248* Using an individualized treadmill protocol to assess maximal steady state exercise capacity in cystic fibrosis

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Introduction: Although the 6 minute walk test (6 MWT) is an established, safe and well tolerated method of assessing sub-maximal exercise capacity in CF, it requires adequate space and may not easily represent activities of daily living. We therefore examined the utility of a simple individualized treadmill protocol to assess metabolic capacity, using the maximal steady state (MSS) and compared it with the 6 MWT.
Patients and Methods: Paired tests were carried out on 216 adult CF patients (mean age 25 years, 106 male): MSS treadmill capacity was compared with a 6 MWT around a 20 metre course. Patients warmed up for 3 minutes at a comfortable pace before using a combination of speed and incline to incrementally reach their highest sustainable exercise intensity, without experiencing undue fatigue and without encouragement, for a minimum of 6 minutes. ACSM metabolic equations were used to estimate O_2 cost and calculate a metabolic equivalent (MET) value for the exercise.
Results: There was a strong correlation between MSS MET values and 6MWT scores ($r^2 = 0.83$, $P < 0.0001$). Furthermore, those who were only able to sustain a low steady state on the treadmill were better able to replicate and frequently surpass their efforts on the 6MWT. Patients achieving higher steady state intensity are likely to have been hindered by the increased anaerobic demands of slowing and reversing direction every 20 metres.
Conclusions: The use of a simple sub-maximal treadmill test may aid clinicians to better relate a patient's functional capacity to the demands of leisure, occupation and daily living as well as to help chart changes in physical fitness and clinical status.

249 Maximal steady state treadmill testing as a guide to assessment for lung transplantation in cystic fibrosis

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Introduction: The 6 minute walk test (6MWT) is a useful tool in assessing exercise capacity in CF patients, where a score of <400 metres may indicate suitability for lung transplantation. However, in clinics with space constraints, such tests are difficult, and they may not easily represent activities of daily living. We examined an alternative means of assessment, the sub-maximal treadmill test, and compared it with the 6MWT as a guide to assessment for transplantation.
Patients and Methods: 26 patients (mean age 27 years, 13 male) considered for transplant referral under went an individualised treadmill protocol exercise test that represented their maximal sustainable effort without undue fatigue or over exertion for a minimum of 6 minutes. ACSM metabolic equations were used to estimate O_2 cost and calculate a Metabolic Equivalent (MET) value for the exercise. These were compared with corresponding 6MWT performed over a level 20 metre course. We also reviewed pulmonary function (FEV_1) and nutritional status (BMI) at the time.
Results: There was a strong correlation between treadmill scores (mean 2.9 METs) and the corresponding 6MWT (mean 392 metres) ($r^2 = 0.905$; $P < 0.0001$). There was no correlation between either sub-maximal exercise test with FEV_1 or with BMI.
Conclusions: A sub-maximal treadmill protocol is a useful tool to aid clinicians regarding the timing of a referral for transplantation. The mean six-minute walk distance achieved by the patients in this study relates well to previous studies. The corresponding mean treadmill score of 2.9 METs might indicate a threshold that below which a CF patient is considered for suitable for lung transplantation referral.

250* Field tests to assess exercise capacity in cystic fibrosis children

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Background: Cardiopulmonary exercise testing represents the *gold standard* to evaluate exercise capacity but its use in the paediatric age is limited. In this age group field tests can be used to assess exercise tolerance as well. However despite their simplicity these tests are not widely used in children and their role in the clinical setting is still to be determined.
Objectives: The purpose of this study was to compare Six Minute Walking Test (6MWT), Step Test (ST) and Modified Shuttle Walk Test (MSWT) in order to establish the most useful method to assess exercise capacity in children.
Methods: 20 patients with CF (13F, 7M aged 6–16 yrs) and normal lung function to moderate airway obstruction were recruited. All subjects performed 6MWT, ST and MSWT on different days. Outcome measures were distance walked or steps completed, SpO_2, heart rate (HR), respiratory rate (RR) and visual analogue score of dyspnea and muscle fatigue, before and after performance.
Results: ΔHR was higher in MSWT than 6MWT ($p < 0.01$) and ST ($p < 0.01$). Dyspnea score at the end of the test was higher in MSWT than 6MWT ($p < 0.0001$) and ST ($p < 0.0001$). SpO_2 at the end of the test was lower in MSWT than 6MWT ($p < 0.001$) and ST ($p < 0.001$). In addition, the distance walked was higher in MSWT than 6MWT ($p < 0.01$). The FEV_1 predicted values were significantly correlated with performances in MSWT and 6MWT.
Conclusion: This study shows that the MSWT when compared to 6MWT and ST is the most useful method to detect the maximal exercise capacity in CF children. These results may be explained at least in part by the fact that MSWT gives children an easier way to control their performance.

251 Is there a relation between a cardiopulmonary exercise test and a performance test in children with cystic fibrosis?

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Introducion: Children need a good level of aerobic capacity to participate in daily life. Cardiopulmonary exercise testing (CPET) is accepted as gold standard to study a patient's level of aerobic capacity. Higher level of cardiorespiratory endurance is associated with proficiency in fundamental movement skills.
Measuring motor health related physical fitness with a CPET is expensive and performance (field) tests are a valid and inexpensive alternative.
The purpose of this study was to examine the association between the Bruininks–Oseretsky test of Motor Proficiency (BOT-2) (Agility and Strength) and two cardiopulmonary exercise protocols: 'classic' step protocol and Steep Ramp (SR) protocol, in children with cystic fibrosis (CF).
Methods: Seventeen CF adolescents (9 males, 8 females; mean age 14.7, mean $FEV_{1\ predicted}$ 80%, participating the MOVIT-study (Mucoviscidosis en Ontsteking, Variabiliteit door Inspanning en Training) performed two CPET protocols and BOT-2.
Results: Pearson correlation between BOT-2 and CPET was moderate to good for VO_{2peak} l/min: $r = 0.69$; VO_{2peak} ml/min/kg: $r = 0.77$; W_{peak}: $r = 0.65$ and W_{peak} kg: $r = 0.64$.
Spearman's rank correlation was moderate to good between BOT-2 (domain 6) and SR-VO_{2peak} (l/min): $r_s = 0.54$; SR-VO_{2peak} (ml/min/kg): $r_s = 0.62$; SR-W_{peak} kg: $r_s = 0.51$; between BOT-2 domain 8 Point score and SR-VO_{2peak} ml/min/kg: $r_s = 0.58$.
Conclusion: Measuring physical fitness with a performance test and a CPET in CF children is useful. BOT-2 seems to reflect better the daily activity level of children with CF, this daily activity level seems not to be in conformity with the aerobic capacity of these children.