Impact of cycling insoles on body statics and performance

Science & Cycling

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Oliver Elsenbach

Certified Sport Scientist (Diploma)

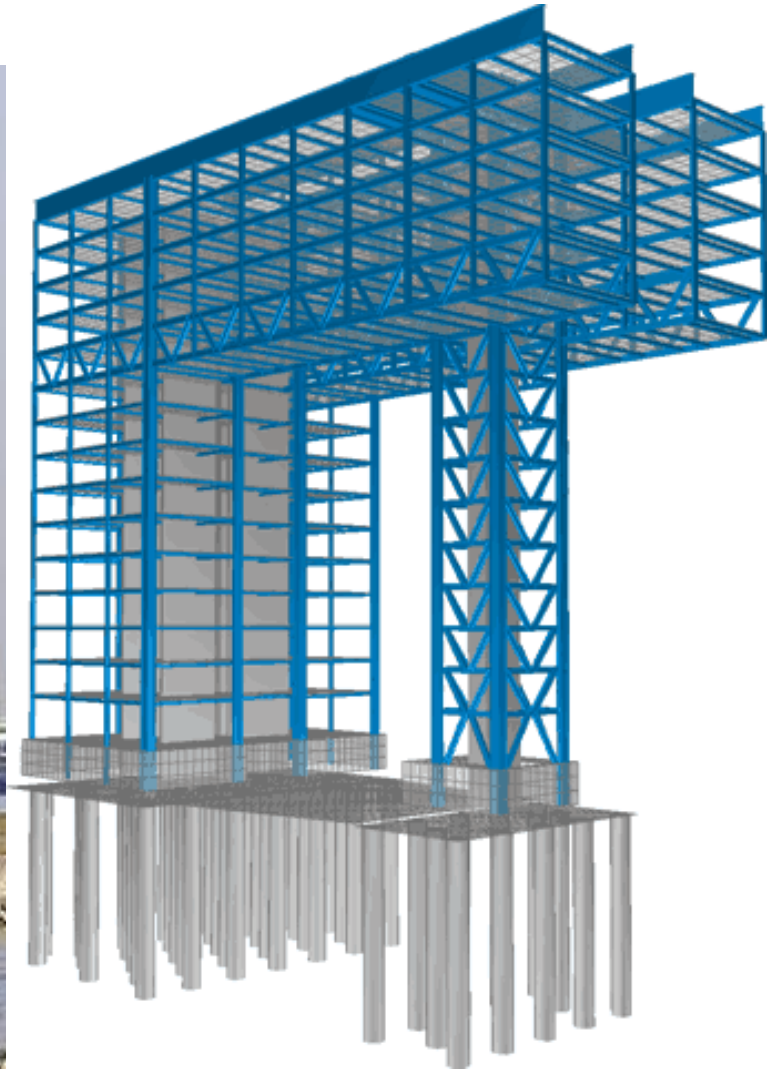
Since 1998 sports diagnostics and training

2003 Orthotics for cyclists

2008 Founding of KOM*__SPORT__ sports diagnostics

2010 Founding of SOLESTAR cycling insoles

Fundament



Fundament Cycling

Closed system

100% foot contact

Whole body

Static / Dynamic

4 - 20 cm^2 pedalplatform

Foot : instable structure

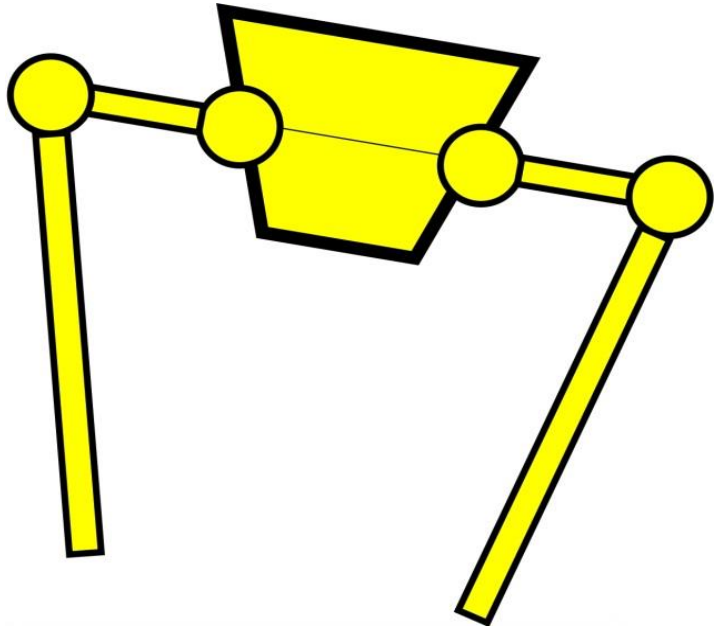
=> 33 joints / 26 bones

Long time endurance sport

=> Muscle fatigue

The foot is designed for standing, walking and running

- Evolution -

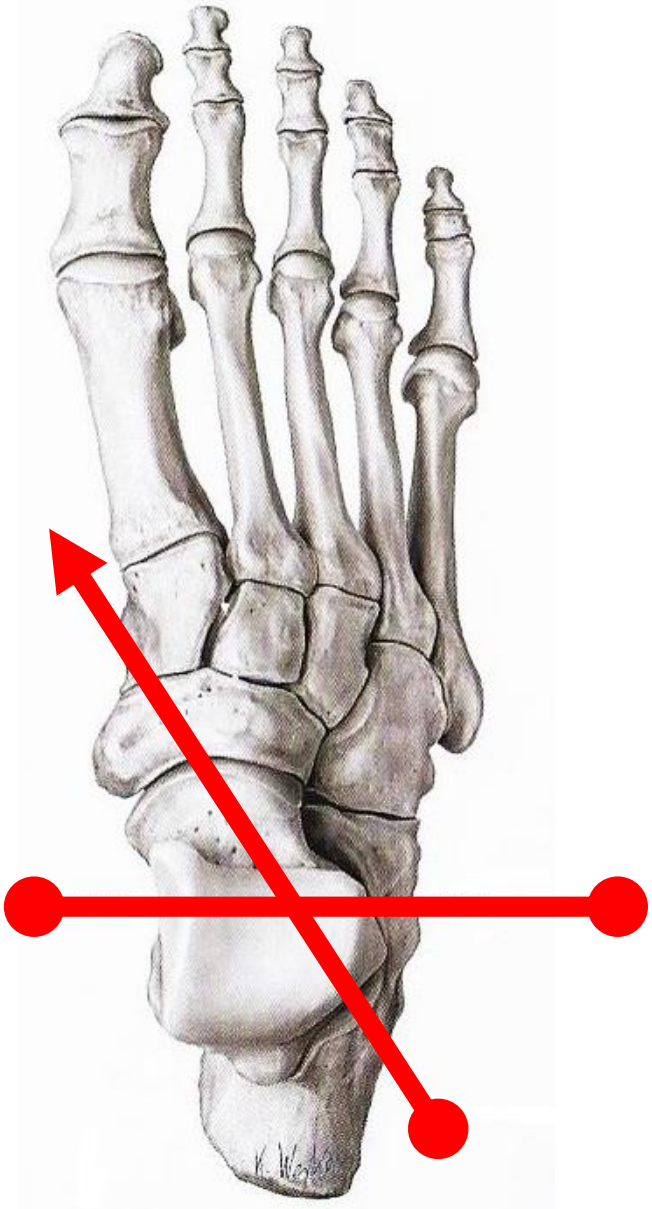


- Asymmetries -

Differences of the length of legs (<20mm) are within the norm

(Knutson,2005)

The Foot



33 joints

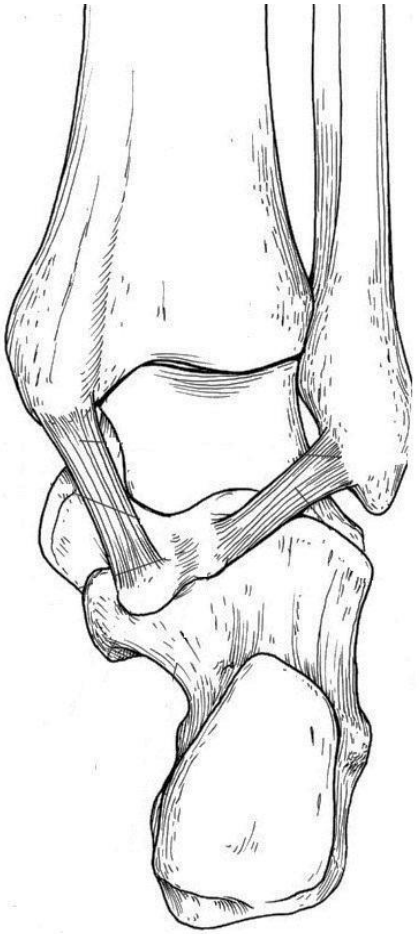
Ankle joint

Malleolus

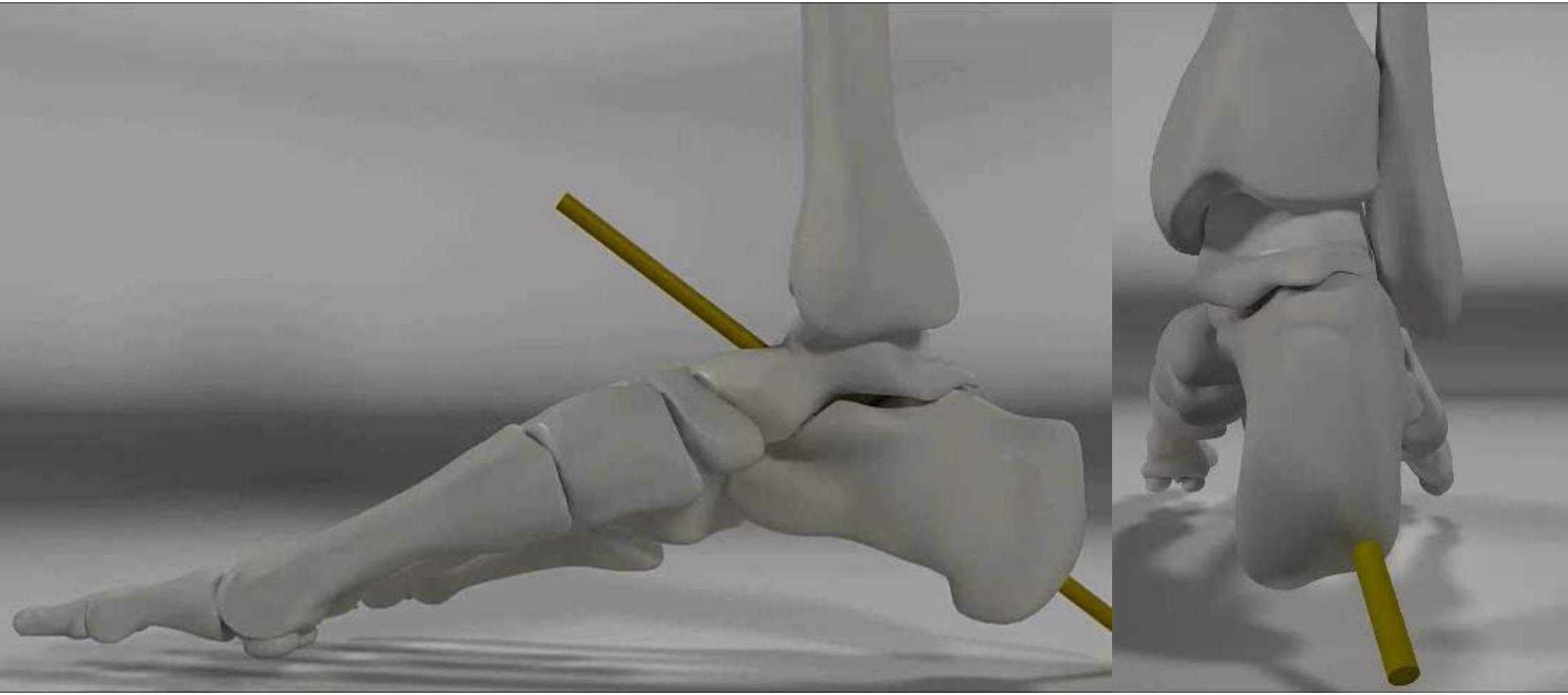
Subtalar joint

“2” axes

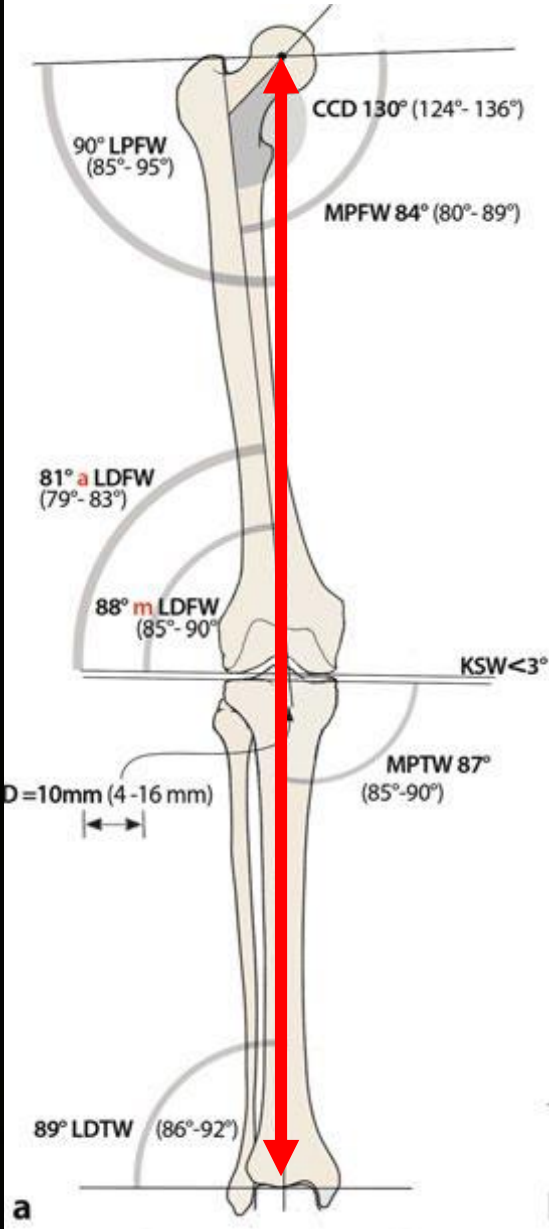
Center of rotation ?



