

established. Two small studies have previously shown no benefit; this may have been due to study power or methodology. Our study investigated whether ambulatory oxygen provides additional benefit to patients undergoing PR who meet the 2006 UK Department of Health criteria for ambulatory oxygen use.

Methods A single blind (researcher) randomised controlled trial compared the effect of a 6 week PR programme either with or without ambulatory oxygen. The study was powered to show an 80% difference between groups. Eligible patients were those who desaturated on baseline exercise testing by >4% to <90% and whose exercise tolerance improved by >10% with ambulatory oxygen. Outcome measures included the Endurance Shuttle Walk Test (ESWT) and the self report Chronic Respiratory Questionnaire (CRQ-SR).

Results Between September 2007 and June 2009 62 patients consented; one patient withdrew choosing to use ambulatory oxygen, ten dropped out of PR. The majority of subjects had Chronic Obstructive Pulmonary Disease; eight had another chronic respiratory condition. Groups were similar at baseline except for weight and BMI (higher in the room air (RA) group). A far greater improvement in ESWT was found in the oxygen group ($p=0.000$) (Abstract S71 Table 1). When the acute effect of oxygen is excluded the oxygen group improved by 75% more than the RA group; this did not meet statistical significance since the study was powered to show an 80% improvement. The oxygen group gained improvements in three CRQ-SR domains (emotion, fatigue and mastery) above the minimally clinically important difference (MCID) but this was not the case for the RA group; the difference between groups for these domains also reached the MCID. Improvements in the dyspnoea domain were similar between groups, although the oxygen group walked 490 m (122%) further.

Abstract S71 Table 1 ESWT outcome

	RA group	O ₂ group	Difference	95% CI	p
Mean change m (SD)	401 (391)	891 (477)	490	245 to 735	0.000*
Mean change % (SD)	77 (76)	199 (214)	122	32 to 211	0.009*
Mean change secs (SD)	380 (358)	682 (311)	302	113 to 491	0.002*

*Unpaired t-test.

Conclusion For patients who desaturate and with an acute positive response to oxygen, ambulatory oxygen significantly enhances the effect of PR.

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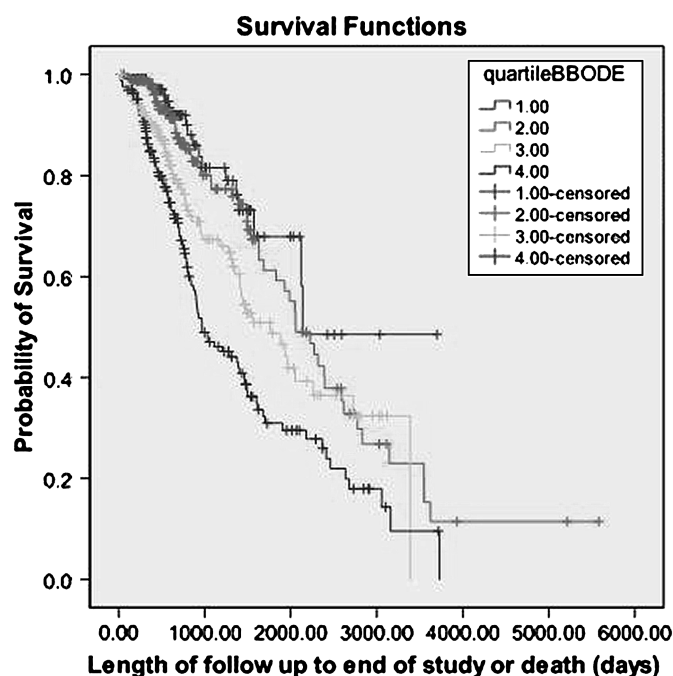
S72 THE UTILITY OF THE MODIFIED BODE INDEX (INCORPORATING THE INCREMENTAL SHUTTLE WALKING TEST) IN ASSESSING SURVIVAL IN PATIENTS WITH COPD SCREENED FOR PULMONARY REHABILITATION (PR)

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Background We have previously reported that distance walked on the Incremental shuttle walking test (ISWT) can be substituted for the 6 min walking distance (6MWD) as the exercise ("E" component) of the BODE index (ERS 2009). This study examines 5 year survival in a cohort of patients with COPD and examines the validity of the modified BODE index as an independent predictor of survival in COPD.

