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Evaluation of the parameter COP regarding saddle fore / aft position

testing group: 18 male cyclists
bikefit: traditional formula
defined handlebar position
5 diff (for/aft) saddle positions: +10, +5, -5, -10 mm

Kraus / Natrup / Schade 2014

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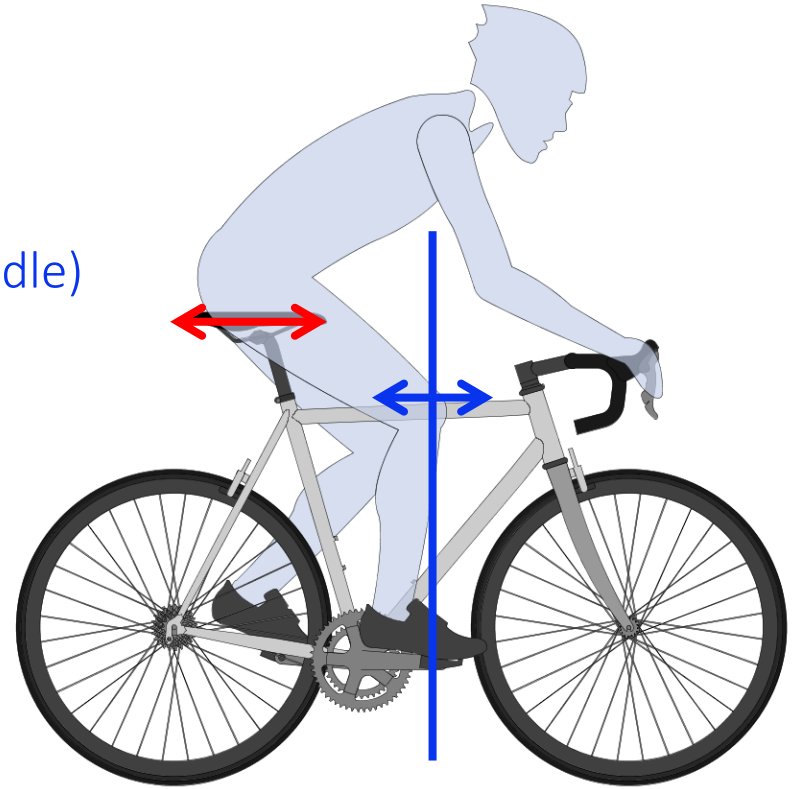
Preliminary considerations

By changing saddle fore / aft:

1. Movement of the knee (over pedal spindle)

OR

2. Movement of the COP on saddle



Traditional method (KOPS)

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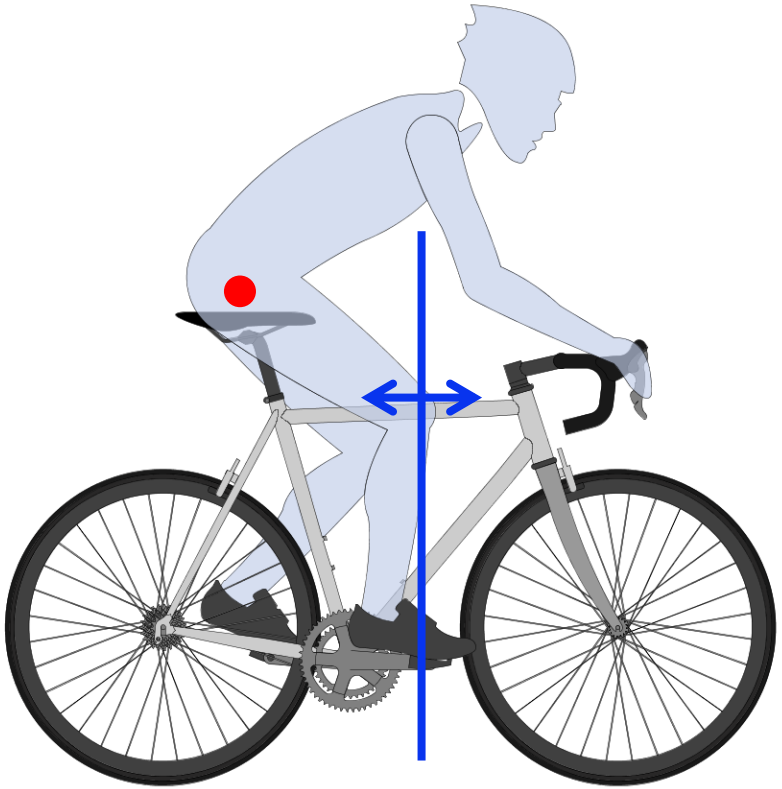
By changing saddle fore / aft:

