The pattern and level of muscle activation and the heart rate response during cycling in a new cycloergometer (PCE) prototype, supposed to simulate running pattern, was compared with cycling in a SRM cycloergometer and with running. The PCE was equipped with a crank of 300mm placed 185-200mm behind the support of the seat, while the SRM was equipped with a crank of 195mm placed 240-260mm ahead of the seat. Nine voluntary subjects (7 males-2 females, 72±10kg body mass; 29±3years old), performed 4 randomized trials of 3 minutes, after warming up during 10min: 1) Cycling on the PCE at 50rpm, 2) Cycling on the SRM at 50rpm, 3) Running at 7kmh-1 with a 12.5% slope (7TR) and 4) Running at 17kmh-1 with a 5% slope (17TR). The estimated power output for all the trials was equated to a workload of 2.4wkg-1body mass. During the trials, heart rate (HR) was recorded every 15s while electromyography signals (SEMG) were recorded (1kHz sampling rate) from the knee extensor and hip flexor (KEHF) muscles: vastus lateralis (VL), rectus femoris (RF), psoas iliacus (PI), vastus medialis (VM), and from the ankle plantar flexor (AF) muscles: gastrocnemius (G) and soleus (S). Several SEMG parameters were calculated: Mean average voltage (MAV) on the entire contraction (integrated EMG/integration time) expressed as a percentage of the MAV of a maximal leg extension or knee flexion isometric contraction (MAV%), the rate of EMG increase (RER), determined as the slope (916;EMG/916;time) in time interval of 0-75ms expressed as a percentage of the MAV of a maximal isometric contraction (RER), and median frequency (MDF). The pattern of muscle activation was different during cycling (PCE and SRM) from during running. Compared to SRM, cycling HR (11%) and MAV% of KEHF during PCE were higher (p<0.05), whereas MAV% and RER of AF were 106% and 34% lower, respectively. Compared to 17TR, PCE cycling showed lower HR (11%), MAV% of AF (307%) and RER of KEHF (126%) and AF (290%) while MAV% of KEHF was no different. PCE compared to 7TR showed higher MAV% of the KEHF (49%), but no differences were observed in the other parameters. No differences were found in MDF between trials. This study showed that cycling in a PCE produced similar activation of knee extensor and hip flexor muscles than running at 17kmh-1, and higher activation than cycling in a traditional cycloergometer. However, neural activation of the ankle plantar flexors in cycling in PCE was lower than cycling in a traditional cycloergometer or during high velocity running. Furthermore, rapid neural activation during cycling in PCE was similar to cycling in a SRM but lower than during running at high velocities. The different HR responses observed between trials could be explained, in part, by differ-