Study of the predictive power of two laboratory exercise tests for short trail running performance

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Introduction

Trail running (TR), a new endurance discipline that requires distinct physiological demands has gained popularity in the recent years. The classical endurance model does not allow meaningful prediction of short TR performance. Therefore, finding exercise testing strategies to predict performance in such discipline is challenging.

Objectives

The aims of this study were:

• to compare the physiological variables measured during a level and uphill graded running tests;

• to examine the predictive power of the physiological variables obtained from these laboratory running tests for short TR performance (using Spearman’s correlation analysis and Fisher z-transformation).

Materials & Methods

Eight competitive male trail runners (24 ± 6y; 75 ± 7kg) completed:

(A) a level treadmill test
(B) an uphill treadmill test
(C) a 31km race (900mD+) (Fig.1)

Gas exchanges, heart rate (HR) and capillary blood lactate were measured for determination of maximal oxygen uptake (VO\textsubscript{2}\text{max}), maximal aerobic speed (MAS) and lactate thresholds (LT).

Results & Discussion

Table 1: Comparison of the physiological variables measured during laboratory tests

<table>
<thead>
<tr>
<th>Variable</th>
<th>Level Test</th>
<th>Uphill Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>VO\textsubscript{2}\text{max} (ml.min\textsuperscript{-1}.kg\textsuperscript{-1})</td>
<td>48.5 ± 5.1</td>
<td>51.5 ± 4.6*</td>
</tr>
<tr>
<td>HR\text{max} (bpm)</td>
<td>180.5 ± 10.8</td>
<td>180.1 ± 10.2</td>
</tr>
<tr>
<td>HR at LT (bpm)</td>
<td>164.1 ± 10.2</td>
<td>160.7 ± 8.2</td>
</tr>
<tr>
<td>%HR at LT</td>
<td>88.5 ± 7.67</td>
<td>79.97 ± 4.73</td>
</tr>
<tr>
<td>MAS (km.h\textsuperscript{-1})</td>
<td>15.8 ± 1.1</td>
<td>10.3 ± 0.8*</td>
</tr>
<tr>
<td>S at LT (km.h\textsuperscript{-1})</td>
<td>13.3 ± 1.1</td>
<td>8.6 ± 0.8***</td>
</tr>
</tbody>
</table>

Lactate threshold (LT) based on capillary blood lactate, Heart Rate (HR); Maximal aerobic speed (MAS); Paired t Test*p<0.05; p<0.001.

• VO\textsubscript{2}\text{max} and MAS showed a stronger correlation (r=0.93) when determined in uphill condition compared to level condition (r=0.57).

• The correlation analysis between the physiological parameters and the race time revealed non-significant results whatever the test. However, it is of interest to underline that VO\textsubscript{2}\text{max} showed a stronger correlation with the race time when determined in uphill condition (Spearman’s rho, r=0.52) than at level condition (r=0.17) (Fig.2).

Conclusions

Our study suggests that the uphill running test tends to be better in predicting trail races than the level test. Further investigations with larger population and including more variables that may impact on trail performance (such as muscle function) should be conducted.