Movement of the knee over pedal spindle



Limitations:

- Various „expert guidelines“*
- Lack of empiric data
- Limited accuracy of measuring tech
- Diverse knee joint structure / size
- 90° not the pos of max pushing

* LeMond 1990, Burke 1994, Pruitt&Burke 2003, Gressmann 2003, Pruitt 2006

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Position of Center of Pressure (COP)

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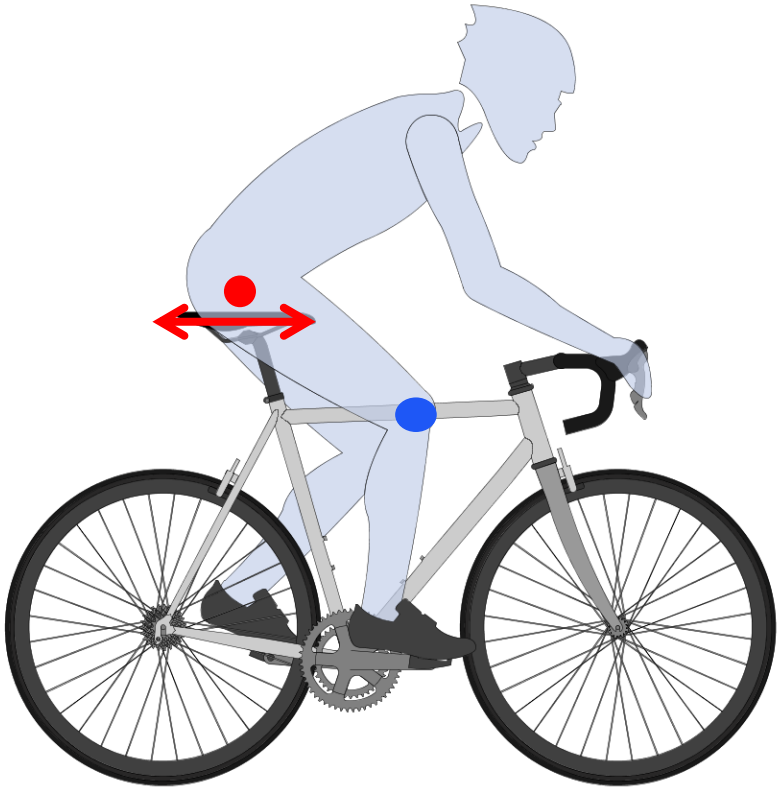
By changing saddle fore / aft:

Movement of the COP on saddle

= change of the saddle position in relation to the anatomical structures of the pelvis

