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[1]. 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).

Reference: (1) Ehrstrom S, Tartaruga MP, Easthope CS, Brisswalter J, Morin JB, Vercruyssen F. Short Trail Running Race: Beyond the Classic Model for Endurance Running Performance. Med Sci Sports Exerc. 2018;50(3):580-8.

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 trail race (900mD$^+$) (Fig.1)

Gas exchanges, heart rate (HR) and capillary blood lactate were measured for determination of maximal oxygen uptake (VO_2max), maximal aerobic speed (MAS) and lactate thresholds (LT).

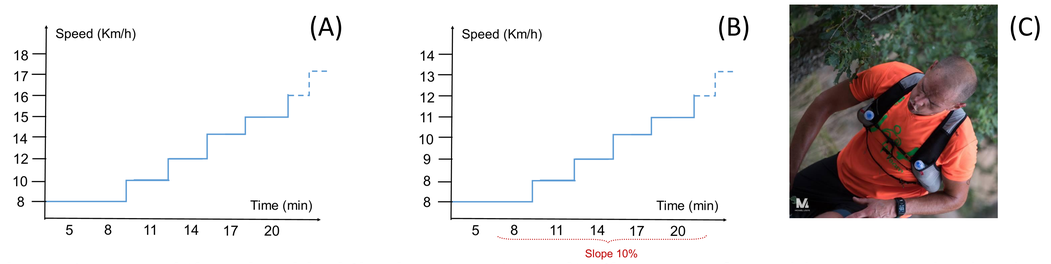


Figure 1: Level (A) and uphill (B) laboratory tests (A,B) were performed in a randomized order with a 7-12d interval period. They consisted of a 5min warmup stage (0%, 8km.h^{-1}) followed by 3min graded steps until exhaustion.

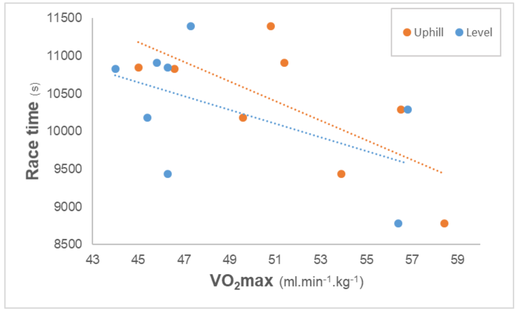
Results & Discussion

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

	Level Test	Uphill Test
VO_2max (ml.min^{-1}.kg^{-1})	48.5 ± 5.1	51.5 ± 4.6*
HRmax (bpm)	180.5 ± 10.8	180.1 ± 10.2
HR at LT (bpm)	164.1 ± 10.2	160.7 ± 8.2
%HR at LT	88.5 ± 7.67	79.97 ± 4.73
MAS (km.h^{-1})	15.8 ± 1.1	10.3 ± 0.8*
S at LT (km.h^{-1})	13.3 ± 1.1	8.6 ± 0.8***

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_2max 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 underlie that VO_2max showed a stronger correlation with the race time when determined in uphill condition (Spearman's *rho*, r_s=-0.52) than in level condition (r_s=-0.17) (Fig.2).



- **Figure 2: Relationship between VO_2max and the race time for both running tests.**

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.