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Contact point management of professional cyclists

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General considerations

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- Interfaces between human and machine
- Multiple hours of contact in a training ride / race
- Several components involved
  (saddle, shoes, bibshorts, insoles, cleats, …)
- Model choice and positioning
- Inter-individual anatomical differences

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General considerations

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Targets of an individual contact profile:

- Stability
- Comfort
- Power transmission

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Limits of fitting with professional riders

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- are used to a position for several years
- developed motion patterns to create power in that position
- short-term solutions = no change of ‚big rocks‘
- limited choice of components
- external restrictions: tight schedules, etc

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Pressure mapping technology

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system specifics

- Flexible sensor mats
- 1,6mm thickness
- 64 resistive sensors inside
- Measuring error ≤ 5%
- Different layouts, e.g. foot sizes, saddle, aero-pads
- Sampling rate 200 Hz
- Wireless data transfer (BT)
- Analysis software

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Case study 1
contact point saddle

150 W / 90 RPM
Allrounder / Climber

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Case study 1

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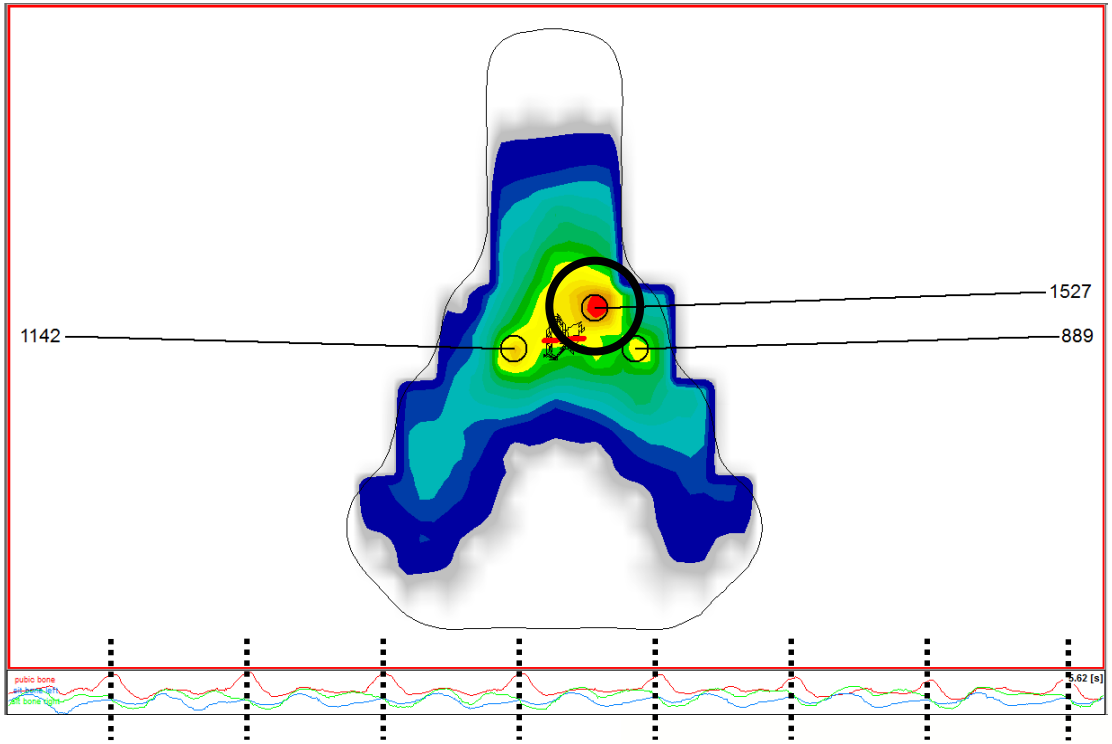
Initial measuring, hoods position, 10 sec



- max pressure 1527 mbar
- max pressure area: 8x8 mm
- longitud position of the spot: 130 mm behind the saddle tip (front-loading)
- COP to the right hand side