= influence on pressure data?*



*comfort / discomfort

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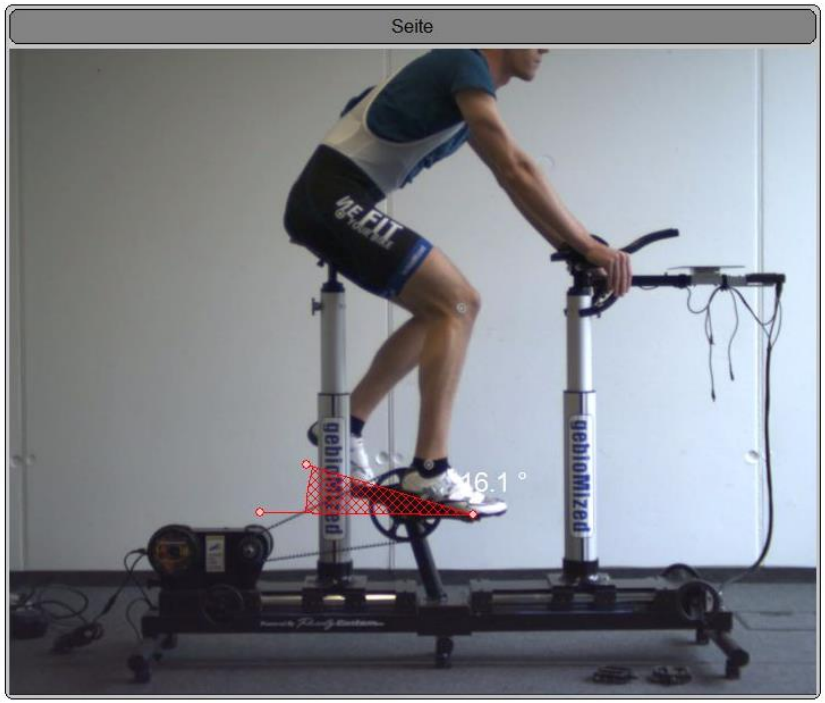
material & method: test setup



- size cycle / wattage based trainer / 2D Video (60 Hz)
- Standardized positioning: traditional formula (static calculation, joint angle, kops)
