Workshop
Physiology of motor systems and exercise

Cardiovascular responses during rest-exercise and exercise-exercise transients

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If indeed vagal withdrawal determines the rapid response to exercise (phase I), the a large reduction, if not complete suppression, of phase I should be found, when an exercise transient starts from a previous lower steady state exercise rather than from rest. On 15 healthy young subjects we measured beat-by-beat cardiac output ($\dot{Q}$, Modelflow from Portapres data) and heart rate (f_H, ECG) during these cycle ergometer exercise transients: 0–50 W (transient from rest, RT) and 50–100W (transient from exercise, ET). A double exponential was used to compute amplitudes and time constants of phase I and II (A_1 and A_2; T_1 and T_2). At steady state, f_H was 87.5±10.4, 109.3±12.0, and 139.6±17.1bpm, and $\dot{Q}$ was 7.3±1.5, 12.6±1.6, and 16,1±1,9L/min, at rest, 50W and 100W, respectively. In RT, A_1 and A_2 for f_H were 11.7±8.6 and 11.3±4.7bpm; the corresponding T_1 and T_2 were 1.6±1.9 and 14.4±21.3s. For $\dot{Q}$, we had: A_1=4.0±1.8L/min, A_2=1.5±1.4L/min, T_1=3.2±1.8s, T_2=11.3±12.2s. In ET, the double exponential model provided preposterous A_1 and T_1 values and extremely high T_2 values (>100s). Subsequent use of a mono exponential model provided, for f_H, A=29.7±8.9bpm and T=7.7±4.9s, and for $\dot{Q}$, A=3.5±8.6L/min, and T=7.0±5.7s. The A and T in ET did not differ from the A_2 and T_2 of RT. We conclude that a single exponential model is more adequate to describe ET and this single exponential corresponds to the second exponential of RT. Our results are compatible with the vagal withdrawal hypothesis.