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Research article

Cardiorespiratory and Metabolic Responses to Loaded Half Squat Exercise Executed at an Intensity Corresponding to the Lactate Threshold

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ABSTRACT

This study was designed to identify the blood lactate threshold (LT2) for the half squat (HS) and to examine cardiorespiratory and metabolic variables during a HS test performed at a work intensity corresponding to the LT2. Twenty-four healthy men completed 3 test sessions. In the first, their one-repetition maximum (1RM) was determined for the HS. In the second session, a resistance HS incremental-load test was performed to determine LT2. Finally, in the third session, subjects performed a constant-load HS exercise at the load corresponding to the LT2 (21 sets of 15 repetitions with 1 min of rest between sets). In this last test, blood samples were collected for lactate determination before the test and 30 s after the end of set (S) 3, S6, S9, S12, S15, S18 and S21. During the test, heart rate (HR) was telemetrically monitored and oxygen consumption ($\dot{V}O_2$), carbon dioxide production ($\dot{V}CO_2$), minute ventilation (VE), respiratory exchange ratio (RER), ventilatory equivalent

for O_2 ($VE \cdot VO_2^{-1}$) and ventilatory equivalent for CO_2 ($VE \cdot VCO_2^{-1}$) were monitored using a breath-by-breath respiratory gas analyzer. The mean LT2 for the participants was $24.8 \pm 4.8\%$ 1RM. Blood lactate concentrations showed no significant differences between sets 3 and 21 of exercise ($p = 1.000$). HR failed to vary between S6 and S21 ($p > 1.000$). The respiratory variables VO_2 , VCO_2 , and $VE \cdot VCO_2^{-1}$ stabilized from S3 to the end of the constant-load HS test ($p = 0.471$, $p = 0.136$, $p = 1.000$), while VE and $VE \cdot VO_2^{-1}$ stabilized from S6 to S21. RER did not vary significantly across exercise sets ($p = 0.103$). The LT2 was readily identified in the incremental HS test. Cardiorespiratory and metabolic variables remained stable during this resistance exercise conducted at an exercise intensity corresponding to the LT2. These responses need to be confirmed for other resistance exercises and adaptations in these responses after a training program also need to be addressed.

Key words: Aerobic fitness/ VO_2 , anaerobic threshold, exercise physiology, strength training

Key Points

- It can be identified lactate threshold at half-squat.
- Exercise intensity is predominantly aerobic.
- The duration of the half-squat can be maintained over time, ~30 min of discontinuous exercise (21 sets, 15 repetitions, 1 min rest).
- Lactate threshold intensity may be suitable for older adults, sedentary individuals, patients or subjects with a lower functional capacity and even for resistance sports athletes.

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