- Standardized protocol in resistance and cadence

material & method: saddle model

gebioMized Cobra: neutral construction, Tit clampening, leather top, 195g

material & method: saddle pressure mapping

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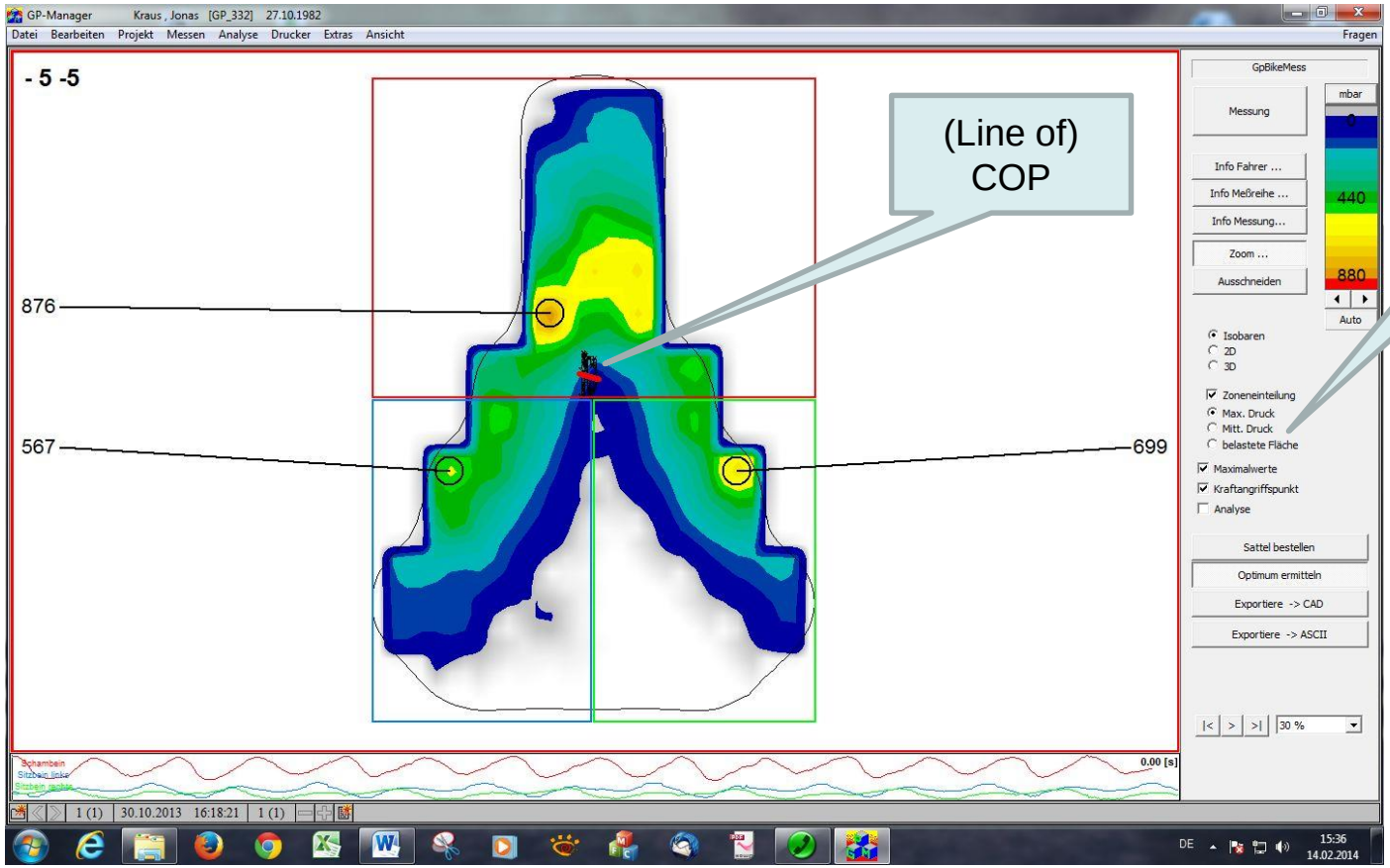

