inactive smokers after 5 months, although the increase was more quickly obtained in smokers who used pedometers as the first intervention.

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Expiratory muscle training in patients recovering open thoracic and cardiac surgery

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Respiratory muscle training has been so far demonstrated to be effective as a rehabilitation technique in COPD patients. However, it is still not clear whether it may similarly be useful when used in patients recovering open thoracic and cardiac surgery.

We have therefore undertaken a randomised 14-day trial in these patients to evaluate changes in maximal expiratory (MEP, as the primary outcome) and inspiratory (MIP) pressures, lung volumes (FEV1, FCV, CV, CI, VR), oxygenation index (PaO₂/FiO₂), perceived symptoms (VAS), and generic quality of life (SF36) following an early intervention including lung expansion + expiratory muscle training (Active) or lung expansion + sham training (Control). Training has been set with incremental resistive load over the study period.

At present, 39 patients (out of the 54 programmed) completed the study, 19 and 20 in Active and Control respectively, with one patient dropped in each group. Anthropometrics and general characteristics, type of surgery, and functional variables at baseline were similar. Pre-to-post change of MEP showed a greater (p<0.043) change in Active (+17.5±25.7 cmH2O) than in Control (+14.4±26.2 cmH2O), whereas FVC, VC, TLC, and SF36 (mental and physical components) trended to better improve in the Active population. Daily recording of VAS dyspnea, discomfort and pain scores similarly decreased in the two groups.

This study confirms that specific and early expiratory muscle training is feasible and effective in patients recovering open thoracic and cardiac surgery. (Unrestricted research grant by Medinet-Italia).

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The effect of radical treatment and pulmonary rehabilitation on muscle mass as measured with CT-scan: A randomised trial in patients (pts) with lung cancer and mesothelioma

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Introduction: Cancer and its treatment are known to contribute to fatigue and functional impairment. The latter is thought to result from loss of muscle mass and strength.

Aim: To investigate the effect of radical treatment and post-treatment rehabilitation on muscle mass and strength in pts with thoracic cancer.