Discomfort: skin-abrasion, furuncle

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Case study 1

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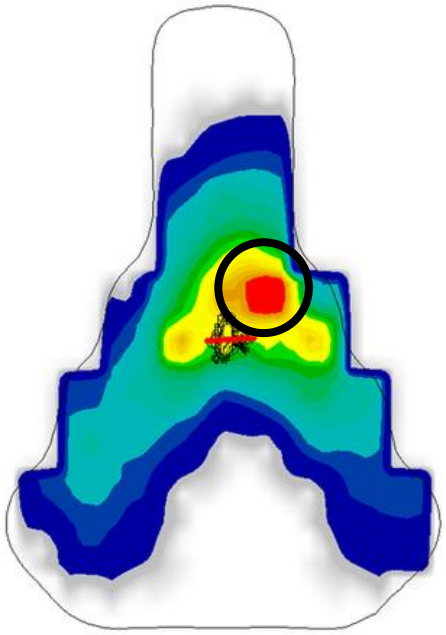
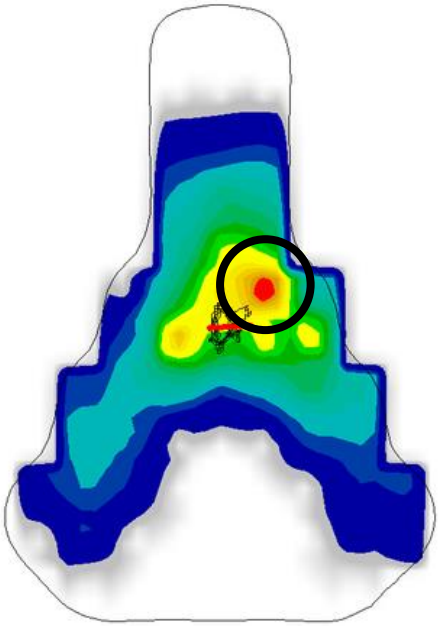
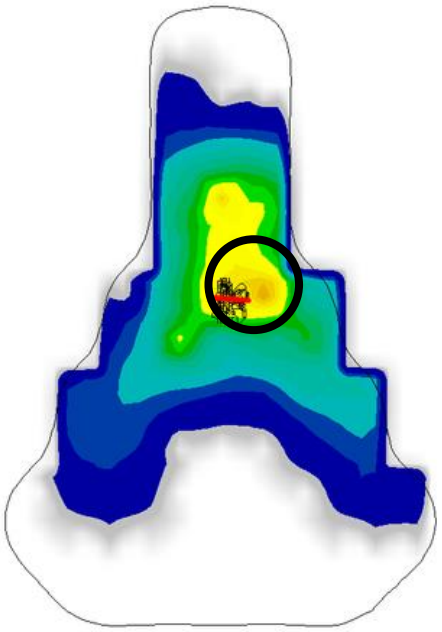


tops



hoods



drops

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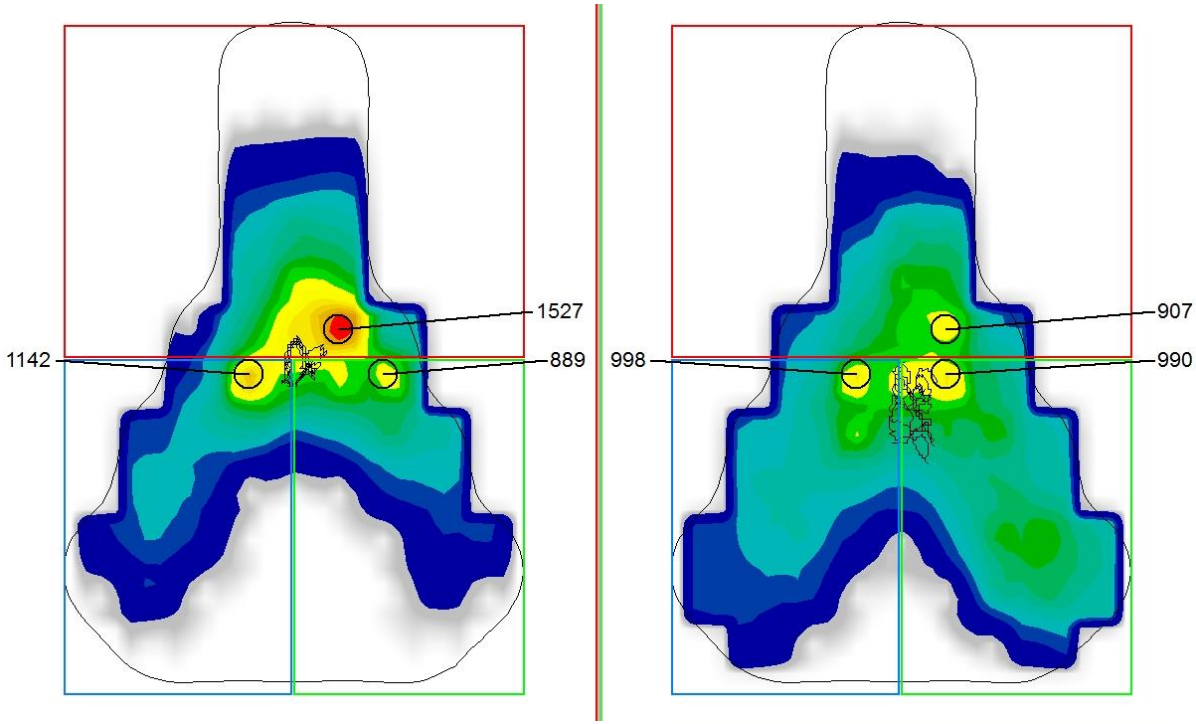
Case study 1 - results