GP Manager, modul GP bike, sampling rate 200 Hz

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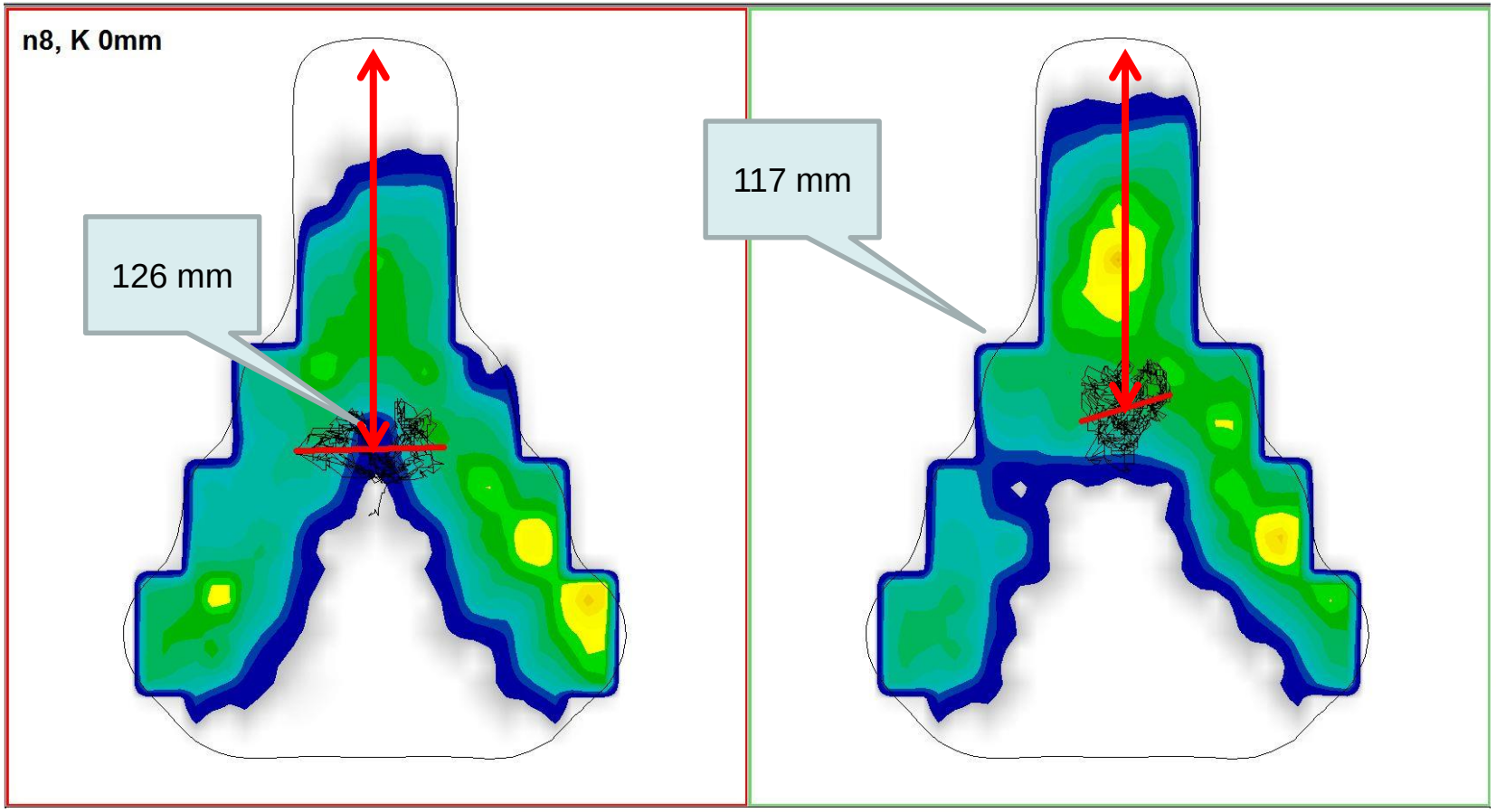
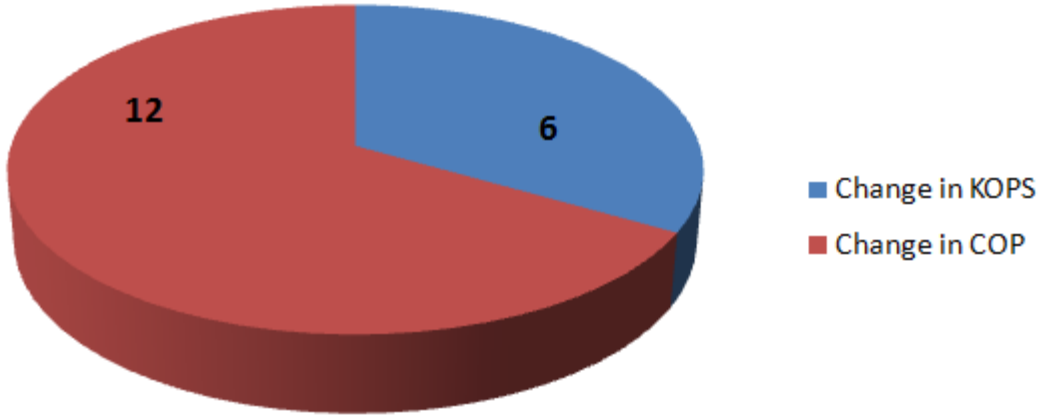
COP