Method Hospital records of 1127 patients with COPD referred to PR (mean (SD) FEV₁ 46.1 (16.2)% predicted, age 68.4 (9.0) years) were examined to assess 5-year survival. A multivariate cox proportional



Abstract S72 Figure 1 Kaplan-Meier survival curves for the four quartiles of the BODE index.

hazards model including the variables gender, age, pack years, FEV₁, FVC, BMI, MRC dyspnoea score and ISWT was used to identify independent factors predicting all cause mortality. A BODE score was then assigned to 626 patients with sufficient data for analysis. Cut-off points for the ISWT quartiles were as follows: <80 m=3, 80–149 m=2, 150–249 m=1, >250 m=0. Cox regression was used to predict hazard ratios for the modified BODE index, adjusted for the independent prognostic factors identified by initial analysis. Kaplan-Meier analysis of survival by quartile of the BODE index was then performed and compared with the log rank test.

Results Overall 5-year survival was 41.9%. Three of the four factors in the BODE index (BMI, exercise capacity, and MRC dyspnoea) were statistically significant independent predictors of survival whilst the fourth, FEV₁% predicted was of borderline significance ($p=0.08$). In addition age and pack years smoked were also independent prognostic factors. The mean (SD) BODE index was significantly higher in patients who had died at 5 years (5.9(2.2)) than those that had survived (4.8(2.2)), $p<0.0001$. The modified BODE index was a significant predictor of death even corrected for age and pack years smoked (adjusted hazard ratio (95% CI) 1.26 (1.17 to 1.35), $p<0.0001$). Kaplan-Meier survival analysis confirmed that each quartile increase in the BODE index was associated with increased mortality ($p<0.0001$) (Abstract S72 Figure 1).

Conclusion The BODE index using the ISWT as the exercise component, is a useful tool for predicting survival in patients with COPD.

S73 4-METRE GAIT SPEED AS A FUNCTIONAL OUTCOME MEASURE IN PATIENTS WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE (COPD)

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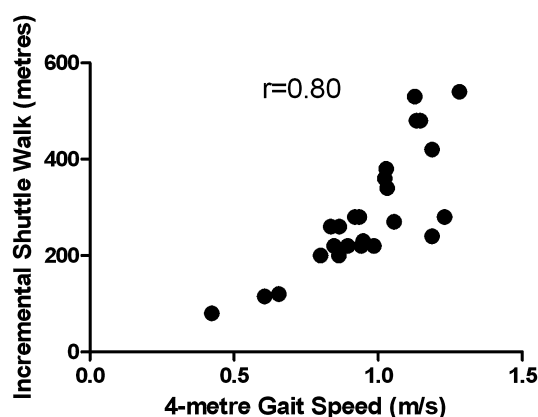
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Introduction Well-established functional outcome measures in COPD include the 6-min walk test (6MW) and incremental shuttle

walk test (ISW). However, these tests require space, repetition, and can be time-consuming. In the elderly population, gait speed alone has been shown to be a significant predictor of disability and mortality. We hypothesised that the 4-m gait speed in COPD patients would correlate well with the 6MW and ISW, and with validated COPD mortality composite scores such as BODE and ADO.

Methods 26 well-characterised COPD patients were studied. Each underwent 6MW test as per ATS guidelines, ISW test and completed a 4-m walk in random order. For the 4-m walk, participants were instructed to walk at their usual speed along a marked, flat unobstructed course. Timing was stopped when the first foot completely crossed the 4-m mark. The faster of two timed walks was used for scoring purposes, and a gait speed was calculated in m/s. Data were analysed using Spearman's rank correlation to assess association between 4-m gait speed and 6MW, ISW, BODE score and ADO index.

Results Baseline characteristics are presented as mean (SD) or median (25th, 75th percentile): 11M: 15 F; age=69 (8); FEV1% predicted=43 (20); 6MW=330 (83); ISW=291 (122.5); MRC dyspnoea 3 (2, 4); St George's Respiratory Questionnaire (SGRQ)=49.6 (21.0); BMI=25.9 (4.9); BODE=4.5 (1.75, 6.0), ADO=5 (4, 6). Mean (SD) 4-m gait speed was 0.96 (0.20) m/s. There was a significant correlation between 4-m gait speed and 6MW ($r=0.62$, $p<0.001$), ISW ($r=0.80$, $p<0.0001$)—see Abstract S73 Figure 1, BODE score ($r=-0.56$, $p=0.003$) and ADO index ($r=-0.43$, $p=0.03$).