hoods position 150 W, 90 RPM



Initial

Control

- 41% less maximum pressure
- 6% larger contact area
- loading more symmetrical
- Max pressure spot shifted 16mm rearwards
- 9 mm Shift of COP (rearwards)

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Case study 2
foot-pedal interface

200 W, 85 RPM
Lead-out racer

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Case study 2

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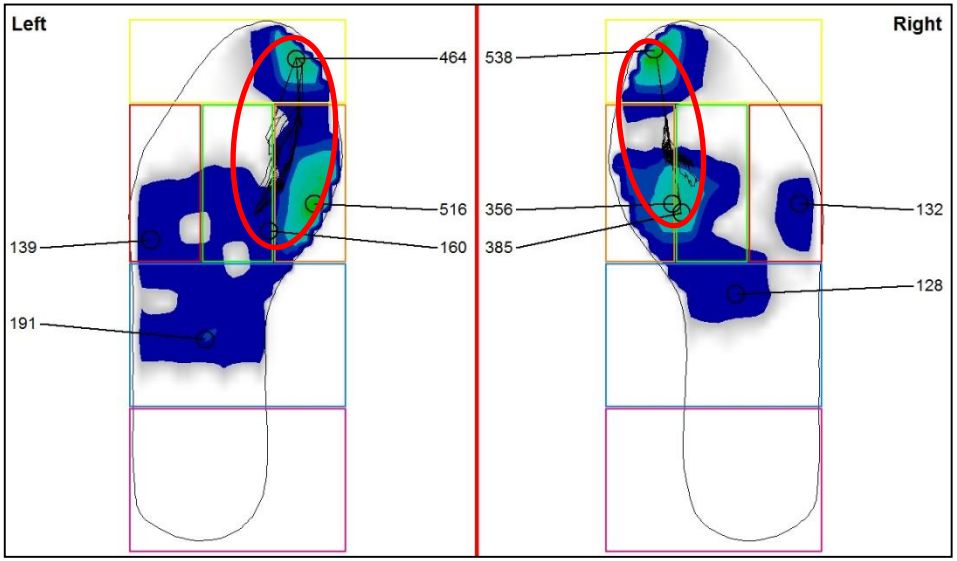
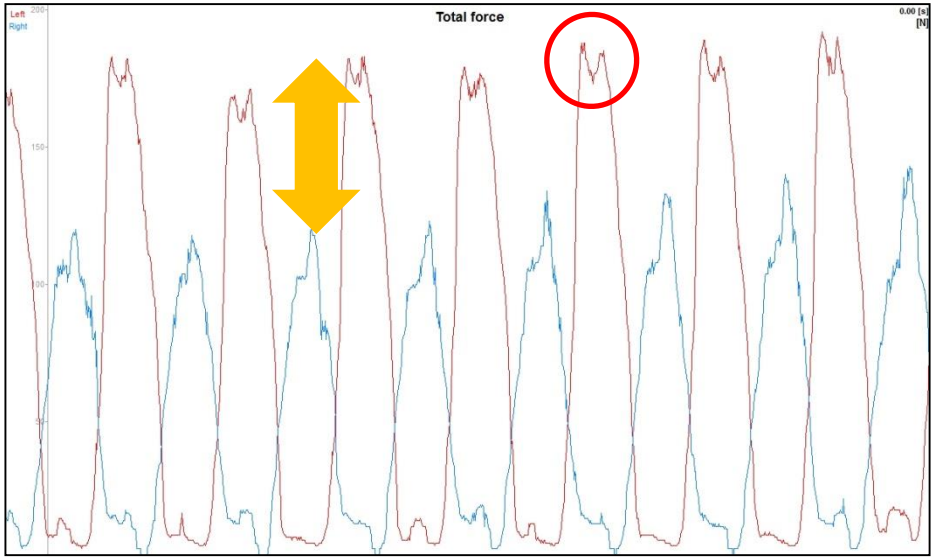
Initial measurement – hoods position 200 W, 85 RPM, 10 sec



foot pressure distribution



force-time-plots

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Case study 2 – pre analysis

- Left-Right asymmetry in pushing phase: L 59:41 R
- instable force peak in the pushing phase (both sides)

