The feasibility of a home-based exercise intervention for the improvement of aerobic function in young cystic fibrosis patients

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INTRODUCTION

• Exercise training is seen as an essential tool in the management of cystic fibrosis (CF)
  ¹. However, no formal exercise guidelines exist and therefore, prescription of exercise training is under-utilised.
  ². As exercise is not always possible or practical in the clinical environment, utilisation of the home environment is an important consideration.
  ³. Exercise training in the home environment has shown to have limited improvements in adult patients⁴ and exercise training has been shown to have some benefits in children⁵, with the strongest results seen in a clinical setting.
  ⁴. However, it is unclear what effect a home-based, mixed aerobic and resistance training programme may have in children with mild-to-moderate CF.

METHODS

Three children (2 females; 13.1 ± 0.6 yr; 139.2 ± 7.3 cm; 33.2 ± 0.6 kg) with mild-to-moderate CF (FVC: 81.0 ± 8.9 %; FEV₁: 89.8 ± 10.3 %) were recruited from the Royal Devon & Exeter NHS Foundation Trust Hospital. Ethics approval was granted by the local NHS Research Ethics Committee.

Variables of Interest

• Anthropometric measurements included height, mass and BMI.
• Lung function was assessed with a hand held spirometer, with FVC and FEV₁ values normalised².
• Cardiopulmonary fitness (VO₂max) was assessed by a combined ramp incremental and super-maximal cycling test to exhaustion⁶. Gaseous exchange was measured breath-by-breath and values for VO₂, VCO₂, V̇E, Heart Rate and RER were obtained.
• Physical activity was objectively assessed using a triaxial GENEActiv accelerometer mounted on the wrist over four days (two weekdays). Time spent in MVPA (moderate-vigorous activity) and sedentary time were collected in absolute and relative terms.
• Subjective exercise tolerance was recorded by way of ratings of perceived exertion (RPE) and ratings of perceived dyspnoea (RPD).

Training Programme

Each participant was assigned a mixed aerobic (AER) and resistance (RES) programme, to take place over a three month period. Participants were allowed free choice in activity selection, but were required to work within a specified HR training zone, based upon initial exercise capacity tests.

• Weeks 1-4: AER; 2/week for 45 minutes at 80% GET. RES; None.
• Weeks 5-6: AER; 3/week for 45 minutes at 40% GET. RES; chest, arms, back – 10 reps x2 with theraband.
• Weeks 7-8: AER; 3/week for 60 minutes at 60% GET. RES; chest, arms, back – 20 reps x2 with theraband.
• Weeks 9-12: AER; 3/week for 60 minutes at 60% GET. RES; chest, arms, back – 20 reps x2 with theraband.

Researchers maintained contact with patients on a weekly basis to assess progress and ensure compliance.

RESULTS

Cardiopulmonary Fitness:

• Changes in absolute and relative VO₂max were observed between pre- (mean ±SD; 1.27 ± 0.13 L min⁻¹; 38.07 ± 4.41 mL kg⁻¹ min⁻¹) and post-training (1.19 ± 0.16; 35.86 ± 6.01).
• The gas exchange threshold increased in absolute terms (0.66 ± 0.12 to 0.72 ± 0.11 L min⁻¹) and as a percentage of VO₂max (52.3 ± 6.9 to 60.5 ± 0.9 %).

Physical Activity:

• The duration of sedentary time decreased by 30.9 ± 25.4 minutes following training (-1.15 ±13.10 %).
• Light activity increased by 8.3 ± 8.21 minutes (+ 2.18 ± 4.48 %).
• MVPA decreased by 3.7 ± 59.2 minutes (-1.33 ± 8.35 %).
• Data may be skewed by individual responses and differences in non-wear time of accelerometer.

AIM

To assess the feasibility of a three-month home-based exercise intervention programme in improving exercise capacity in children with mild-to-moderate CF.

CONCLUSIONS

The results of this feasibility study suggest:

• Home-based exercise is a feasible modality of exercise training in children.
• A mixed aerobic and resistance programme can improve exercise capacity, exercise tolerance and physical activity.
• Compliance is difficult to ensure and may explain large variances in results.
• The current methods and results will be utilised to inform future randomised controlled trials in CF.

REFERENCES


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