

ABSTRACT

Title: Movement economy and physiological response during differing climbing speeds in sport climbers.

Aims: The work aims to evaluate climbing economy and physiological responses of intermediate and advanced climbers in different climbing speeds.

Methodology: 32 climbers (11 advanced men, 11 intermediate men, 10 intermediate women) performed 3 submaximal tests in treadwall at slope of 90° at speeds 4, 6 and 9 m.min⁻¹. Each of the tests lasted exactly 4 minutes. Oxygen consumption (VO₂), heart rate (HR), ventilation (V_E), respiratory ratio (RER) and energy expenditure were monitored.

Results: Advanced men reported lower energy expenditure than intermediate men in all climbing speeds (4 m.min⁻¹: -0,06 kcal.kg⁻¹, $P = 0,007$; 6 m.min⁻¹: -0,06 kcal.kg⁻¹ $P = 0,048$; 9 m.min⁻¹: -0,07 kcal.kg⁻¹ $P = 0,022$). Intermediate women reported only slightly lower energy expenditure than intermediate men (4 m.min⁻¹: -0,01 kcal.kg⁻¹ $P = 0,051$; 6 m.min⁻¹: 0,06 kcal.kg⁻¹ $P = 0,091$; 9 m.min⁻¹: -0,03 kcal.kg⁻¹ $P = 0,115$). Energy expenditure was significantly lower at 4 m.min⁻¹ than at 6 m.min⁻¹ (-9,82 kcal, $p = 0,001$) and also significantly lower at 6 m.min⁻¹ than at 9 m.min⁻¹ (-8,3 kcal, $p = 0,001$). Advanced men reported significantly lower VO₂ at speeds 4 a 6 m.min⁻¹ (- 2,2 ml.kg⁻¹.min⁻¹, $P = 0,022$; -3,9 ml.kg⁻¹.min⁻¹, $P = 0,021$), HR at 6 a 9 m.min⁻¹ (-17,1 tepû/min, $P = 0,030$; -19,1 tepû/min, $P = 0,011$), V_E at 9 m.min⁻¹ (-8,2 l.min⁻¹, $P = 0,018$) and RER at 6 m.min⁻¹ (- 0,04, $P = 0,048$) than intermediate men. Intermediate men reported only lower RER at 9 m.min⁻¹ (-0,09, $P = 0,012$) than intermediate women. Furthermore, significantly differences in physiological responses were found between the climbing speeds in almost all monitored parameters.

Conclusion: Lower energy expenditure among advanced men refers to better climbing economy than among intermediate men and women. This result means the need of improve climbing skills not only by beginners, but also by experienced climbers.

Keywords: energy expenditure, sport climbing, technique, indirect calorimetry