n8 with 0mm for /aft pos

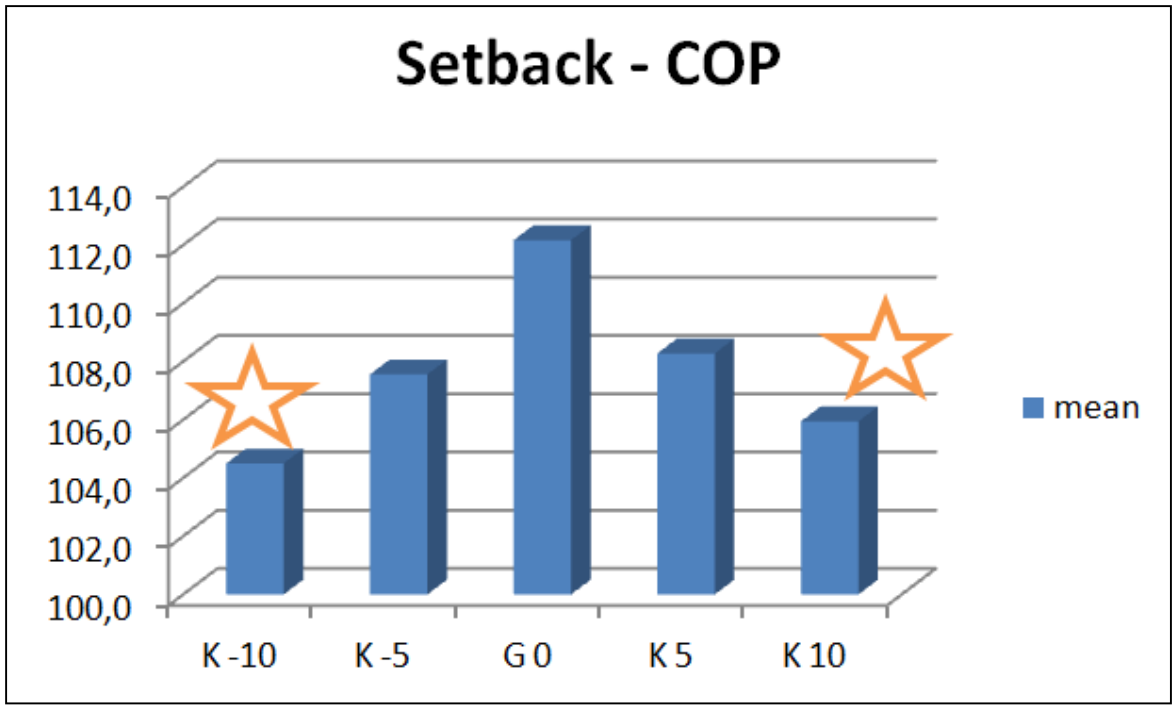
n8 with -10mm for /aft pos

results



67% change loading position on the saddle (group a)
33% change position of the knee (group b)

