



# Pacing for adolescent cross-country skiers



## Introduction

- Not clear whether young skiers have similar abilities to repeatedly perform, and recover from, efforts above their maximal aerobic power, and thereby induce similar relative exercise intensities to those observed in adult skiers
- Learning optimal pacing can be of great importance in the development and future performance of young athletes

## Methods

- Eleven young male skiers (YOS) ( $14.4 \pm 0.5$  years,  $VO_{2peak}$   $63.9 \pm 2.8$  mL·kg<sup>-1</sup>·min<sup>-1</sup>) and eight adult male skiers (ADS) ( $22.6 \pm 4.3$  years,  $VO_{2peak}$   $77.4 \pm 4.4$  mL·kg<sup>-1</sup>·min<sup>-1</sup>) performed a free technique rollerski time trial (TT) over a distance of 4.3 km (YOS) and 13.1 km (ADS) to simulate normal racing distances.
- Position and speed was tracked throughout the TT with a GNSS system
- Cost of transportation and  $VO_{2peak}$  were measured on an additional day to calculate the relative oxygen demand ( $VO_{2dem}$ ) in 13 segments of the TT.

## Results

- YOS were slower than ADS in all types of terrain (mean speed difference of 13%), with differences for uphill of 19%, undulating terrain of 11% and downhill of 8% (all  $P < .05$ ).
- The mean relative  $VO_{2dem}$  tended to be higher for YOS compared to ADS (120 vs. 112% of  $VO_{2peak}$ ,  $P = .09$ ) and the difference was more pronounced in the initial four calculated segments of the race (130 vs. 110% of  $VO_{2peak}$ ,  $P < .01$ ).
- Time loss (s·m<sup>-1</sup>) for YOS compared to ADS increased drastically when inclination increased.

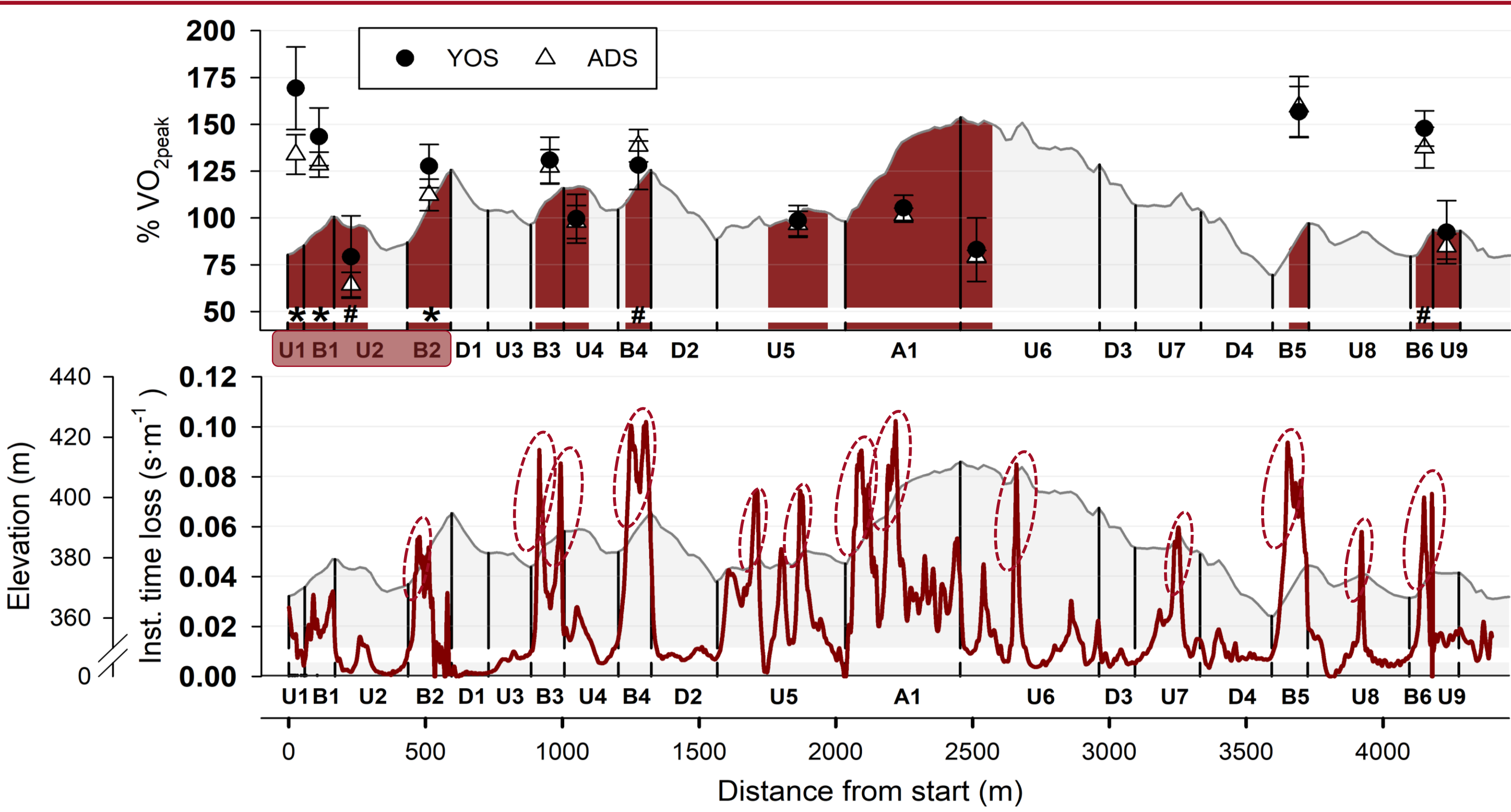


Fig. 1. Top: Exercise intensity expressed as relative  $VO_{2dem}$ . Bottom: Time loss (s·m<sup>-1</sup>) (red line) for YOS compared to ADS.

## Practical Applications

- **T**he higher effort for the young skiers in the initial phases of the TT may imply that younger skiers could benefit from adopting more conservative pacing to enhance their performance.
- **Y**ounger skiers might benefit from focusing on efficient transitions into the uphill to prevent time loss.
- **I**ncorporating training in the skill of pacing could be an important part of optimizing performance for young skiers.