

Identifying Maximal Fat Oxidation during Arm Ergometry

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ABSTRACT

Metabolic responses have been extensively studied in response to various exercise modalities, such as treadmill running and cycling. Achten et al. (2002) demonstrated that graded exercise testing in trained cyclists using 3 minute (min) stages led to similar estimates of fat oxidation (FOx) and maximal fat oxidation (MFO) as 5 min stages. However, minimal research has studied FOx responses during exercises using arm cycle ergometry (ACE). **PURPOSE:** To compare FOx responses during progressive ACE using 3 and 5 min stages. **METHODS:** Participants consisted of 11 healthy, non-obese men and women (age = 24 ± 9 yr, %BF = $23 \pm 5\%$, VO_{2peak} and PPO = 23.5 ± 5.7 ml/kg/min and 103.2 ± 40.4 W) who are physically active (PA = 5 ± 2 h/wk) but unfamiliar with ACE. Participants initially underwent graded exercise testing to determine peak oxygen uptake (VO_{2peak}) and peak power output (PPO) on the ACE. Utilizing a randomized crossover design, on two separate days, following a 12 h fast, participants performed progressive exercise on the ACE with gradually increasing intensities every 3 or 5 min, starting at 15%PPO and PO increasing by 10% per stage. Gas exchange data, heart rate (HR), and blood lactate concentration (BLa) were obtained throughout exercise. **RESULTS:** Paired t-test showed no significant differences in MFO between 3 and 5 min stages (0.16 ± 0.07 vs 0.13 ± 0.07 g/min, $p=0.07$), and there was a strong, positive correlation between these values ($r=0.82$, $p=0.002$). There were no significant differences between protocols in BLa at MFO (1.94 ± 1.0 vs. 1.95 ± 0.8 mM, $p=0.93$), MFO expressed as percent of peak HR (%HRpeak) (59 ± 9 vs. 58 ± 11 %HRpeak, $p=0.80$), % VO_{2peak} (38 ± 8 vs. $42 \pm 15\%$ VO_{2peak} , $p=0.24$) or power output (PO) at MFO (26 ± 12 vs. 24 ± 10 %PPO, $p=0.17$). However, RER at MFO was significantly different between 3 and 5 min stages (0.83 ± 0.05 vs. 0.86 ± 0.03 , $p=0.04$). Results showed no significant duration X time interaction for BLa ($p=0.25$), FOx ($p=0.44$), carbohydrate oxidation (CHOOx) ($p=0.057$), RER ($p=0.61$), or blood glucose ($p=0.24$) between stage durations. **CONCLUSION:** As no significant differences in FOx were revealed between stage durations, we recommend 3 min stages to identify metabolic responses during progressive ACE. However, more study is merited to elucidate the individual variability in the FOx response to exercise.