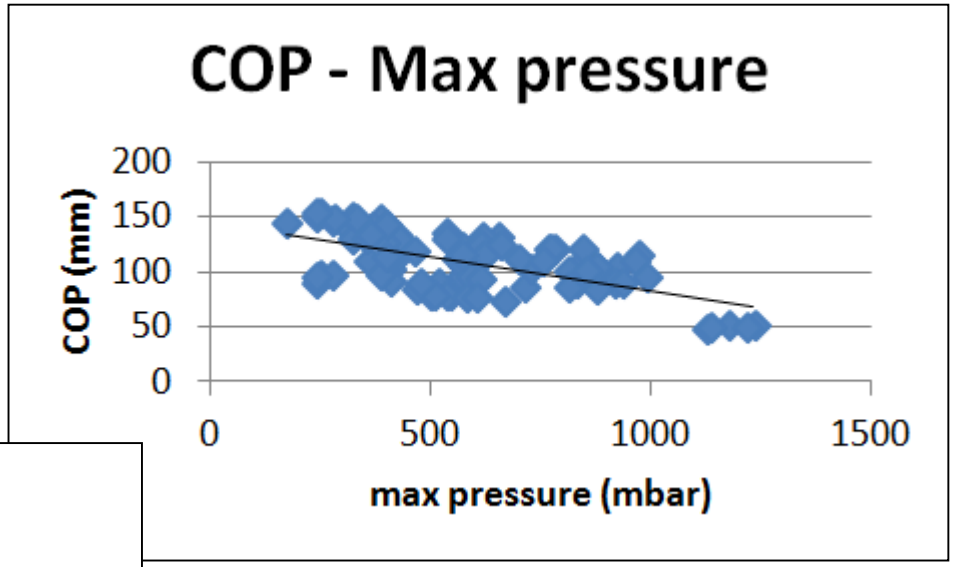
results



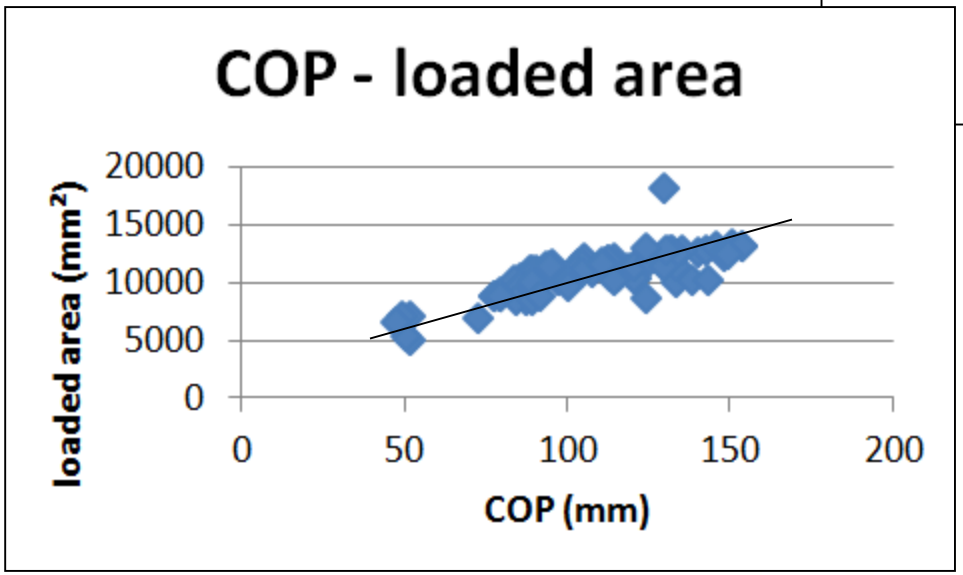
+10 mm highly significant (p = 0,01)

- 10 mm significant (p = 0,04)

results



Moderate negative correlation $r^2 = 0,6$



Moderate positive correlation $r^2 = 0,78$ / group a: strong correlation $r^2 = 0,9$

results

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Summary

- individual positioning on the saddle in a range of > 100 mm
- 66% of subjects change COP by changing saddle fore / aft
- 5 mm changes bring minor effects, 10 mm difference results in significant effects on COP
- COP related to pressure data on saddle :
    1. pos backwards create larger loaded area
    2. pos backwards reduce max pressure values