-> 50msec loss of power left side

- small contact area
- instable movement of the COP Ratio = left 15,1 right 12,7

Case study 2

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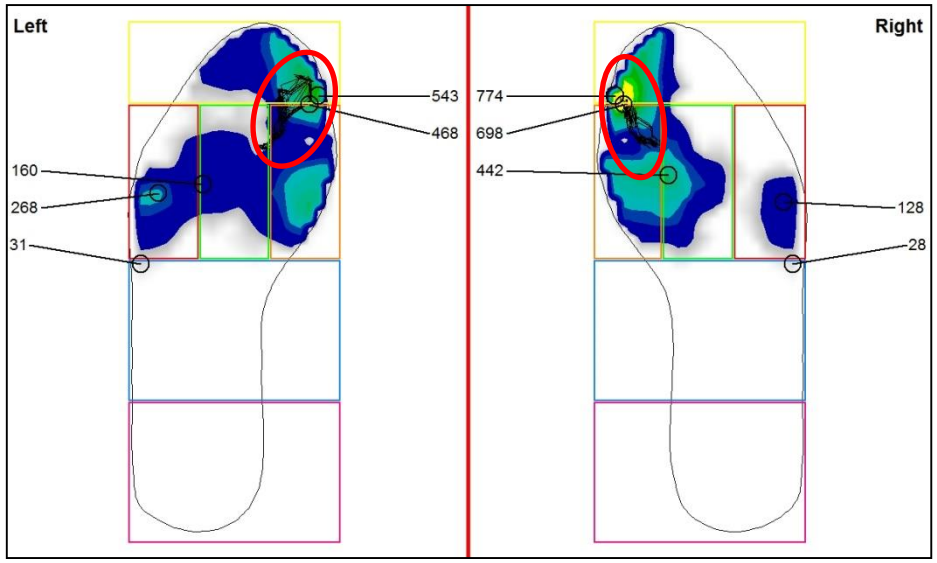
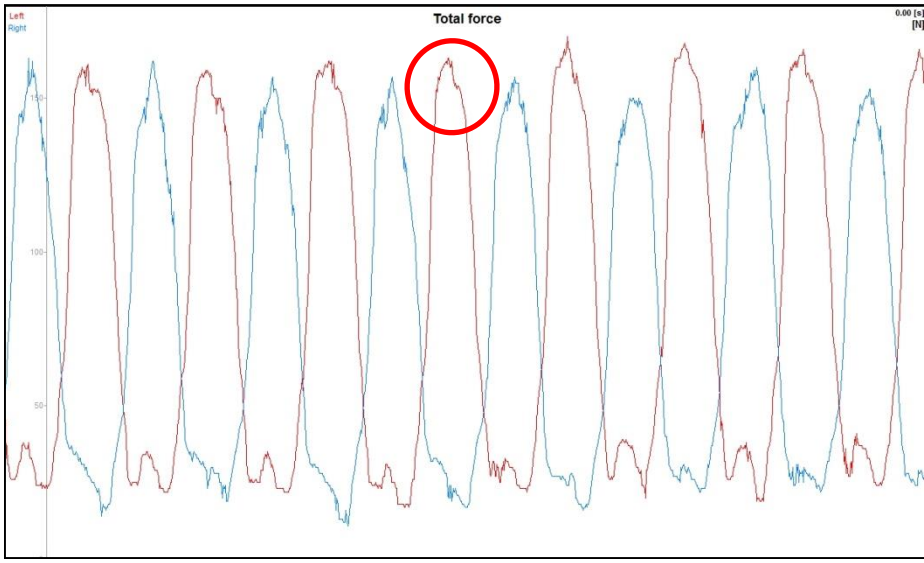
Control measurement – hoods position 200 W, 85 RPM, 10 sec



foot pressure distribution



force-time-plots

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Case study 2 – post analysis

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- Left-right differences reduced: L 51:49 R
- loss of power period reduced
- 22% larger contact area left side
- COP stabilized: Ratio = left 10,9 (38%) – right 6,0 (210% more stable)
- next step: custom insoles

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Take home messages

- contact point analysis useful to optimize the interfaces
- pressure mapping as an evidence based tool
- fine-tuning within the limits of products
- small tweaks = large effects
- individual solution necessary
- work in progress

Thanks to:

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TREK FACTORY RACING

KATЮША
RUSSIAN GLOBAL CYCLING PROJECT

movistar TEAM

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