GENDER DIFFERENCES IN ANAEROBIC WORKING CAPACITY, BUT NOT CRITICAL POWER, DURING AN ALL-OUT CYCLING TEST

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ABSTRACT

Backgrounds: The three-minute all-out cycling test (3MT) has shown to be a valid method of determining critical power (CP) and anaerobic working capacity (W'). When compared to the estimation of these measures from analysis of the hyperbolic power-time relationship, the effects of total body mass and segmental lean mass on differences in CP and W' between men and women are not fully understood. 

Purposes: To examine the absolute and relative gender-related differences in CP and W' determined from 3MT. Methods: 38 recreationally-active young adults exhibited greater aerobic work capacity and anaerobic working capacity (W') compared to the average power output during the final 30 seconds of the test when and was given in kilopelops (kJ), such that:

\[ W'(kJ) = \frac{\text{AUC}}{\text{CP} \times \text{time (180s)}} = \frac{(\text{W' kg}) \times 180}{(\text{W' W/kg})} \]

The three-minute all-out cycling test (3MT) has shown to be a valid method of determining CP and W' [5].

RESULTS CONT.

• Absolute values for CP and W' were significantly different between men and women (p<0.01 and p<0.01, respectively).
• Relative to BM, CP was similar between groups (p=0.71) while W' was greater in men (p<0.01).
• Relative to LLM, CP remained similar (p=0.12) while W' was significantly greater in men compared to women (men: 0.87 ± 0.15 kJ·kg⁻¹·min⁻¹, women: 0.66 ± 0.16 kJ·kg⁻¹·min⁻¹). Significant associations were shown between absolute CP and VO2 peak (r=0.76; p<0.01), and W' and LLM (r=0.83; p<0.01). Conclusions: Men in this sample of recreationally-active young adults exhibited greater W' relative to LLM than women, however, a gender difference in CP was not observed when considered relative to either BM or LLM. This discrepancy in W' is significant above differences in muscle composition between men and women.

INTRODUCTION

In theory, critical power (CP) is the maximum power output that can be maintained at a metabolic steady state, and demarcates hard from severe exercise [1,2]. Following the same theory, anaerobic working capacity (W') is an estimate of the finite work capacity that can be completed above critical power and is associated with stored energy substrates in the muscle and intramuscular buffering capacity [1,3]. Previously, multiple tests to exhaustion on separate days were used to determine CP and W' [2,4]. The three-minute all-out cycling test (3MT) has shown to be a valid method of determining CP and W' [5]. The effects of total body mass (BM) and segmental lean mass (LLM) on differences in CP and W' between men and women are not fully understood.

METHODS

To examine the absolute and relative gender-related differences in CP and W' determined from a 3MT in a sample of recreationally active young men and women.

Table 1: Participants

<table>
<thead>
<tr>
<th></th>
<th>Age (yrs)</th>
<th>Body Mass (kg)</th>
<th>Leg Lean Mass (kg)</th>
<th>VO2max (ml·kg⁻¹·min⁻¹)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men</td>
<td>19</td>
<td>76.1 ± 9.8</td>
<td>22.3 ± 3.6</td>
<td>40.8 ± 4.6</td>
</tr>
<tr>
<td>Women</td>
<td>19</td>
<td>62.9 ± 7.1</td>
<td>15.1 ± 1.5</td>
<td>35.6 ± 3.6</td>
</tr>
</tbody>
</table>

Participants were healthy, recreationally active young men and women.

REFERENCES


Figure 1: DEXA scan image. Red outlines show area assessed for leg lean mass.