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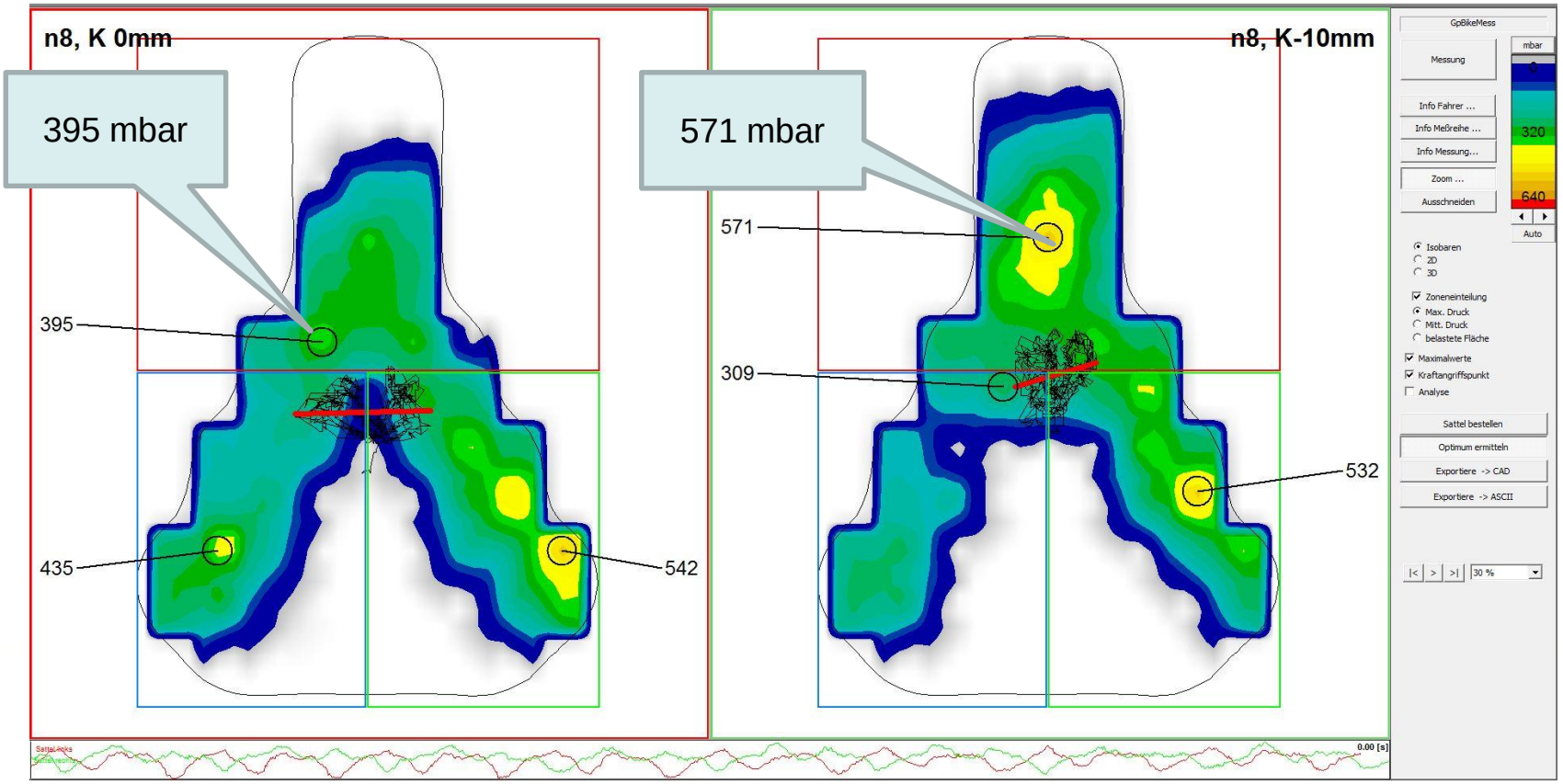
discussion



Saddle 10mm backwards: **30 % increased maximum pressure**

discussion

- Rider does position themselves highly individual on the saddle
- Rider does react on a change of the saddle set back highly individual
- ..but mainly they do
- A change of the position of the COP is associated with pressure data
- Saddle fore / aft seem has an influence on comfort / discomfort on the contact point

conclusion

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Change of saddle for / aft

… may change the position of the knee or

… (more likely) change the position of the saddle in relation to the anatomical structures of the pelvis

A changed position of the saddle

… influences the comfort related pressure parameter (MaxP, loaded area)

The position of COP on the saddle

… correlates to comfort on the saddle

… is a worthful scientific parameter for finding the right saddle setback

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limitations

- Every detail of a bike set up has an influence on the position of the rider on the saddle
- Findings doesn´t allow any short cuts yet (every fit has to be individual)
- First empiric evaluation on COP on the saddle, further research (discipline related, bigger sample) recommendet

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„A change of some millimeter saddle setback doesn´t influence any joint angle, but can mean the world for pressure on the saddle.“

Thank you!

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