PC18

Maximal oxygen uptake and fatty acid oxidation in athletic older men and women and healthy control

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Introduction: Cardiopulmonary and musculoskeletal systems deteriorate through middle and into older age. This has a negative impact on physical capability and energy metabolism. The purpose of the present study was to determine the effects of ageing and exercise on peak rates of oxygen uptake (VO_2peak) and fatty acid oxidation (PFO).
Methods: All participants provided written, informed consent. Masters Athletes (MA: n=40, aged 37-90) specialised in endurance (n=10) or sprint running (n=30) were recruited during the 2012 European MA Championships in Zittau, Germany. Untrained (n=42, aged 18-67; 23 men and 16 women) were recruited from the general Manchester population (UK). The untrained participants also completed 12 weeks very high intensity sprint cycle training (4* 20s at 170% VO_2max, 3/wk). VO_2max and PFO were assessed using indirect calorimetry and incremental cycle ergometry. Statistical significance was gained by independent samples t-tests using IBM SPSS v.20.
Results: The endurance and sprint trained MA were a similar age and had similar VO_2max (Endurance MA: 47.22 ml/kg/min (±4.15) vs Sprint MA: 43.52 ml/kg/min (±2.21) p=0.416). Both MA groups were significantly higher than untrained people

(38.86 ml/kg/min). MA sprinters and endurance runners had a VO_2max similar to 19 years younger untrained, healthy people. Regression analysis showed that VO_2max decreased by around 11% per decade after the age of 40 yrs in the MA group and 5% per decade after the age of 40 yrs in the untrained group. PFO was similar in endurance and sprint trained MA (Endurance: 8.09 mg/kg/min (±0.95) vs Sprint: 6.91 mg/kg/min (±0.53) p=0.284). In the untrained group, PFO was significantly lower than MA (p=0.006). Regression showed that PFO of MAs was similar to that of an untrained, healthy person 19 years younger. The sprint-training programme caused VO_2max to increase by 10% (Pre: 38.86 ml/kg/min (±1.31) vs Post: 42.84 ml/kg/min (±1.24) p<0.001) and PFO to increase by 18% (Pre: 5.57 mg/kg/min (±0.33) vs Post: 6.58 mg/kg/min (±0.41) p=0.050).

Conclusion: These results show that MAs have a cardiopulmonary and metabolic fitness at levels equivalent to someone almost 20 yrs younger. Previously untrained middle-aged people can achieve substantial gains in fitness by completing relatively short duration, but high intensity sprint training and reach levels similar to those observed in the master athletes.

Where applicable, the authors confirm that the experiments described here conform with The Physiological Society ethical requirements.
