Field-based analyses in cross-country skiing and biathlon

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“A field-based analysis of performance at Östersund’s ski stadium during sprint and distance cross-country skiing and biathlon competitions”

Rolf & Gunilla Enström’s foundation

Approx. 1 130 000 SEK / 105 000 EUR
Similar projects in the Nordic region

Technological advancements to improve tracking accuracy in the field using Global Navigation Satellite Systems (GNSS)
A field-based analysis of performance at Östersund’s ski stadium during sprint and distance cross-country skiing and biathlon competitions

A collaboration between:
- Mid Sweden University Sports Academy (ski section)
- Swedish Skiing and Biathlon Federations
- International Biathlon Union (+ other int. federations)

Three competitions (2018-19)
- Elite training race
- Scandinavian Cup
- Biathlon world Championships

Catapult system
GPS watches
“Performance and micro-pacing strategies in a classic cross-country skiing sprint race”

Background:

- Energy expenditure is higher in uphill sections compared to flat and downhill sections
- Lower exercise intensities during flat and downhill sections then enable recovery prior to subsequent uphill sections
- Uphill sections are the most important parts of the track in determining overall skiing performance (in cross-country)
- Yet to be addressed, however, is how pacing strategies are applied within specific track sections


“Performance and micro-pacing strategies in a classic cross-country skiing sprint race”

Aims: To analyze the differences in “micro-pacing strategies” between higher- and lower-performing cross-country skiers during competition; To examine how these micro-pacing strategies are related to section times and overall competition performances.

Method: 11 female cross-country skiers (age 23.9 ± 2.7 y; sprint FIS points 102 ± 24) Equipped with a GNSS and inertial sensor unit (OptimEye S5, Catapult Sports) Sprint qualification race (i.e., time trial) : 1380 m, height diff 29 m, total climb 52 m Mapping trajectory was measured prior to competition using a dGNSS device (according to Gløersen et al. 2018a,b) … to apply a coordinate mapping procedure to the competition GNSS data


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Preliminary group results:

• The first critical point was the skier’s ability to accelerate and acquire a high velocity shortly after the end of the first uphill
  • The skiers achieving the best results were able to accelerate faster out of the uphill and win time on the subsequent flatter section

• The second critical part was the first half of the last long uphill, where better performing skiers again won time against their competitors
  • The last uphill was followed by a long downhill section with plenty of time for recovery, so a high intensity from the beginning of the climb was optimal
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Preliminary individual results:

- Here we compared the individual pacing strategies of the two best skiers.
- The winner of the race was more than 3 s slower than the second-best skier in the first flat and uphill parts of the track.
- However, the winner was faster on the later track sections and got ahead of the second-best skier during the finishing straight.
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Summary:

• These data have not been fully analysed, so the findings are only preliminary

• There are likely to be differences between optimal micro-pacing strategies on a group level compared to those for specific individuals

• We are able to identify individual strengths/weaknesses and provide feedback relating to tactical pacing strategies

• However, individual micro-pacing strategies are complex and vary, due to variations in:
  • An individual’s physiology, biomechanics/anatomy, technique, etc.; daily form; track profiles; race tactics, etc.

• Advances in technology have enabled huge increases in the type and amount of data we can collect; the challenge for us lies in how best to use (analyse, present and apply) the available information
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Thank you!

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