Pronation

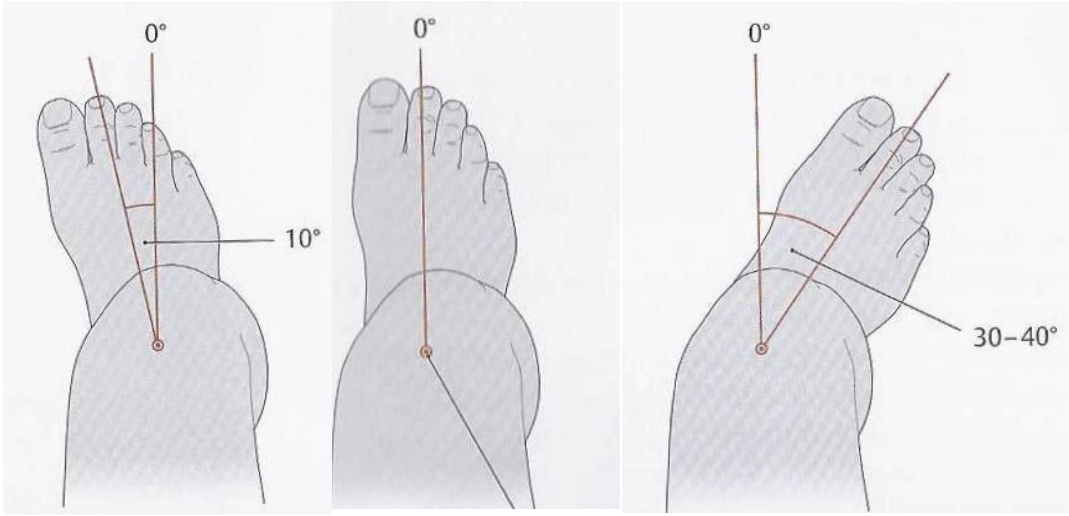


Leg



Mikulicz-Line (knee 3° varus)

lateral open angle (174° average)

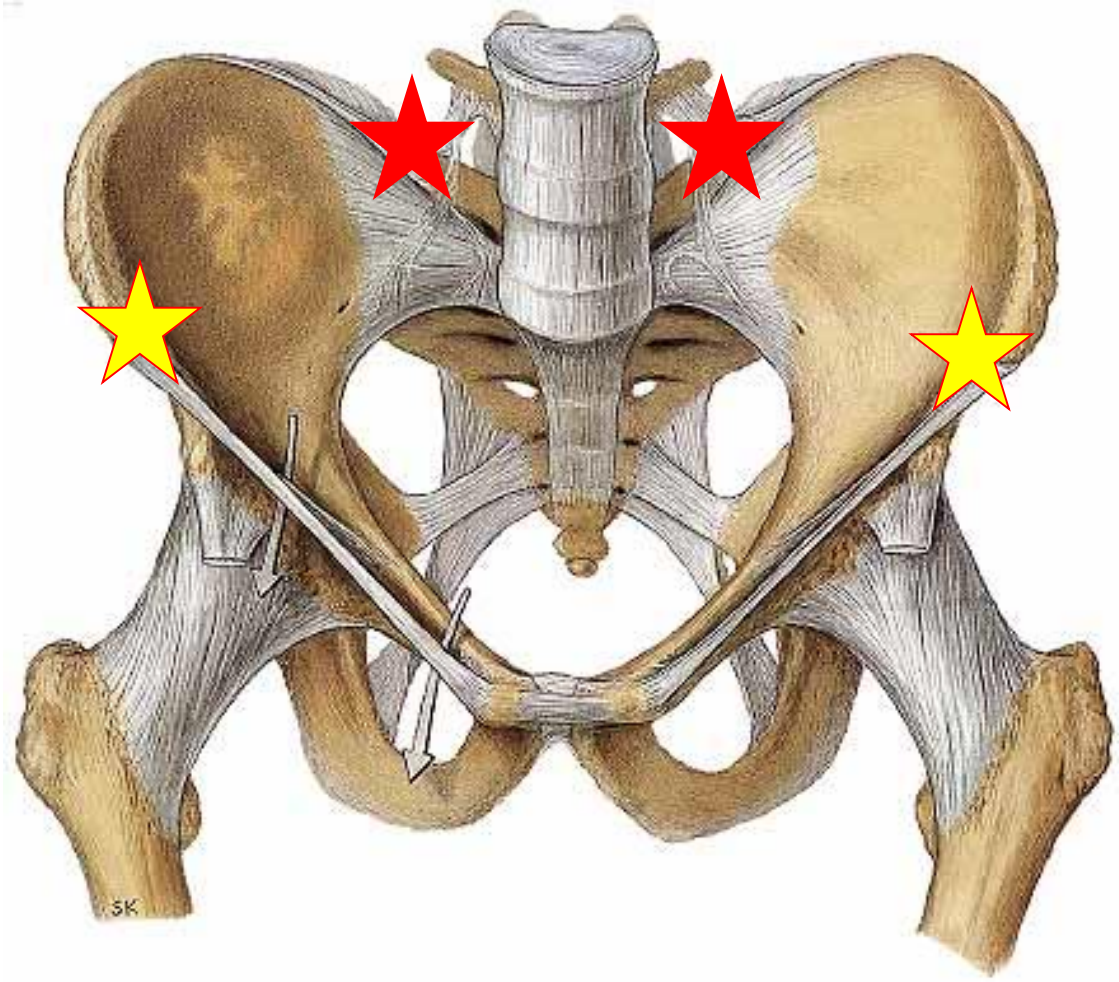


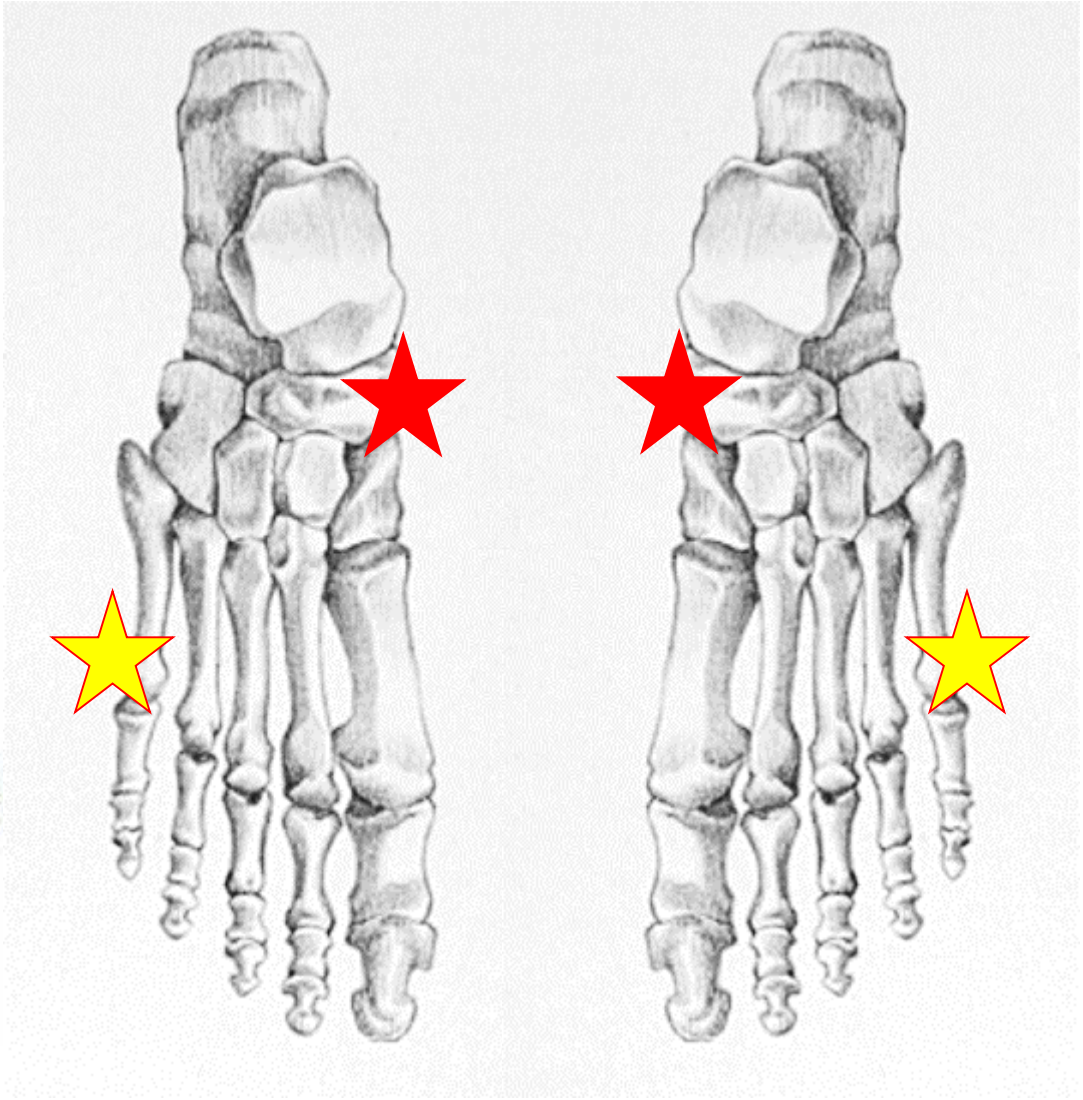
In cycling:

up to 15° knee rotation

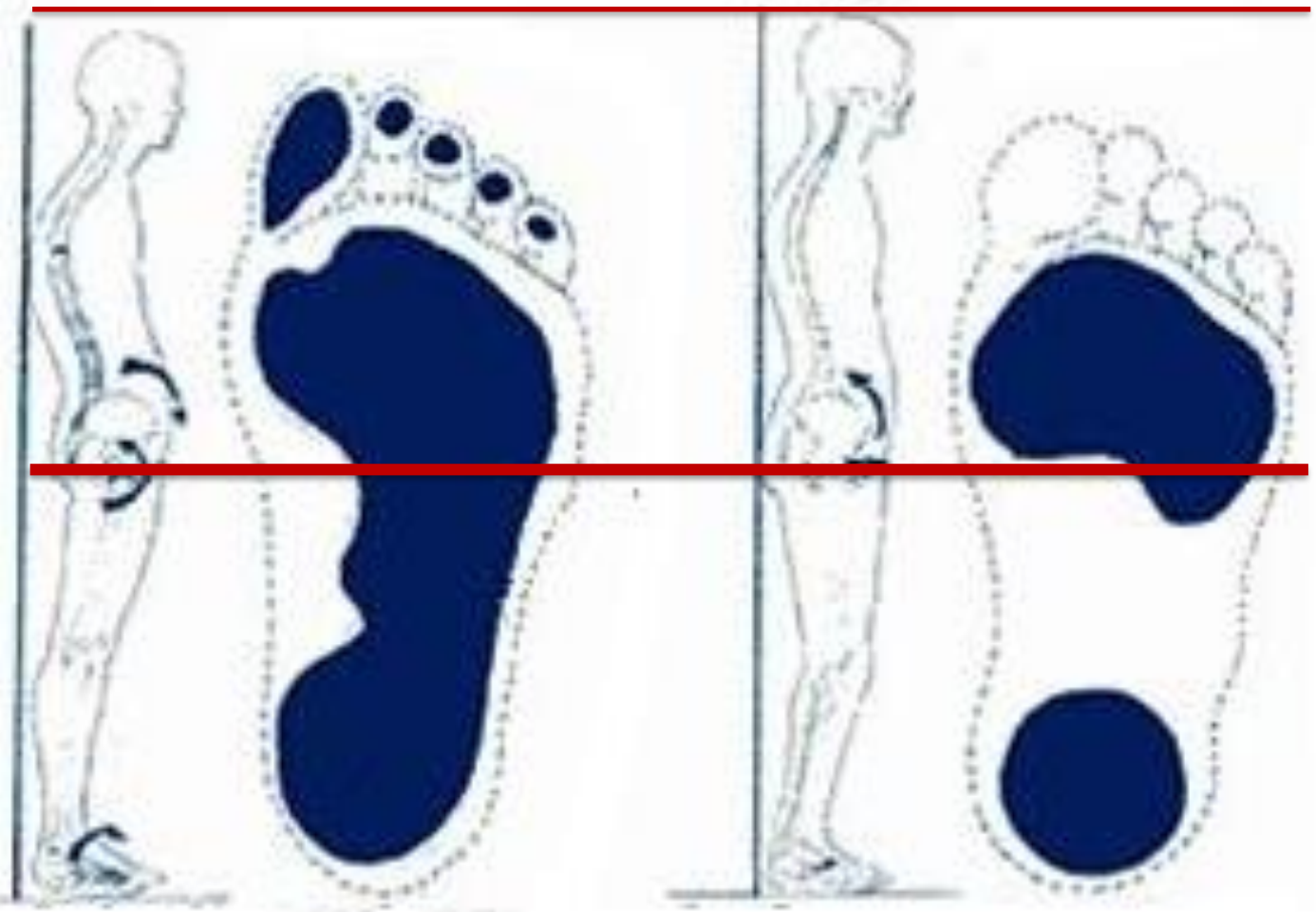
40 ° knee extension – flexion

Connection





Feet - Pelvis



Flatfoot Highfoot

Pelvis rotation

Flatfoot -> anterior

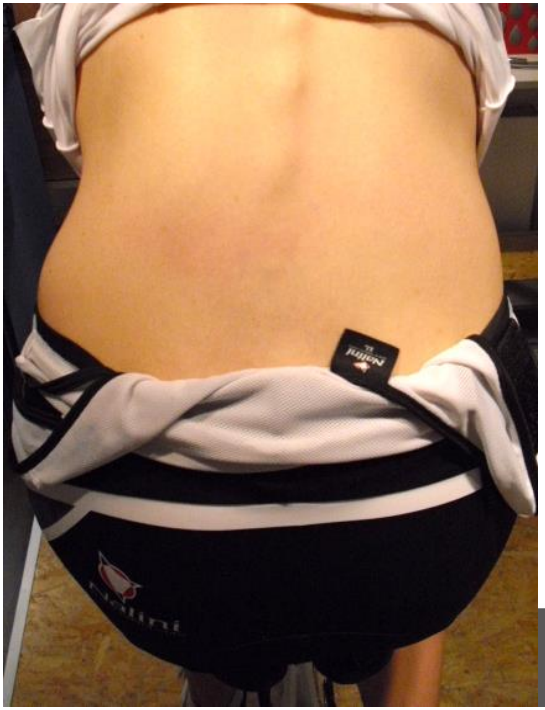
Highfoot -> posterior

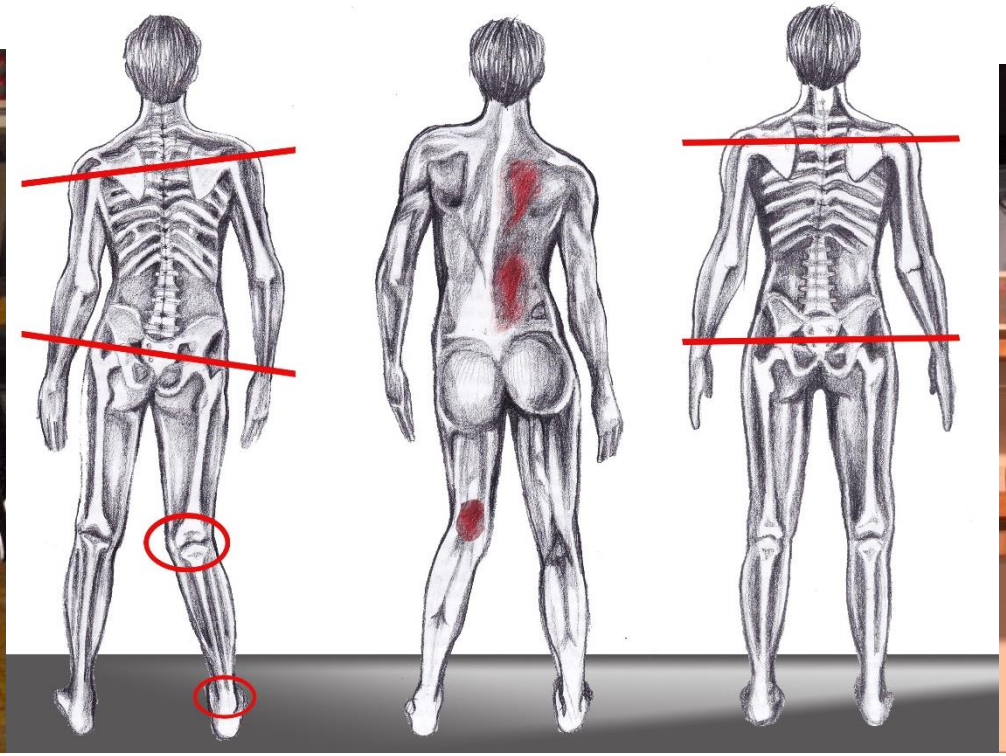
Body height

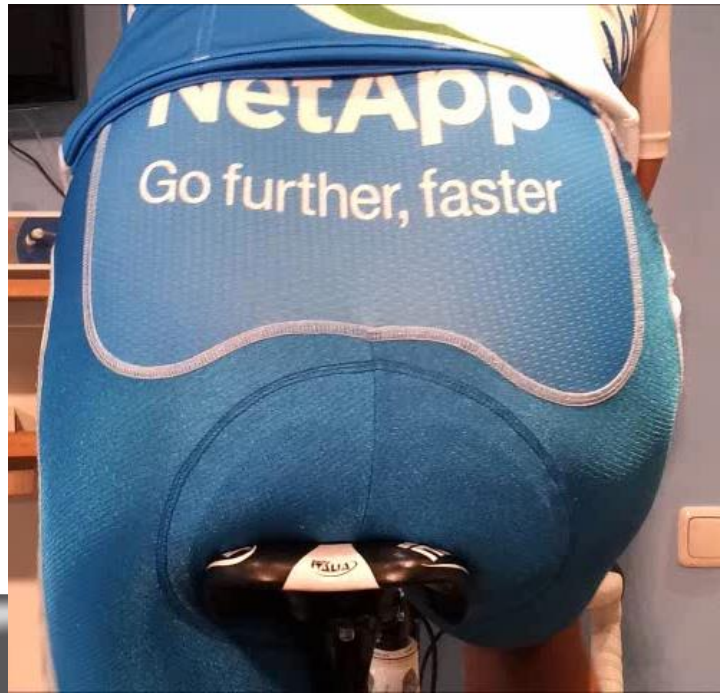
Leg length

Range: up to 30mm

Dysbalance

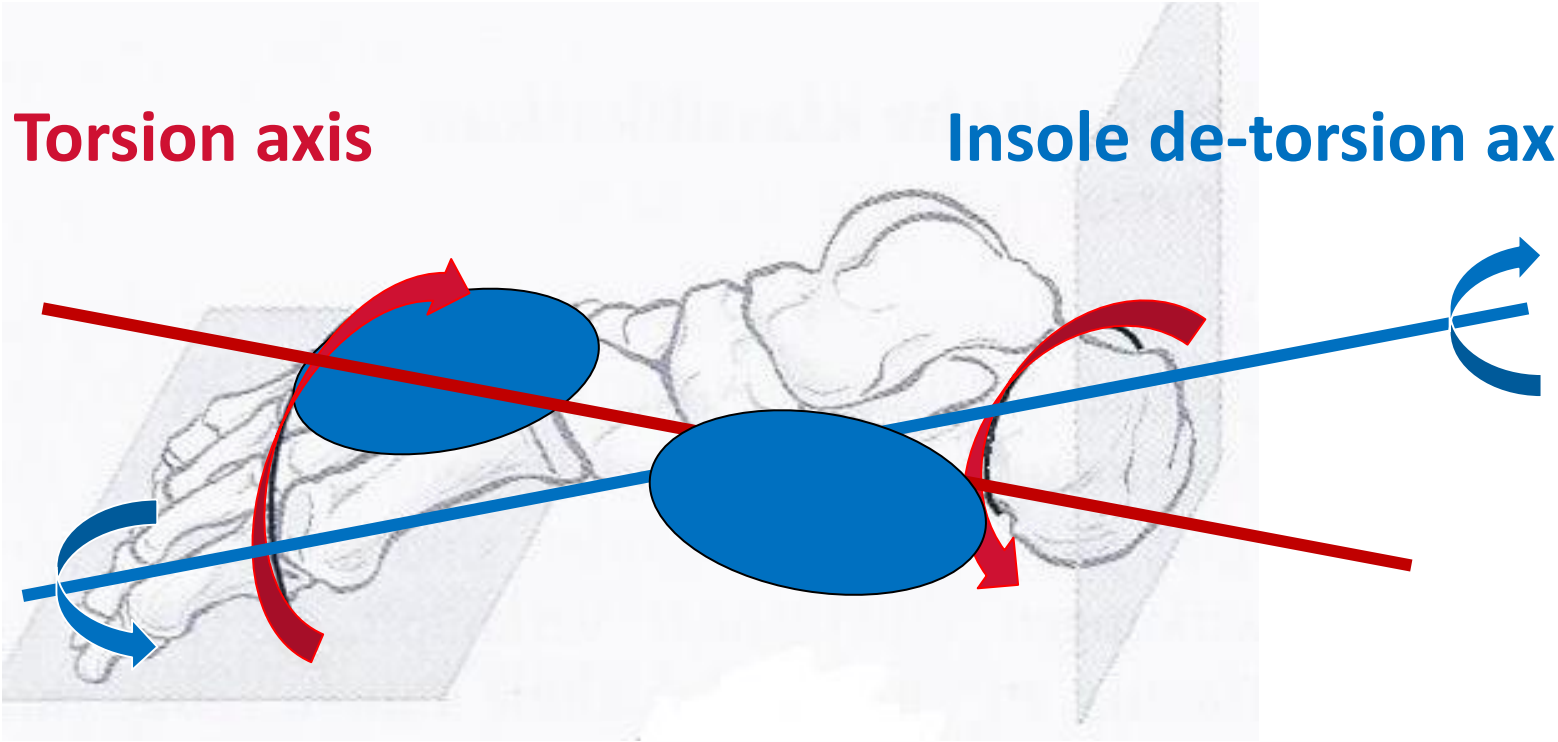






Bottom up System

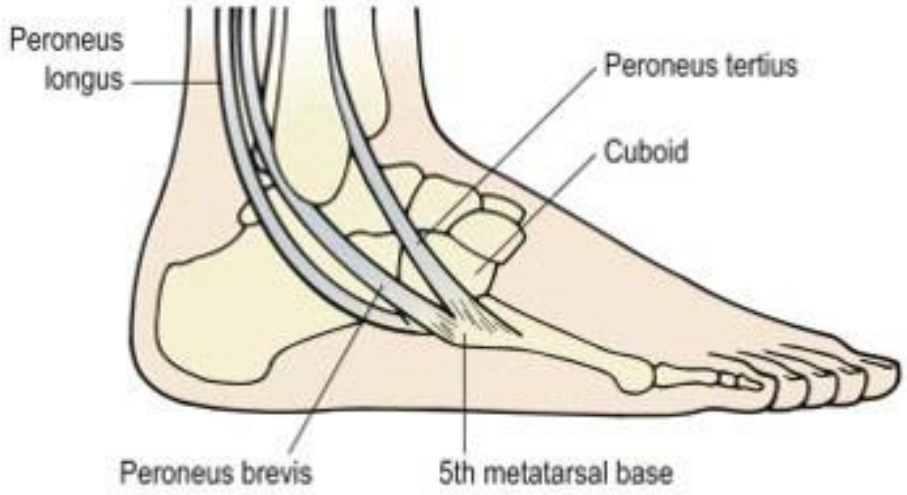
Foot Torsion

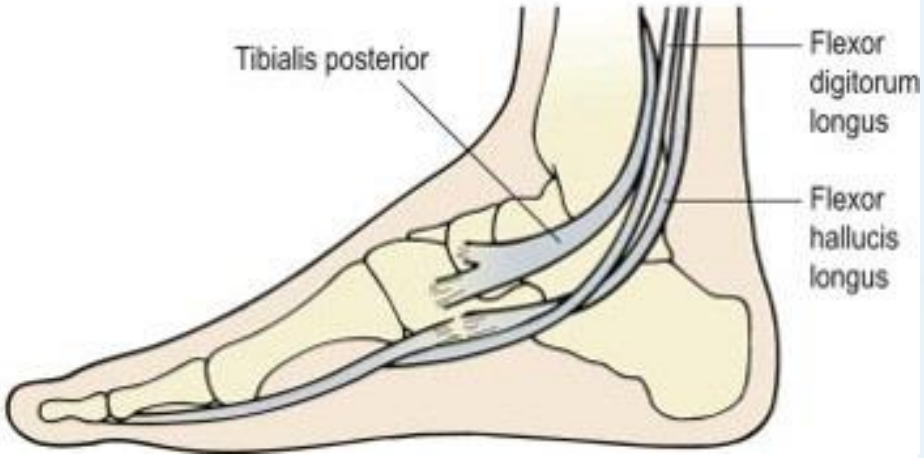


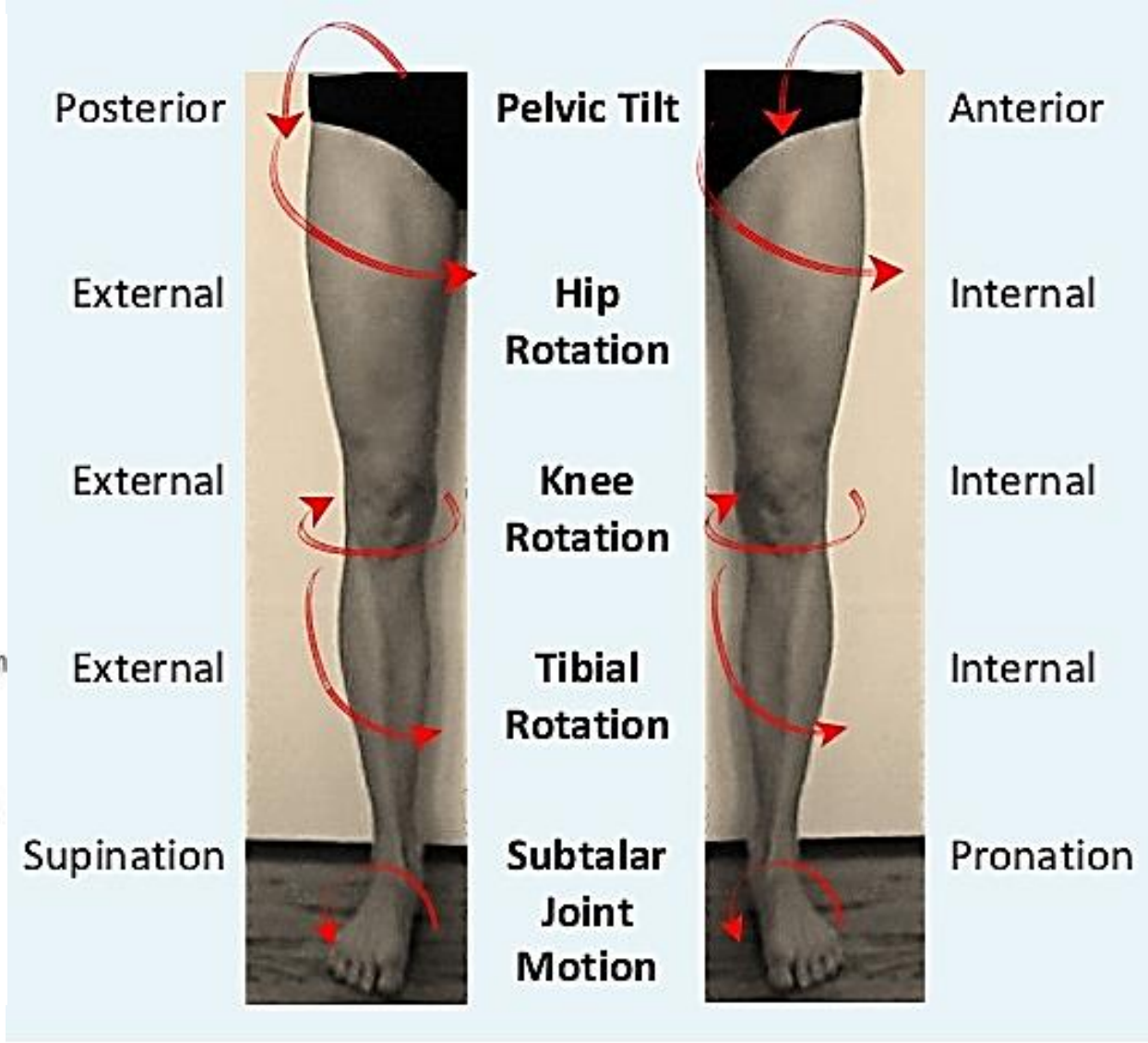
Forefootsupination **Rearfootpronation**