Abstract S73 Figure 1

Conclusions 4-m gait speed correlates well with existing functional outcome measures and validated mortality composite scores used in COPD. It is an easy and quick to perform field test, and does not require specialist training or equipment. Further longitudinal and intervention studies are required to validate the 4-m gait speed as an assessment tool.

S74 EFFECT OF PULMONARY REHABILITATION ON THE SHORT PHYSICAL PERFORMANCE BATTERY (SPPB) IN COPD

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Introduction The Short Physical Performance Battery (SPPB) is a simple objective assessment tool developed by the National Institute on Ageing for evaluating lower extremity function in older persons. It comprises tests of standing balance, normal gait speed

and timed sit-to-stand with a maximum score of 12, and predicts nursing home admission rates and mortality. Lower extremity dysfunction is well recognised in COPD, and hence the SPPB may be a useful functional outcome measure in COPD patients. Pulmonary rehabilitation (PR) is a highly effective intervention in COPD and ameliorates lower limb dysfunction. We hypothesised that the SPPB would improve after PR.

Methods 35 COPD (18M:17F) patients underwent an 8 week outpatient pulmonary rehabilitation programme. The SPPB, incremental shuttle walk (ISW) and St George's Respiratory Questionnaire (SGRQ) were measured immediately before and after a PR programme. Paired *t*-test (or non-parametric equivalent) was used to test the effect of PR.

Results Baseline characteristics are expressed as mean (SD) or median (25th, 75th percentiles): age 69 (8), FEV1% 43 (23), MRC Dyspnoea 4 (3, 4), ISW 130 (60, 270), and SGRQ 57 (16). Following PR, there was a significant improvement in ISW (mean 70 m; $p<0.001$) and SGRQ (-7.0 ; $p<0.005$). SPPB also significantly improved from a median of 9 (6, 11) pre-PR to a median of 11 (7, 12; $p<0.004$) post-PR. Change in SPPB did not correlate with change in ISW ($r=0.22$; $p=0.20$).

Conclusions The SPPB may be a useful functional outcome measure in COPD, and gives different information from the ISW. Larger studies are required to determine the minimum clinically significant change in the SPPB.

Contributors M S Patel, A L Clark contributed equally to this study.

S75 IS A PRACTICE INCREMENTAL SHUTTLE WALK TEST ALWAYS NECESSARY AND IS IT INFLUENCED BY MRC DYSPNOEA GRADE?

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Introduction The Incremental Shuttle Walk Test (ISWT) is a common assessment tool used to assess exercise capacity in patients with Chronic Obstructive Pulmonary Disease (COPD). Healthcare professionals conducting this test will ask patients to perform a practice Incremental Shuttle Walk Test (PISWT). The aim was to explore whether a PISWT is needed and to examine whether variance between PISWT and the second shuttle walk test (ISWT2) is influenced by MRC dyspnoea grade.

Method This is a retrospective audit of 441 COPD patients: male 194 female 297 mean (SD) age 68.9 (10.13) years who were assessed for outpatient pulmonary rehabilitation (PR). Patients undertook a PISWT and rested for 30 min before performing ISWT2. Distance covered (m), MRC grade, heart rate (HR), forced expiratory volume in 1 s (FEV1), forced vital capacity (FVC) and body mass index (BMI) were recorded.

Results The mean (SD) change between both shuttle walk tests and significance levels were analysed using a paired *t* test. These results are detailed in Abstract S75 Table 1. Overall, there was a statistically significant increase in mean walking distance between PISWT and ISWT2. In each patient subgroup, a significant increase was seen for all, except for those of MRC grade 1; however this group consisted only of eight patients. Furthermore, no patient subgroup achieved the minimum clinically important distance for the ISWT >47.5 m (Singh *et al*, 2008). Patients in MRC grades 2 and 3 showed more variance between each shuttle walk test. The least mean change was seen in patients of MRC grade 5.