IX Simposio Internacional de Actualizaciones en Entrenamiento de la Fuerza, Madrid 16-17 de Diciembre 2016

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IX International Symposium in Strength Training

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<table>
<thead>
<tr>
<th>Sección</th>
<th>Página</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRÓLOGO</td>
<td>5</td>
</tr>
<tr>
<td>PREFACE</td>
<td>9</td>
</tr>
<tr>
<td>1. Presentación del Simposio</td>
<td>13</td>
</tr>
<tr>
<td>1. Symposium Presentation</td>
<td>15</td>
</tr>
<tr>
<td>2. Dirección, Comité Científico y Organización</td>
<td>17</td>
</tr>
<tr>
<td>2. Direction, Scientific Committee and Organizing Committee</td>
<td>19</td>
</tr>
<tr>
<td>3. Programa científico/Scientific Program</td>
<td>21</td>
</tr>
<tr>
<td>4. Programa ampliado/Extended Program</td>
<td>27</td>
</tr>
<tr>
<td>4.1. Ponentes internacionales/International Speakers</td>
<td>31</td>
</tr>
<tr>
<td>4.2. Ponentes nacionales/National Speakers</td>
<td>45</td>
</tr>
<tr>
<td>4.3. Comunicaciones orales/Oral Presentations</td>
<td>63</td>
</tr>
<tr>
<td>4.4. Pósteres/Posters</td>
<td>97</td>
</tr>
<tr>
<td>NOTAS/NOTES</td>
<td>167</td>
</tr>
<tr>
<td>ORGANIZADORES/ORGANIZERS</td>
<td>195</td>
</tr>
<tr>
<td>PATROCINADORES/SPONSORS</td>
<td>197</td>
</tr>
<tr>
<td>COLABORADORES/CONTRIBUTORS</td>
<td>199</td>
</tr>
</tbody>
</table>
9. Determining physiological and performance variables during a time trial in a first category mountain pass


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Background: Physiology and performance of uphill time-trials (TT) in professional road cycling have been previously described (Lucia A et al., 2004; Padilla S, Mujika I, Orbañanos J, & Angulo F, 2000; Padilla S, Mujika I, Santisteban J, Impellizzeri FM, & Goiriena JJ, 2008). Recent field-based uphill trials focused on power output due to its reliability and accuracy to assess aerobic and anaerobic performance (Bossi AH, Lima P, Perrout de Lima J, & Hopker J, 2016; Vogt et al., 2008; Vogt et al., 2007). However few studies have attempted to correlate the different physiological and performances variables in field conditions.

Objective: To assess the relationships among power output, velocity, cadence and oxygen uptake (VO₂) during an uphill time-trial frequently used in cycling competitions.

Methods: Fourteen elite road cyclists (mean±SD: 25±6 years, 174±4.2 cm, 64.4±6.1 kg) completed a field-based uphill TT in a 9.2 km first category mountain pass with a 7.1% slope. Oxygen uptake, power output, velocity and cadence were measured throughout the test.

Results: During the TT mean power output and velocity were: 302±7 W (4.2±0.1 W·kg⁻¹) and 18.7±1.6 km/h, respectively. Mean VO₂ was: 3941±110 ml·min⁻¹ (61.6±2.0 ml·kg⁻¹·min⁻¹). Mean power output, both absolute and relative to body mass, were strongly correlated with mean velocity (r= 0.82, for both correlations) and maximum velocity (r=0.77 and r=0.75, respectively). Strong associations were also observed between
peak power output and both mean and maximum velocity ($r=0.78$ and $r=0.80$, respectively). Regarding cadence, a moderate correlation was appreciated with mean power output relative to body mass ($r =0.50$), whilst non significant associations were found with velocity. Finally, a moderate correlation between oxygen uptake ($\text{ml} \cdot \text{min}^{-1} \cdot \text{kg}^{-1}$) and power output relative to body mass was observed ($r=0.42$), ($p < 0.001$ for all correlations)

**Conclusion:** During an uphill TT, velocity rises as a consequence of increasing power output whilst cadence and oxygen uptake do not seem as decisive in order to achieve a competitive advantage.

**Practical Application:** This data may provide coaches and cyclists, both elite and non professional, with information to adjust training prescription accordingly, allowing them to compare their performance to an elite model.


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