Pronation support **Supination support**

Chain Reaction



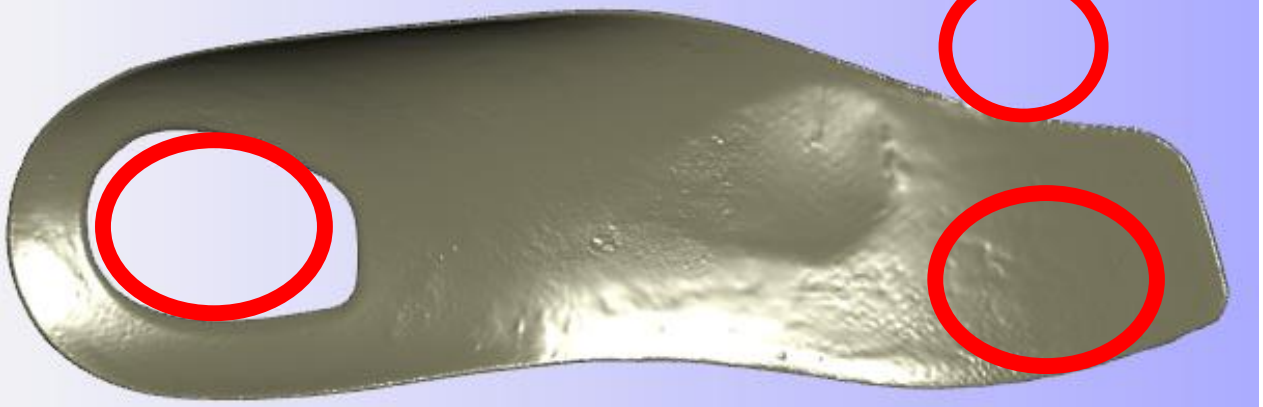




Solestar Element `s

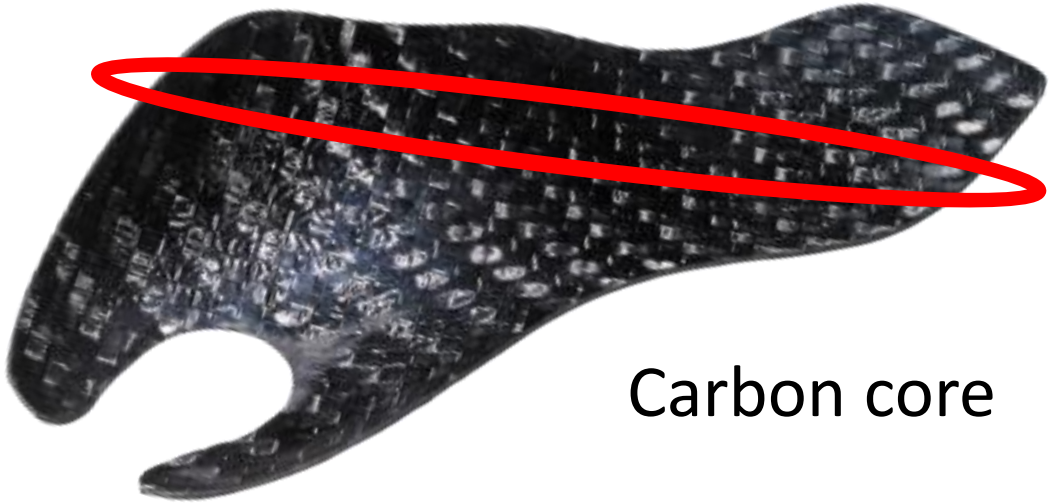
Support subtalar joint

Recess for the 1st met



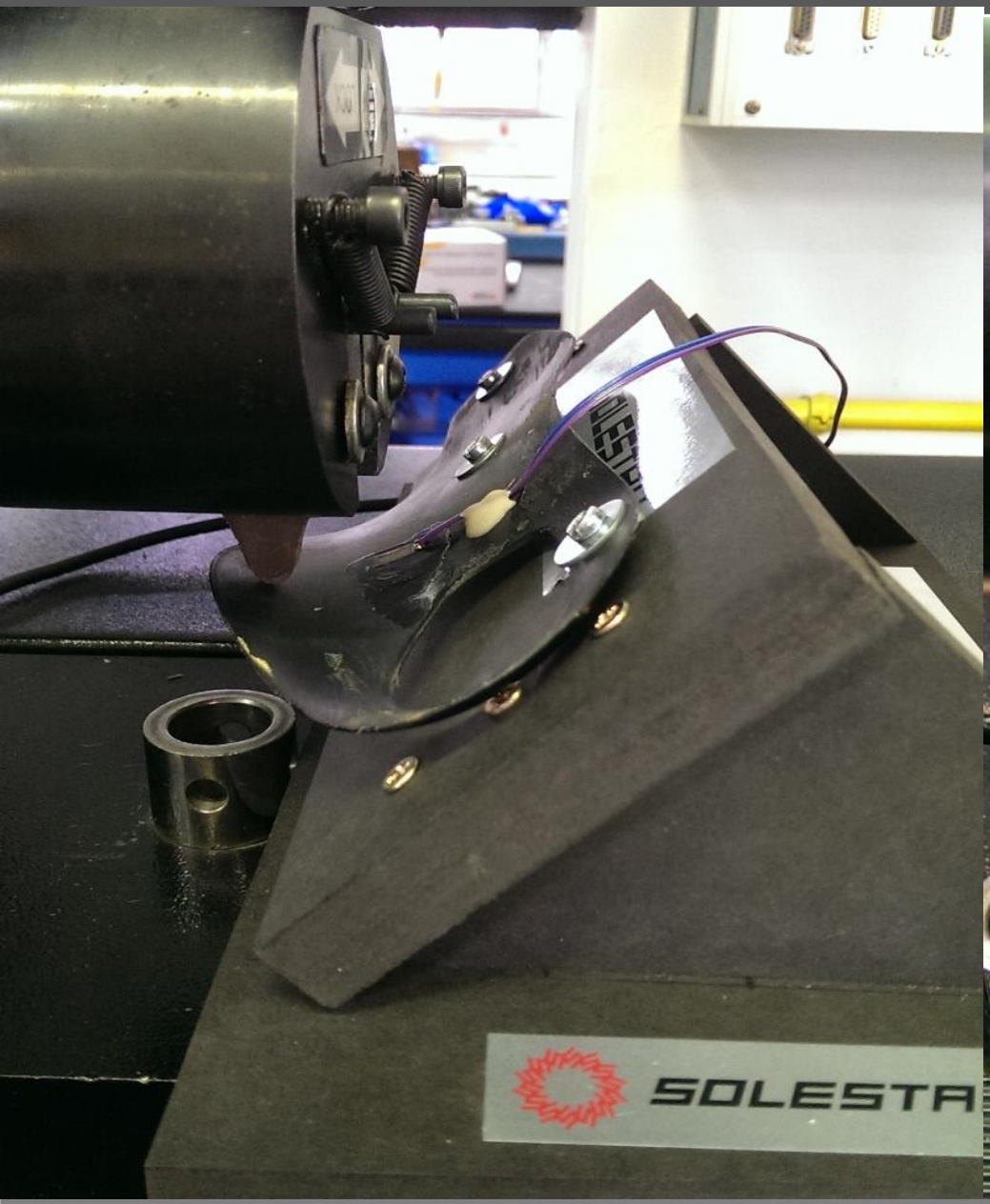
Heel clasp

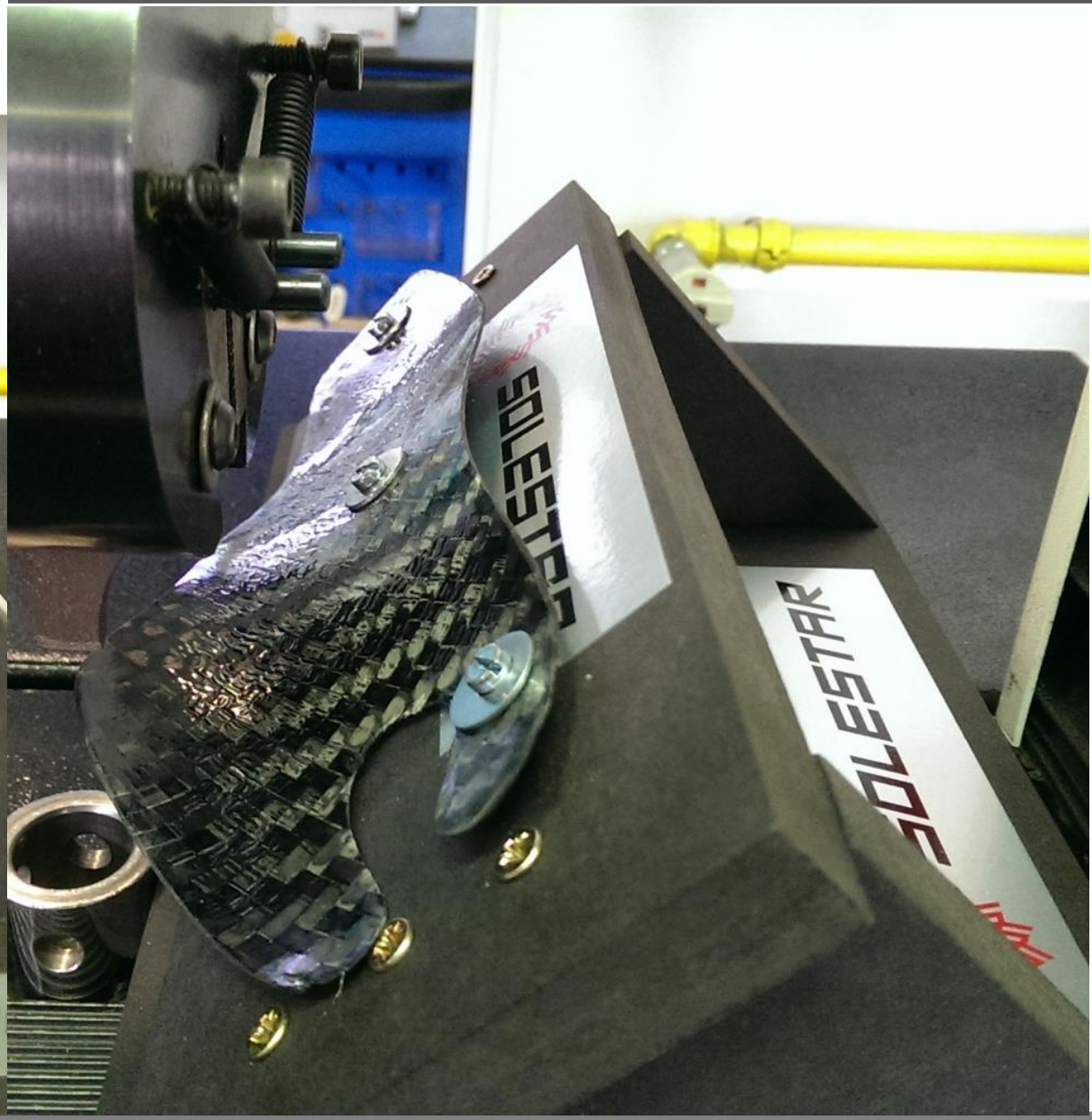
Lateral raise



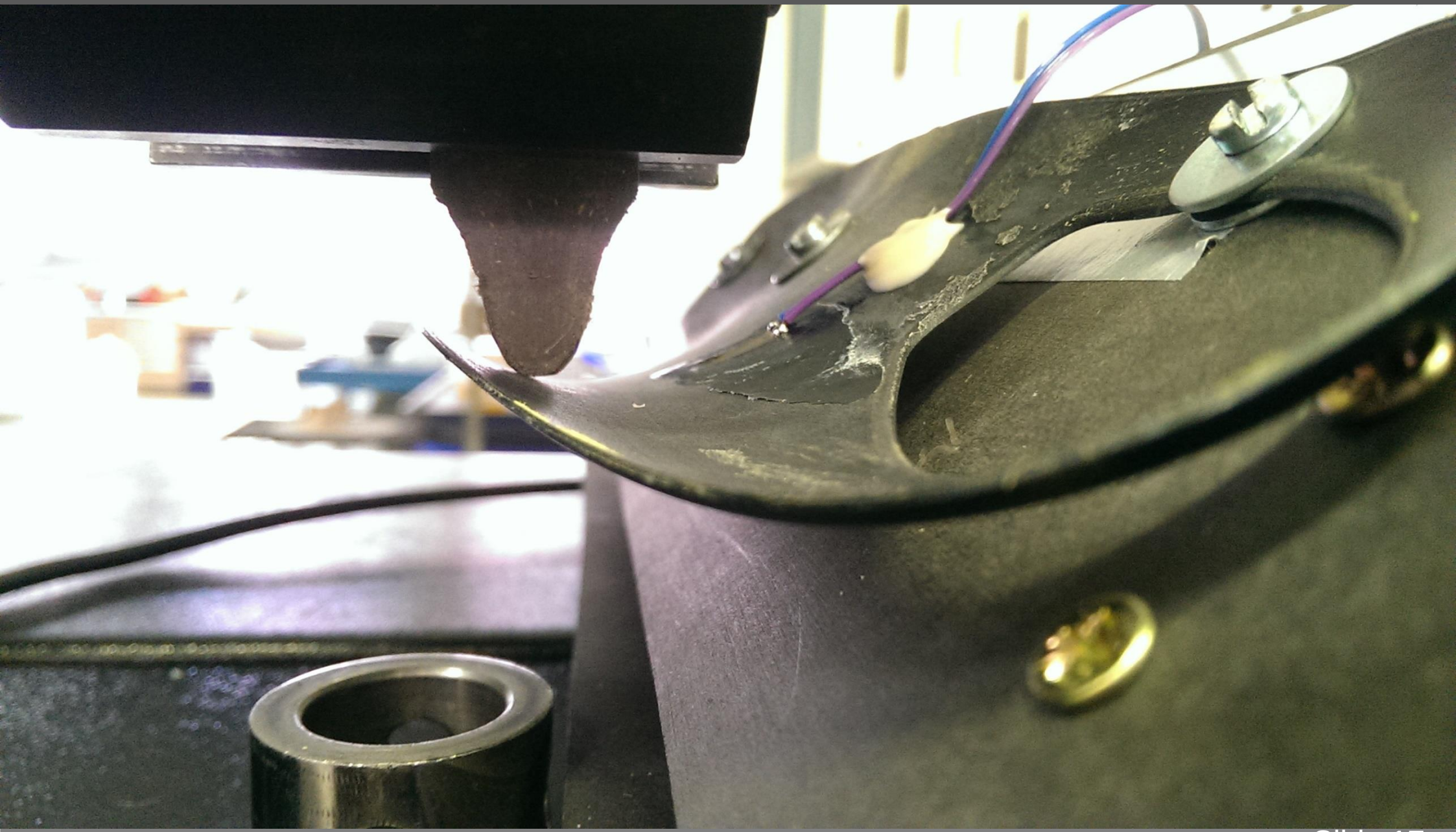
Carbon core

Core Stiffness

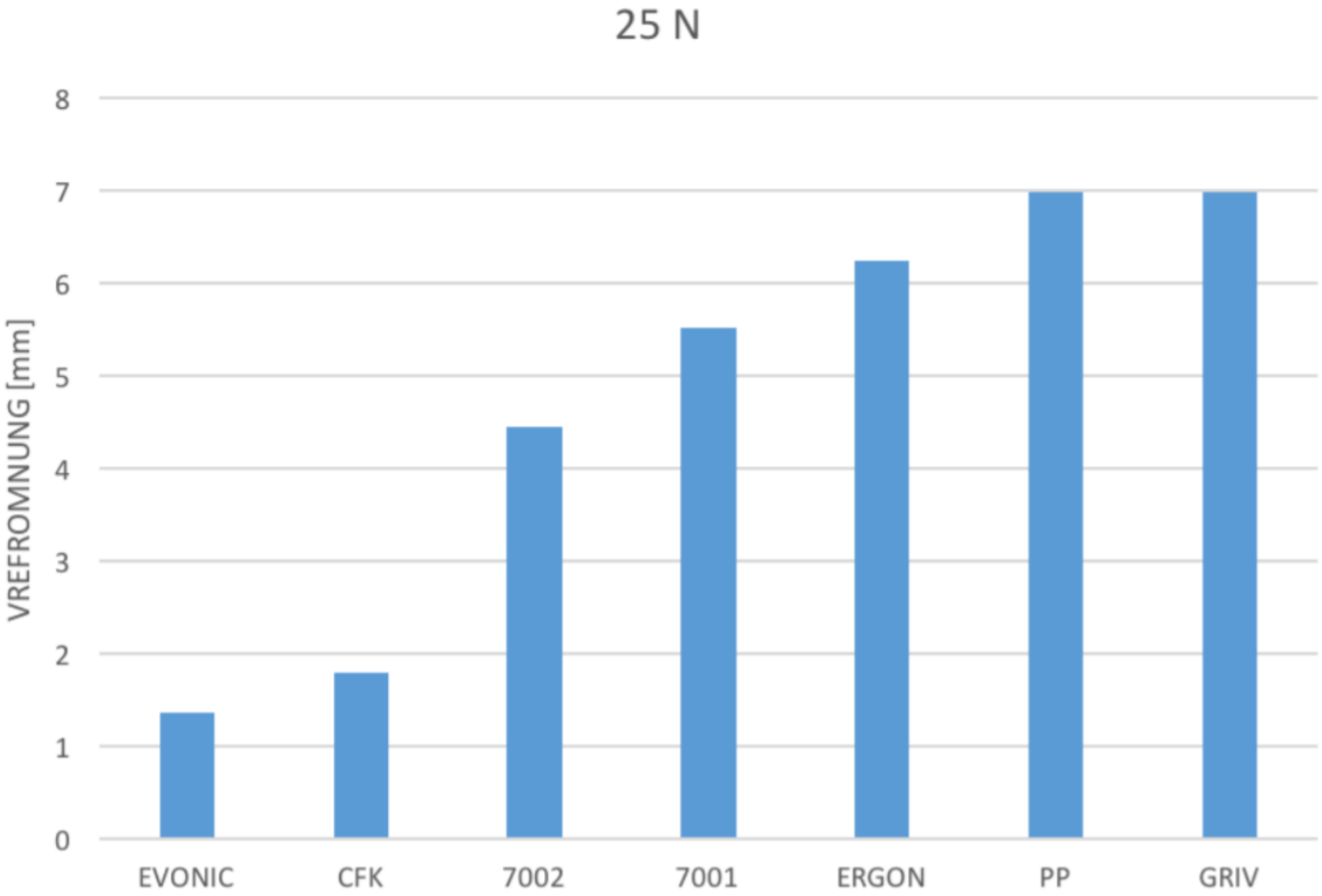




Core Stiffness



Core Stiffness



Solestar Function

Fixing the ankle joint

Fore foot counter support

Deeper placement 1st met

=> STABILIZATION DELTA!

Effects

Optimal power transmission and reduction of the shear forces

⇒ The SOLESTAR insole fixes the foot in a neutral position during the whole pedaling action (reduction of backfootpronation and forefootsupination)

Asymmetries and disbalances are regulated in their functional system

⇒ The operating mode of the SOLESTAR insoles and individual adjustments reduce loss of power and overburdening

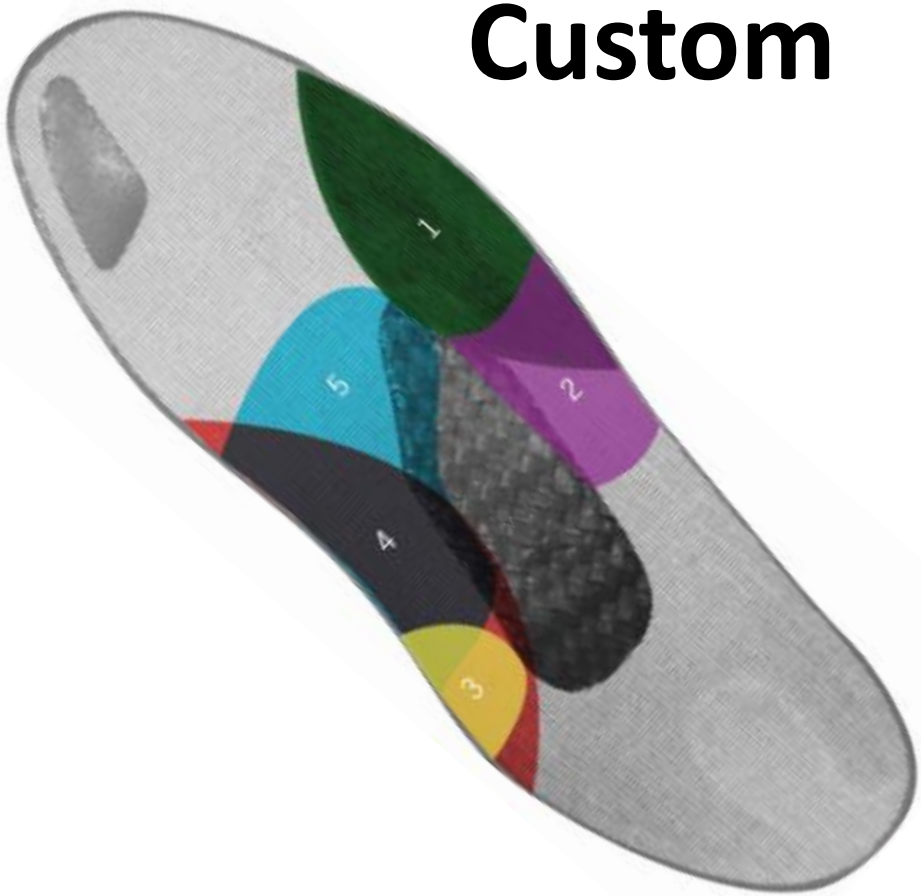
Solution

SOLESTAR

Standard

90 %

Custom



100 %

Performance

Power [Watt] =

Cadence [1/min] x Pedalforce [Newton]

Example:

Power 300 Watt

90 [1/m] x 180[N] - 110 [1/m] x 150 [N]

Functional Problem

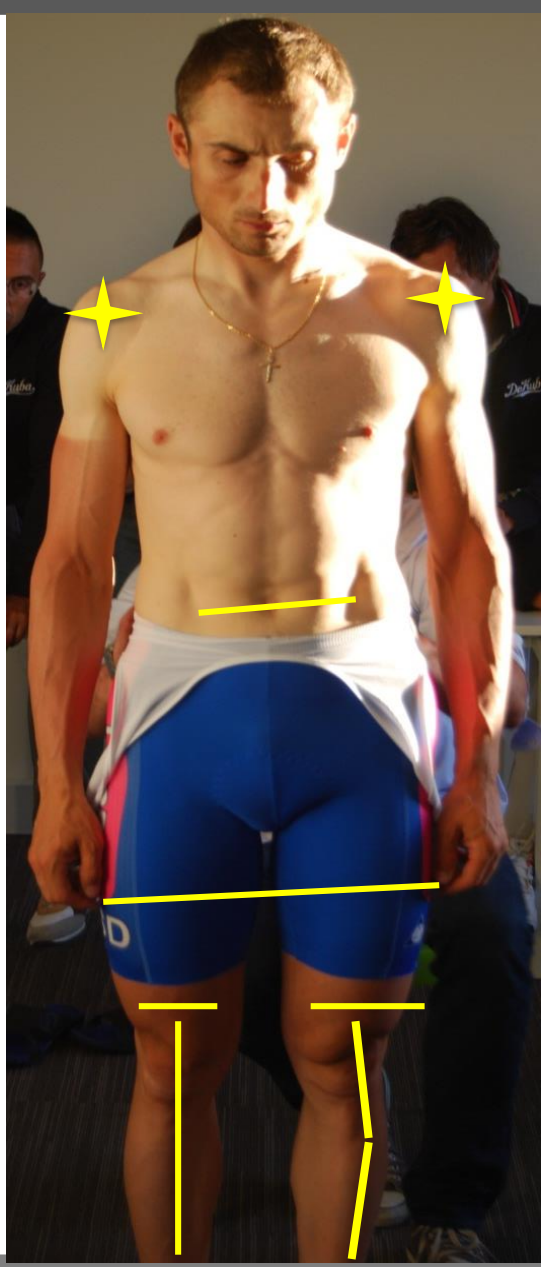
Shoulder

Pelvis

Hand

Muscle structure

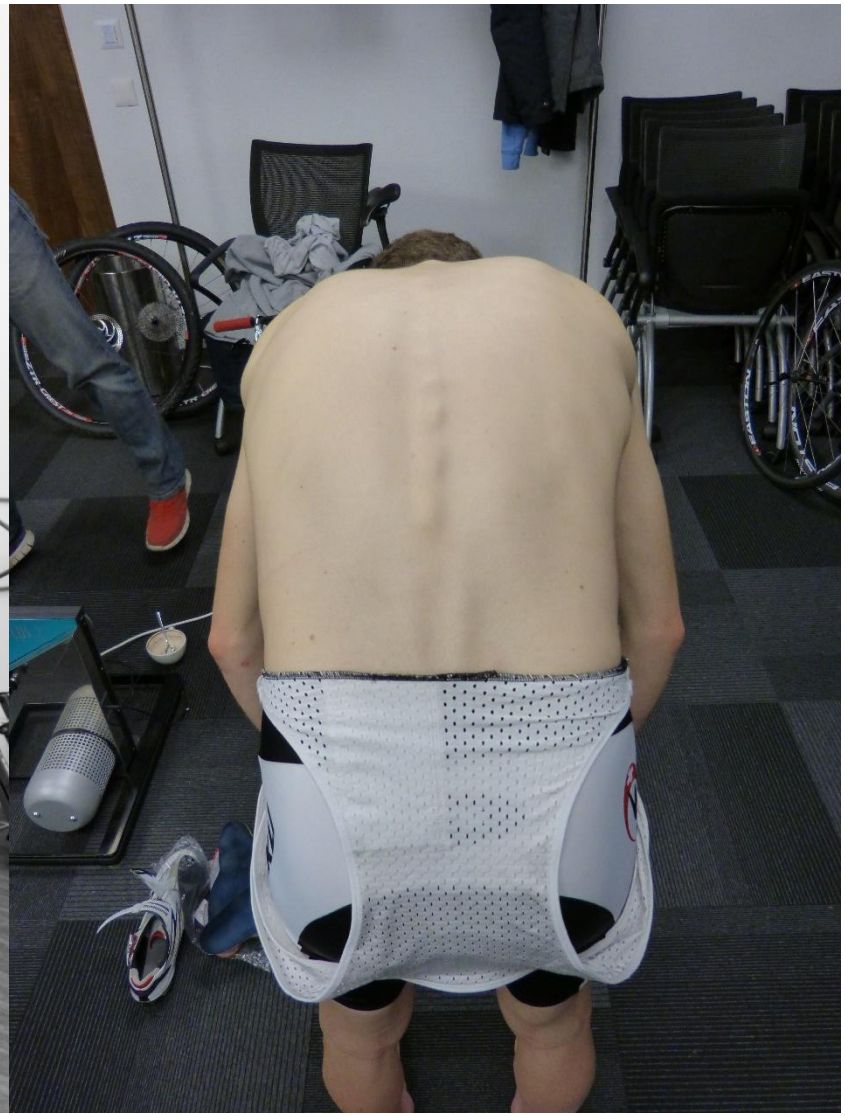
Legs



Functional Problem

Vorlauf Test – standing flexion test

Vorlauf Position on the Bike



On the Bike

Squadtesting

Pelvis

Hip

Femur

Knee

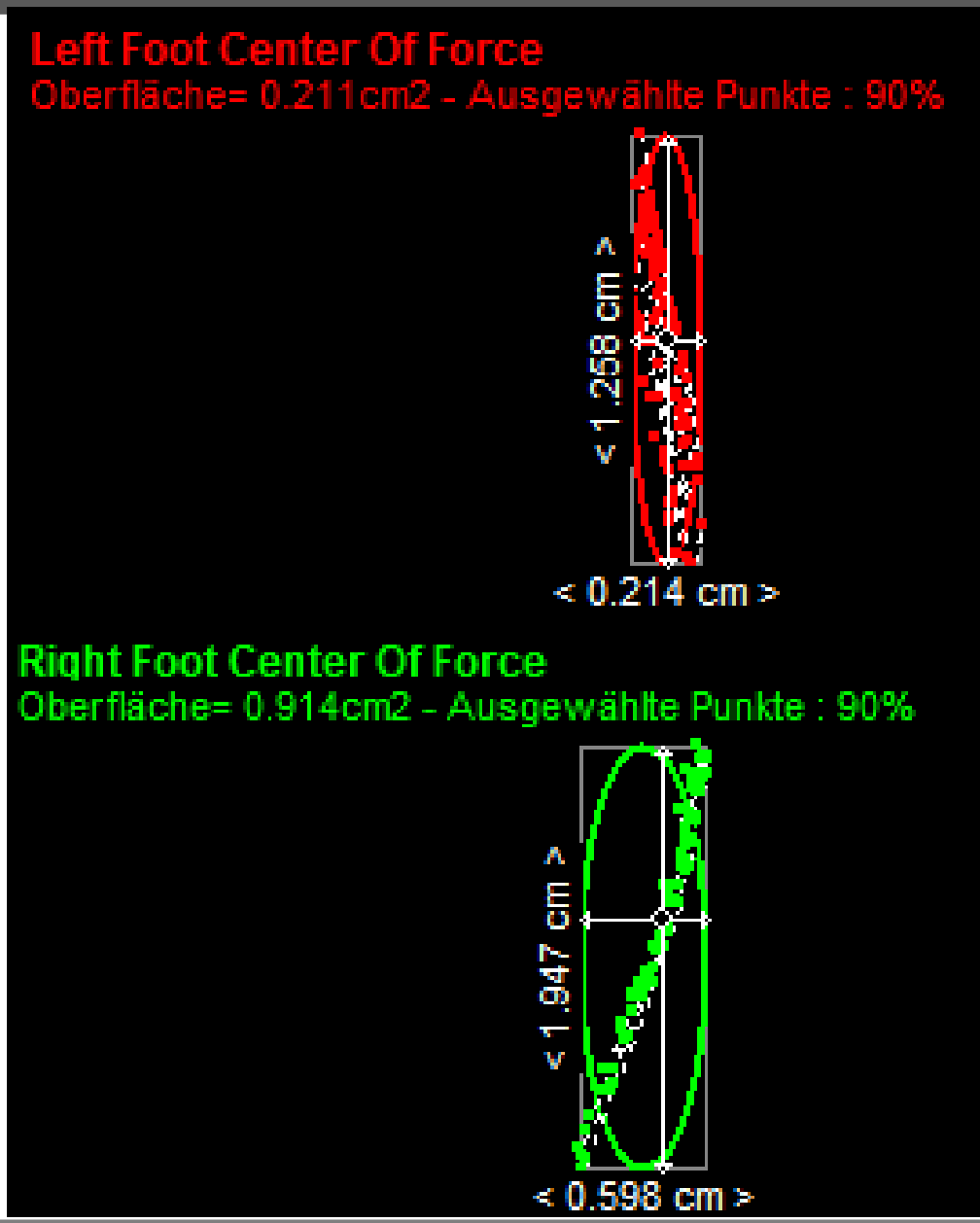
Tibia

Fibula

Malleolus

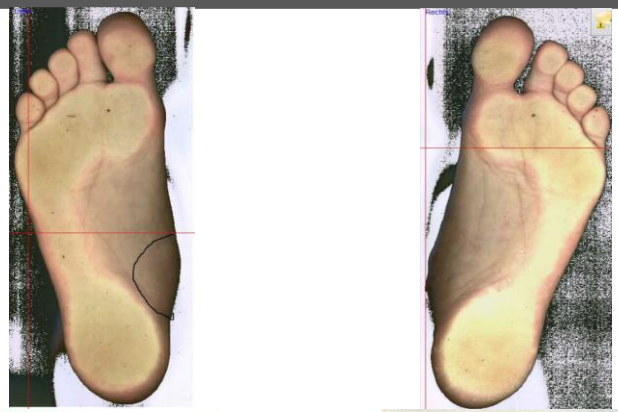
Subtalar joint

Toe



Procedure




Off the Bike

Knee Overload

"Wout Van Aert is suffering from friction between the tendons in his knee and his kneecap" (jan 2017)

The End - THANK YOU

SOLESTAR

Mastertitelformat bearbeiten

Bis hier ENDE

The Foot

Functional Problem

Soft problems

-blisters

-hard skin

-warts

-corns and callus

-metartarsal problems

-sinew inflammation

Clinical problems

-flat foot

-high arch foot

-club foot

-pigeon toes

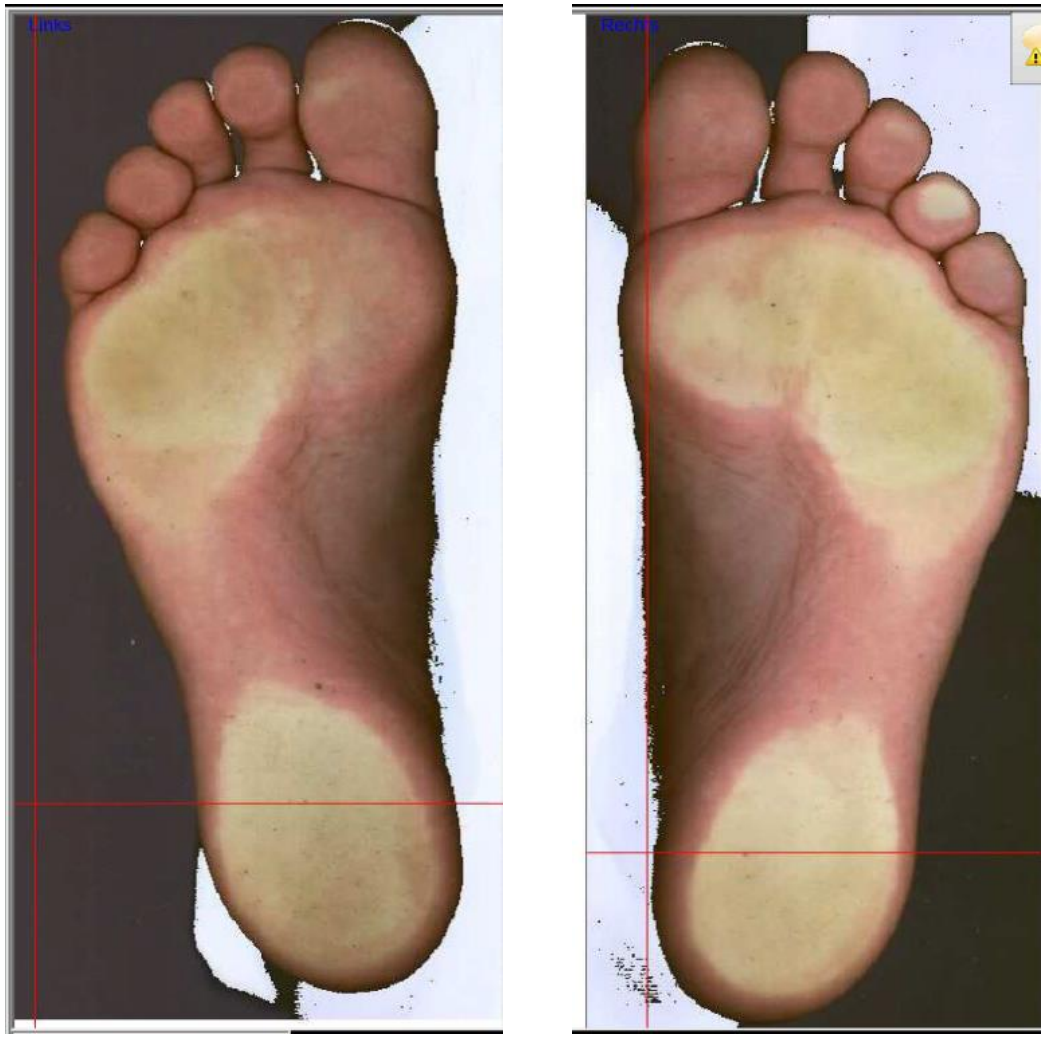
-hallux valgus

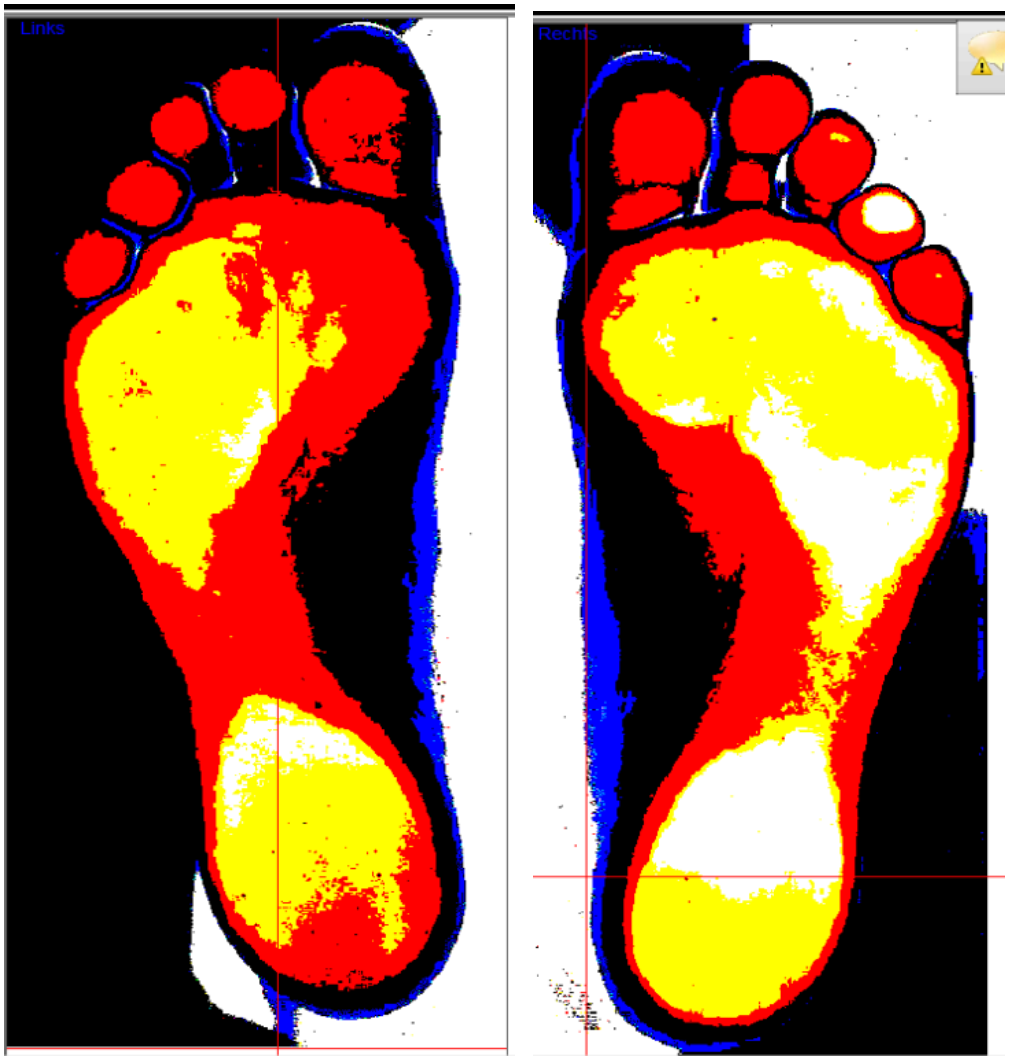
-metartarsalgia


cycling
Alpecin
Caffeine Shampoo

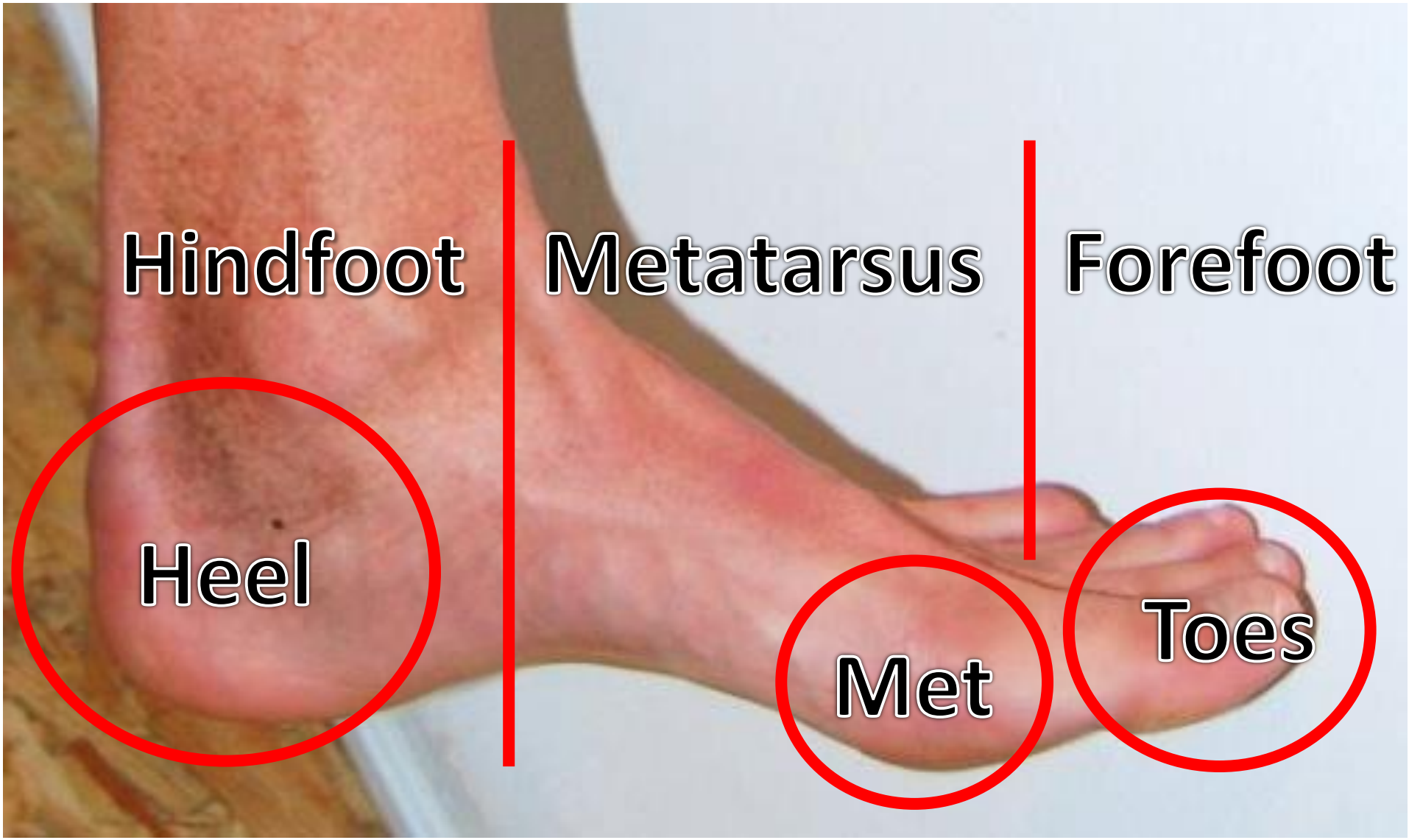

BONT
BONT


THE WORLD
ETNIES
CANYON


Links
Rechts


Links
Rechts

The Foot



Musculare Dysbalances

Volume

Definition

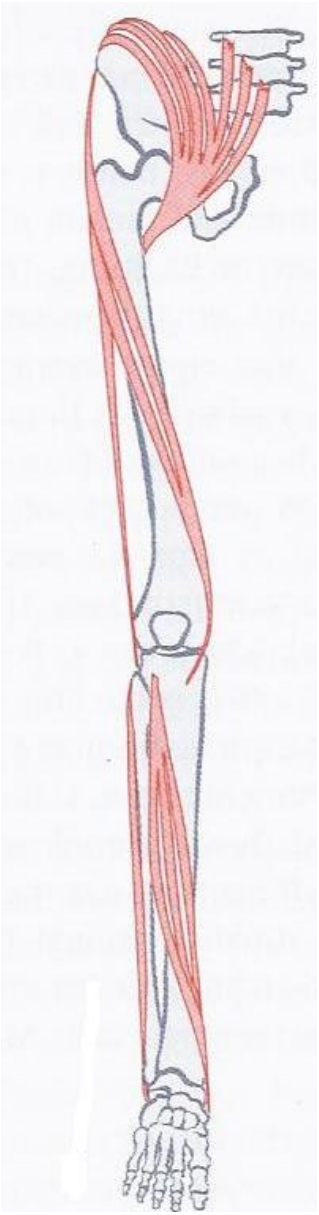
Tightness

Intermuscular

Intramuscular


fi'zi:k
fi'zi:k

Leg



Bones

Joints

Muscles

Sinews

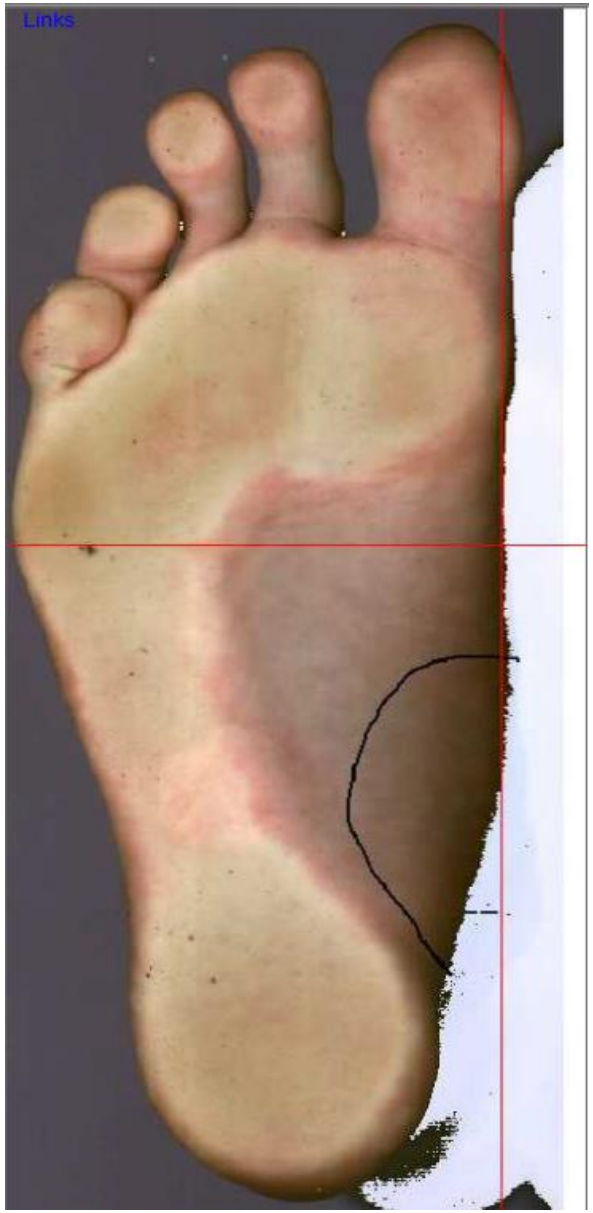
Ligaments

Cartilage

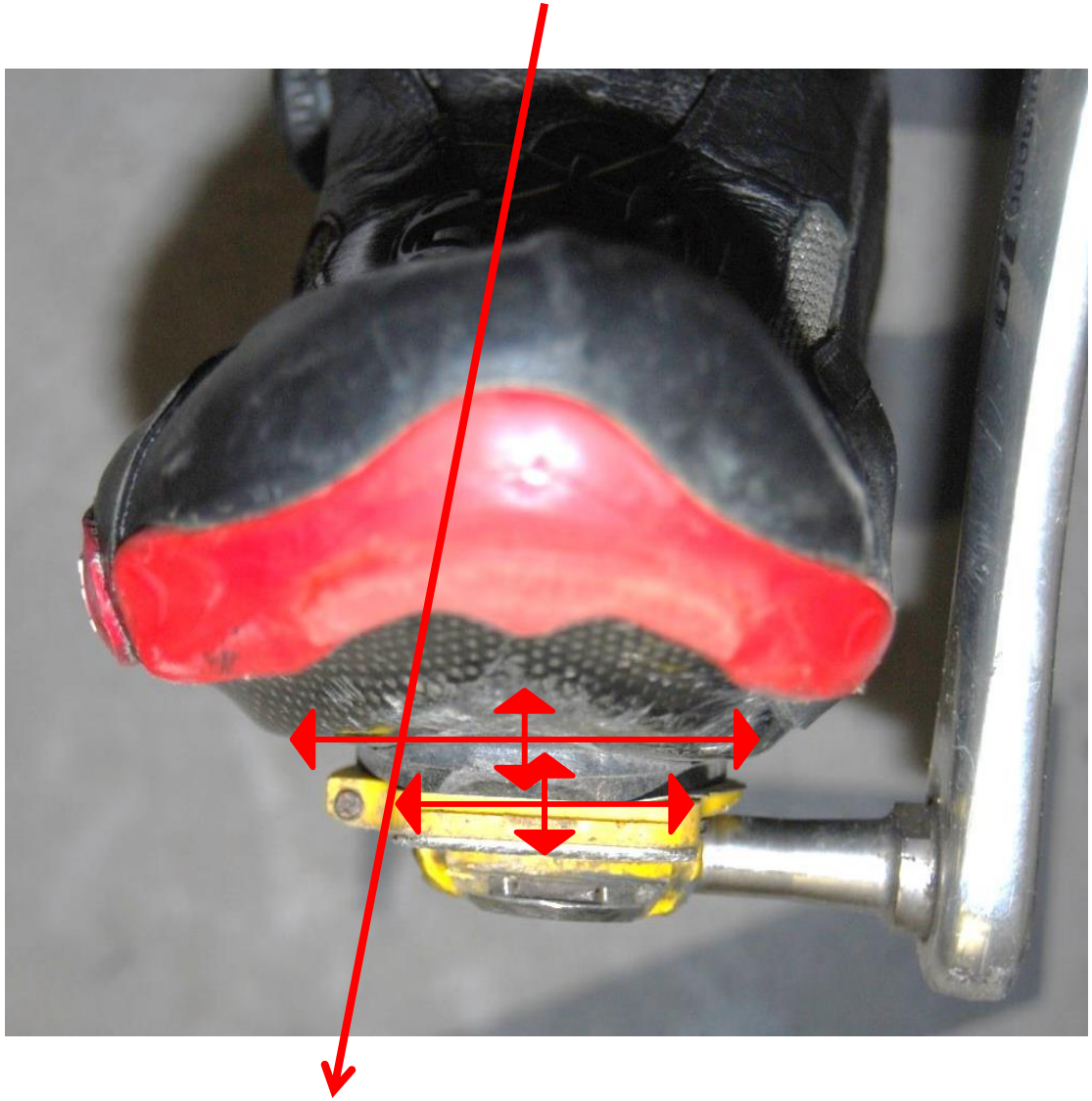
Neutral

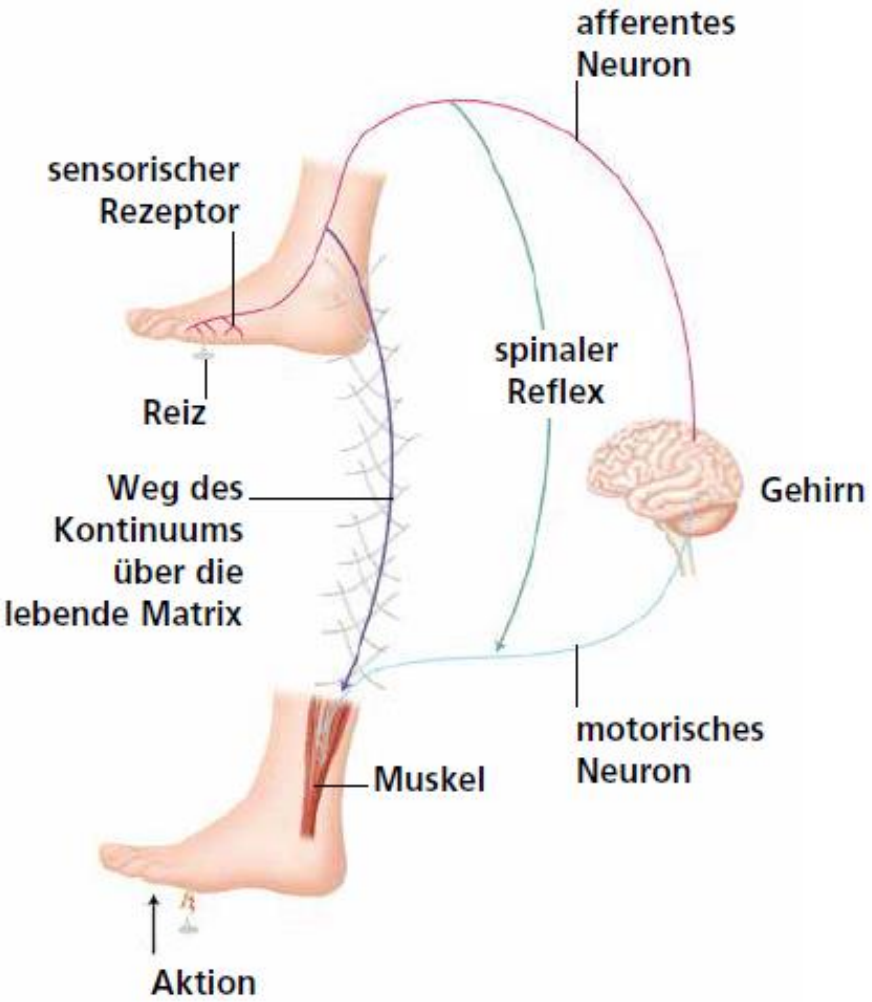
Valgus

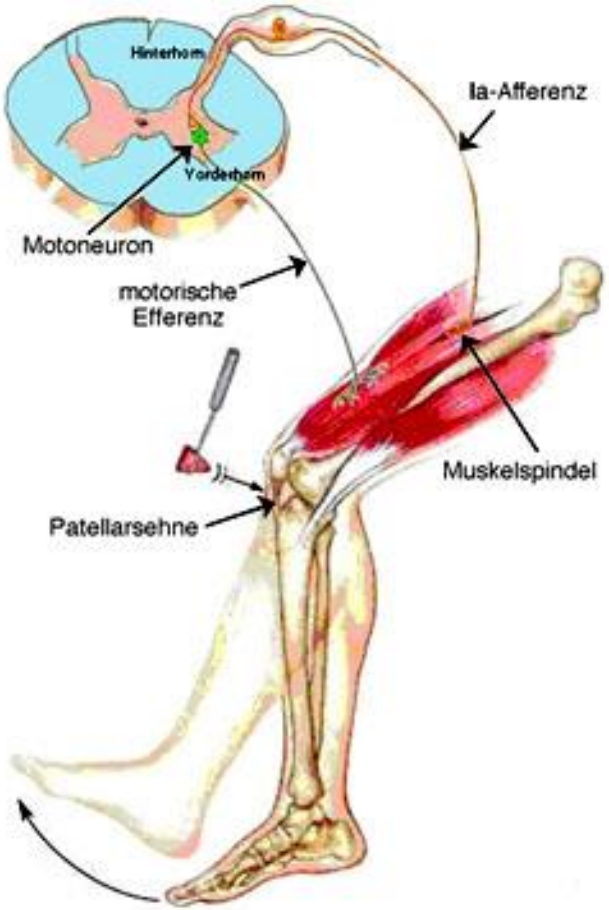
Varus


Links


Rechts




afferentes
Neuron
sensorischer
Rezeptor
spinaler
Reflex
Reiz
Weg des
Kontinuums
über die
lebende Matrix
Gehirn
motorisches
Neuron
Muskel
Aktion


Hinterhorn
Vorderhorn
Ia-Afferenz
Motoneuron
motorische
Efferenz
Muskelspindel
Patellarsehne

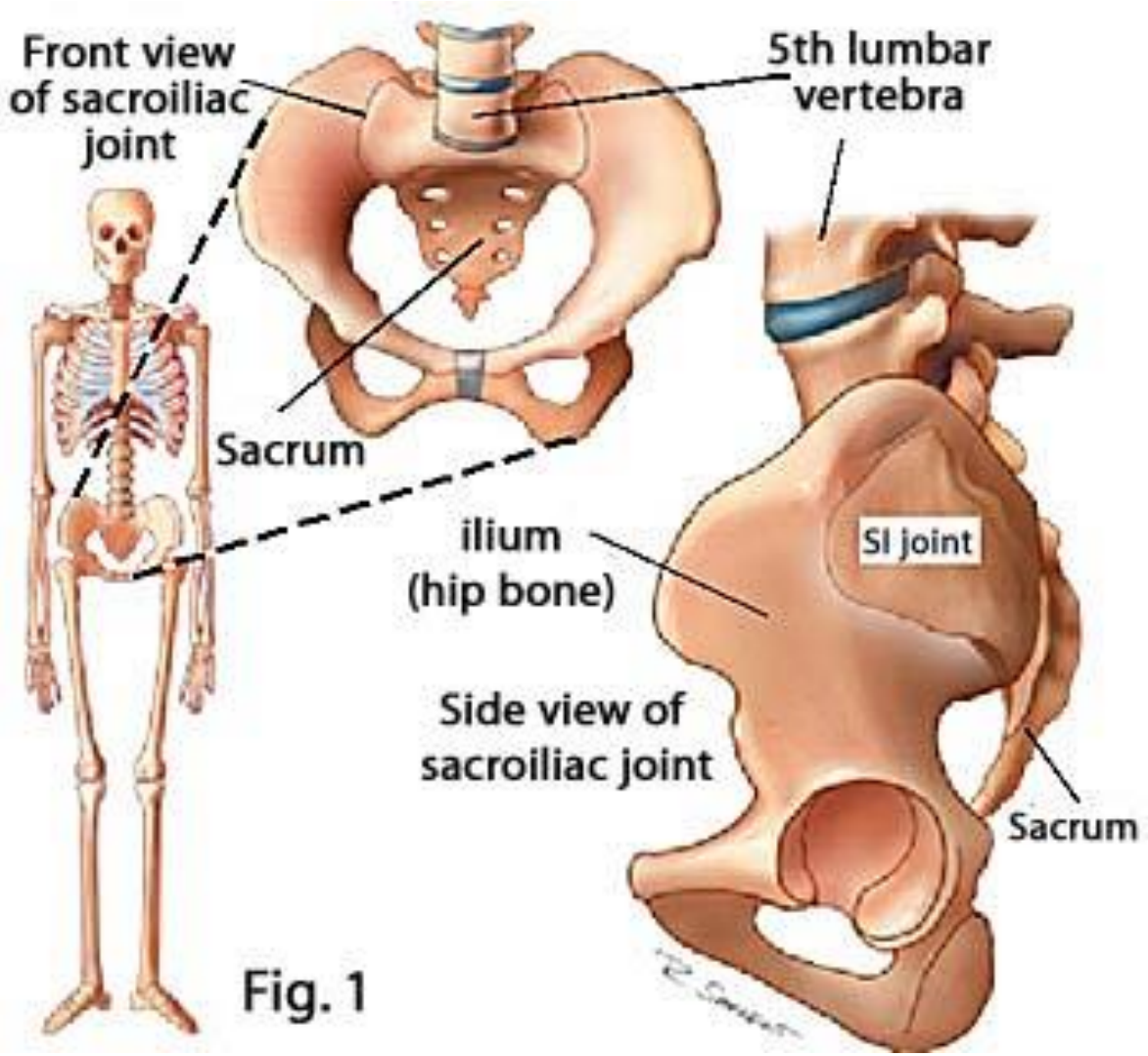
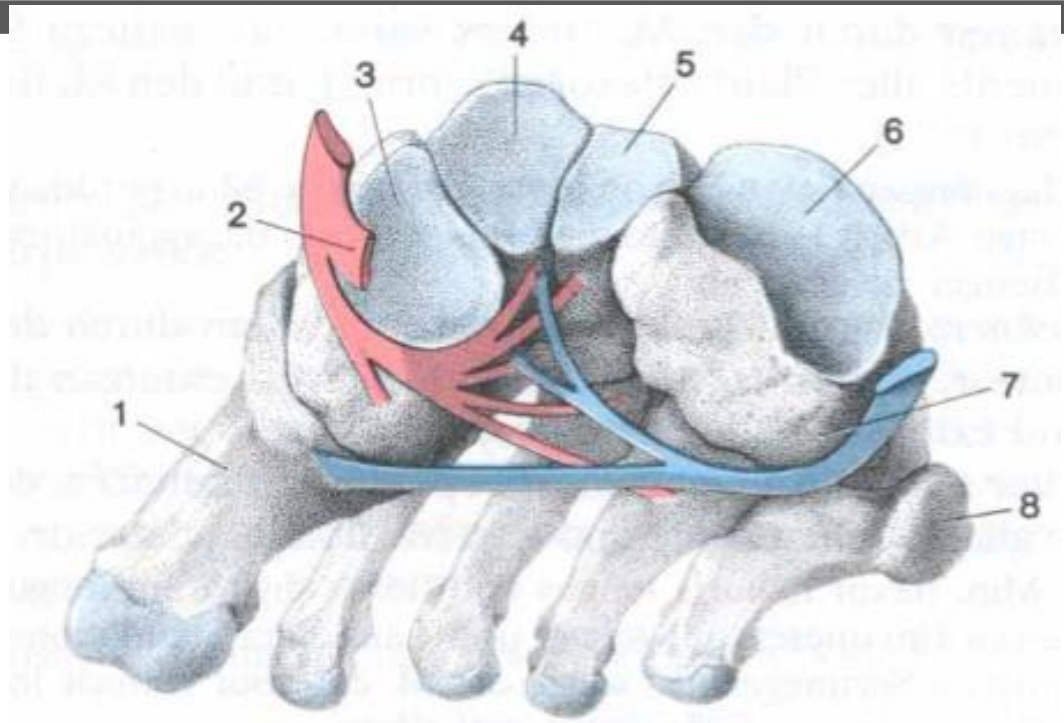
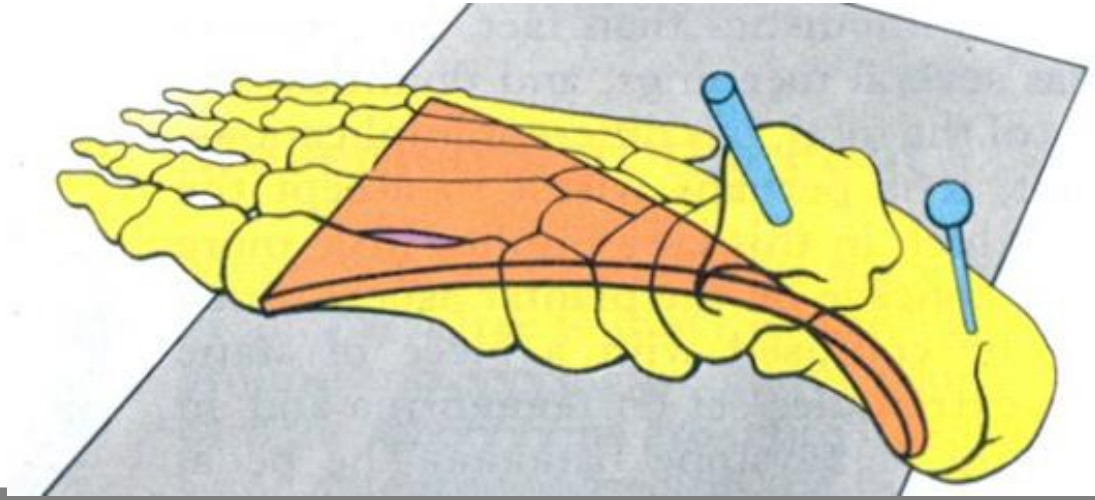

Front view of sacroiliac joint
5th lumbar vertebra
Sacrum
ilium (hip bone)
SI joint
Side view of sacroiliac joint
Sacrum

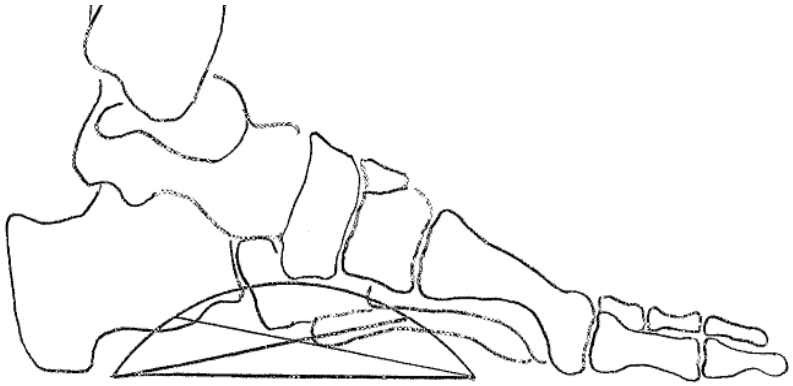
Fig. 1

Stabilisations-“Steigbügel“ M. tibialis posterior medial : Peronealsehnen lateral (verlaufen von medial und lateral unter das Fußgewölbe)

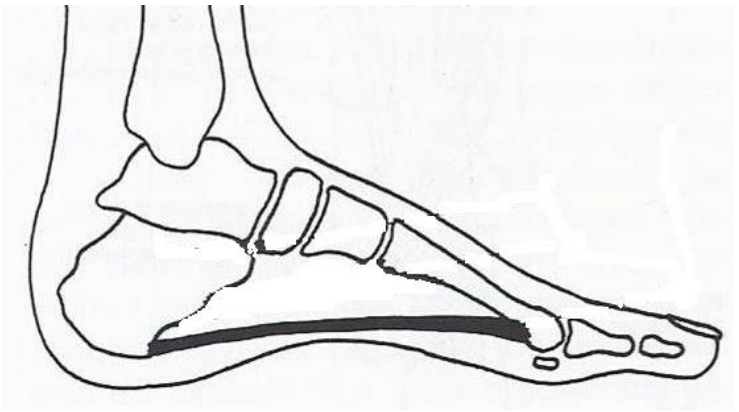




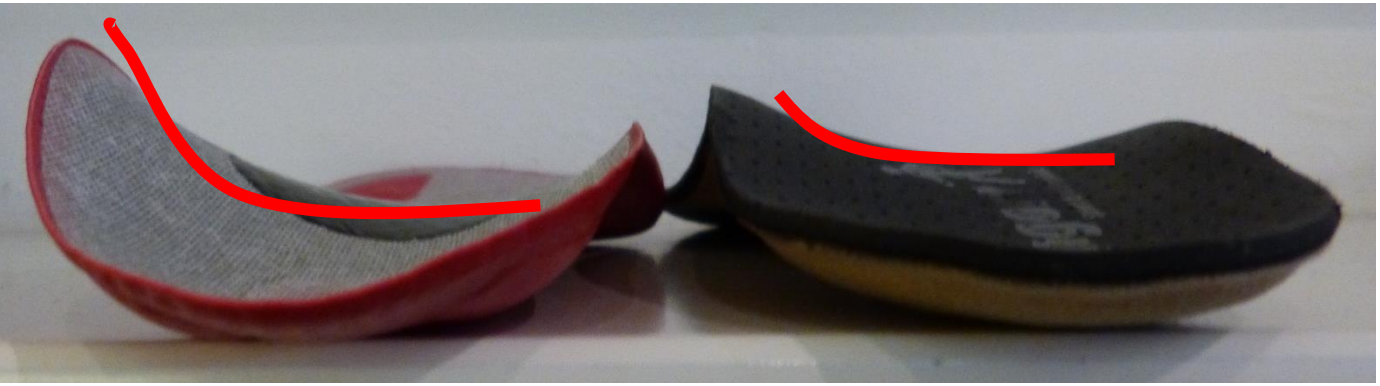
Details



Maximum support of subtalar joint

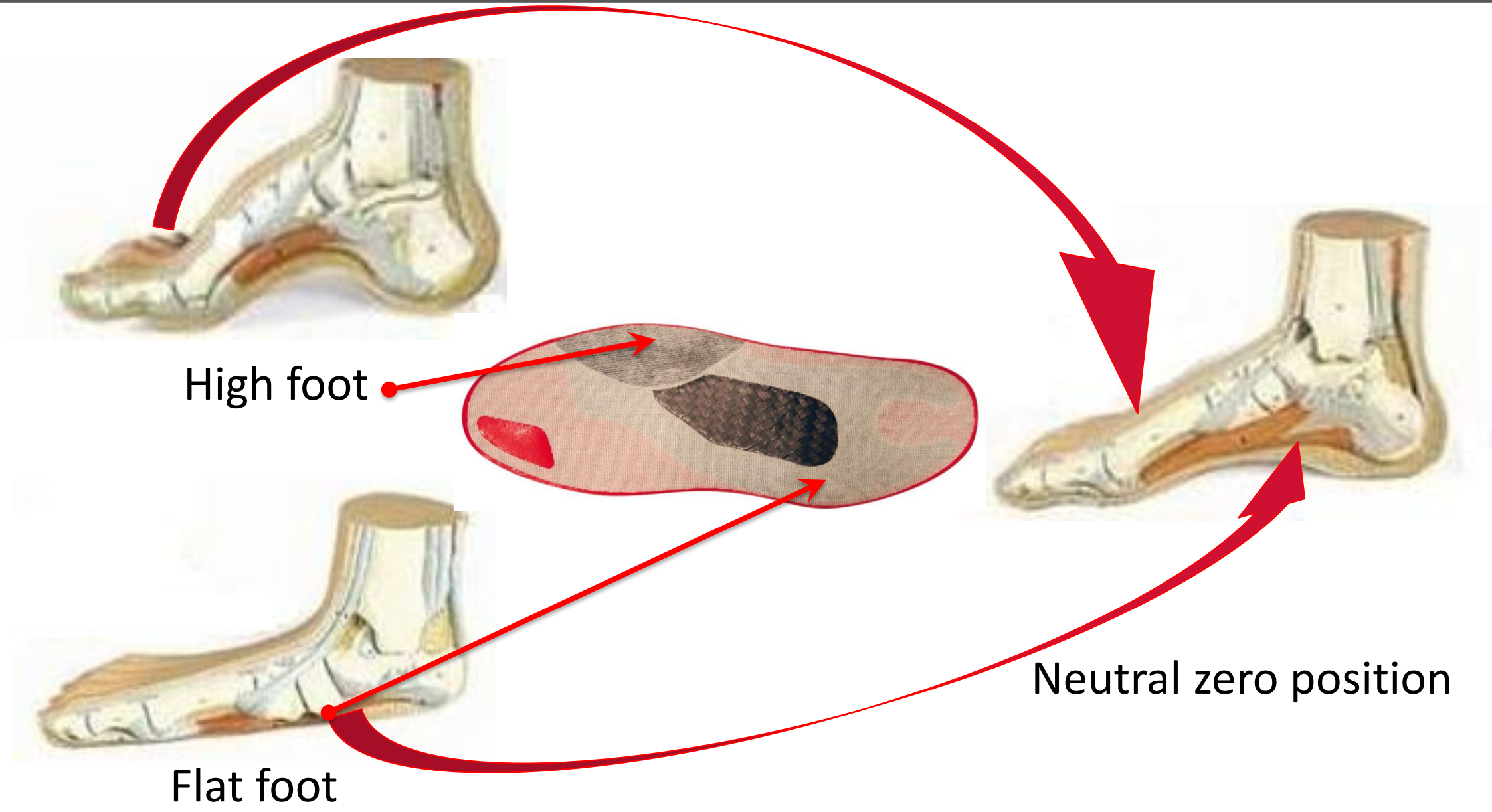


Free movement of plantar fascia

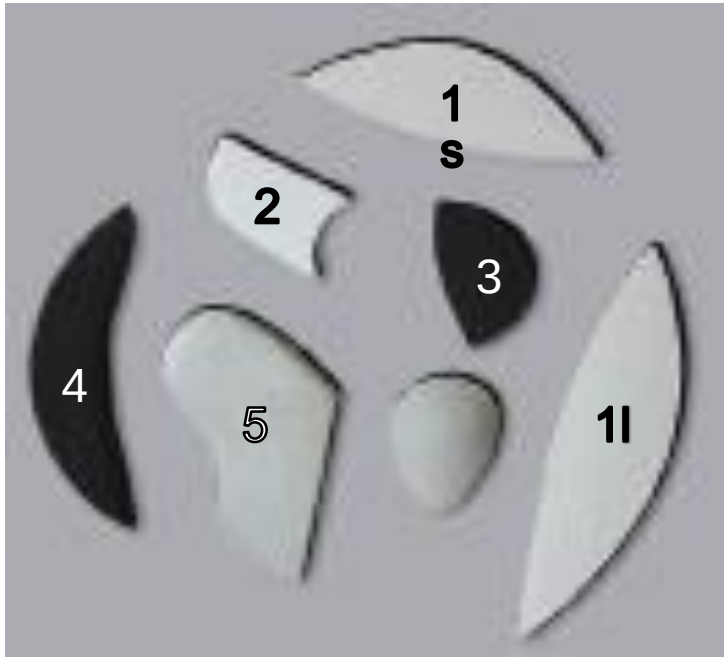


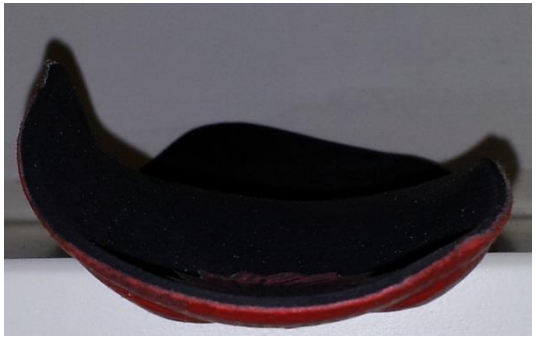
Gradation of the medial support is important

Neutral Zero Position



Modifikation





Resistive force

Sensomotoric

Decompression

Covermaterial

Heat molding

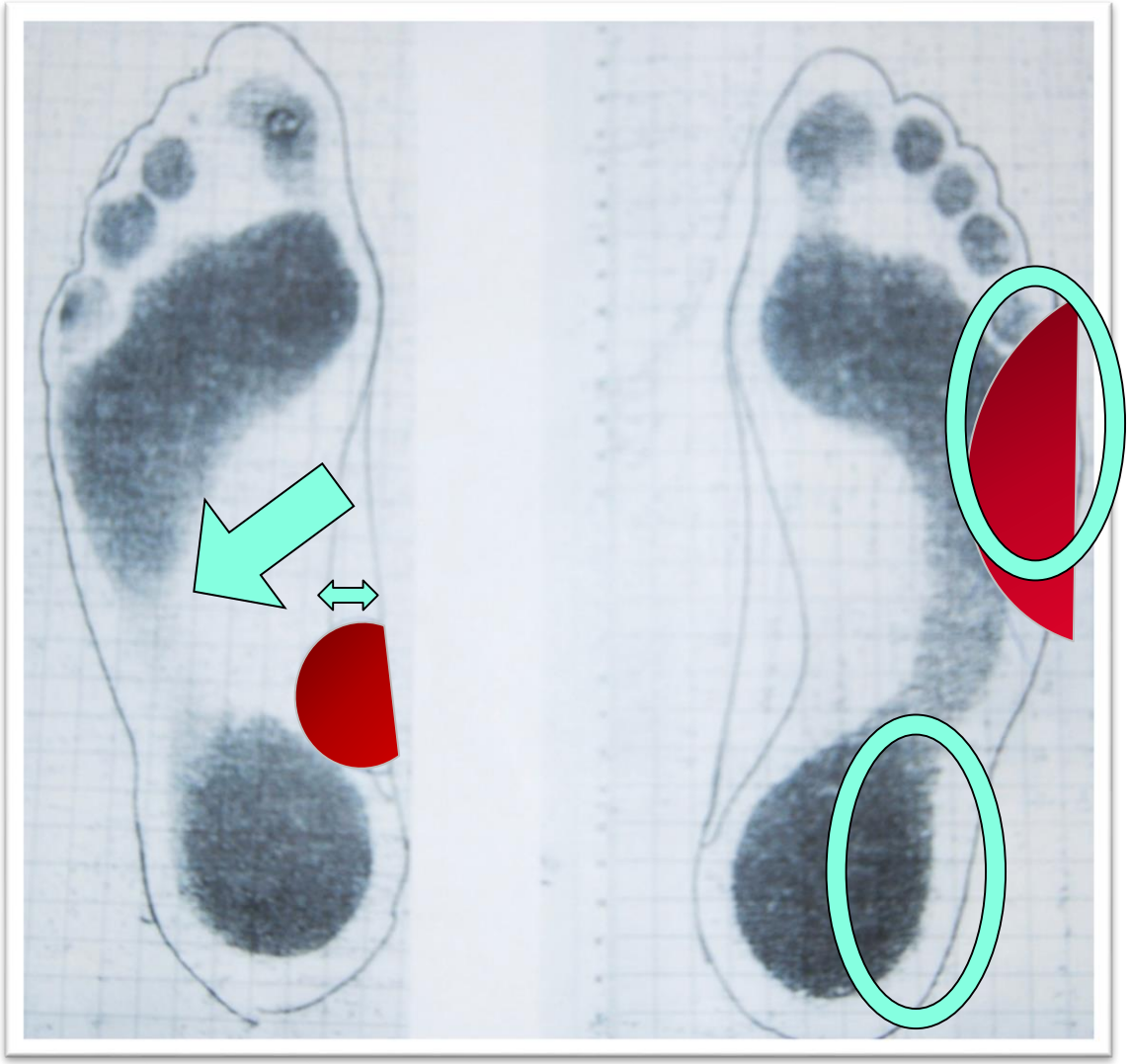
Practice I

Diagnosis:

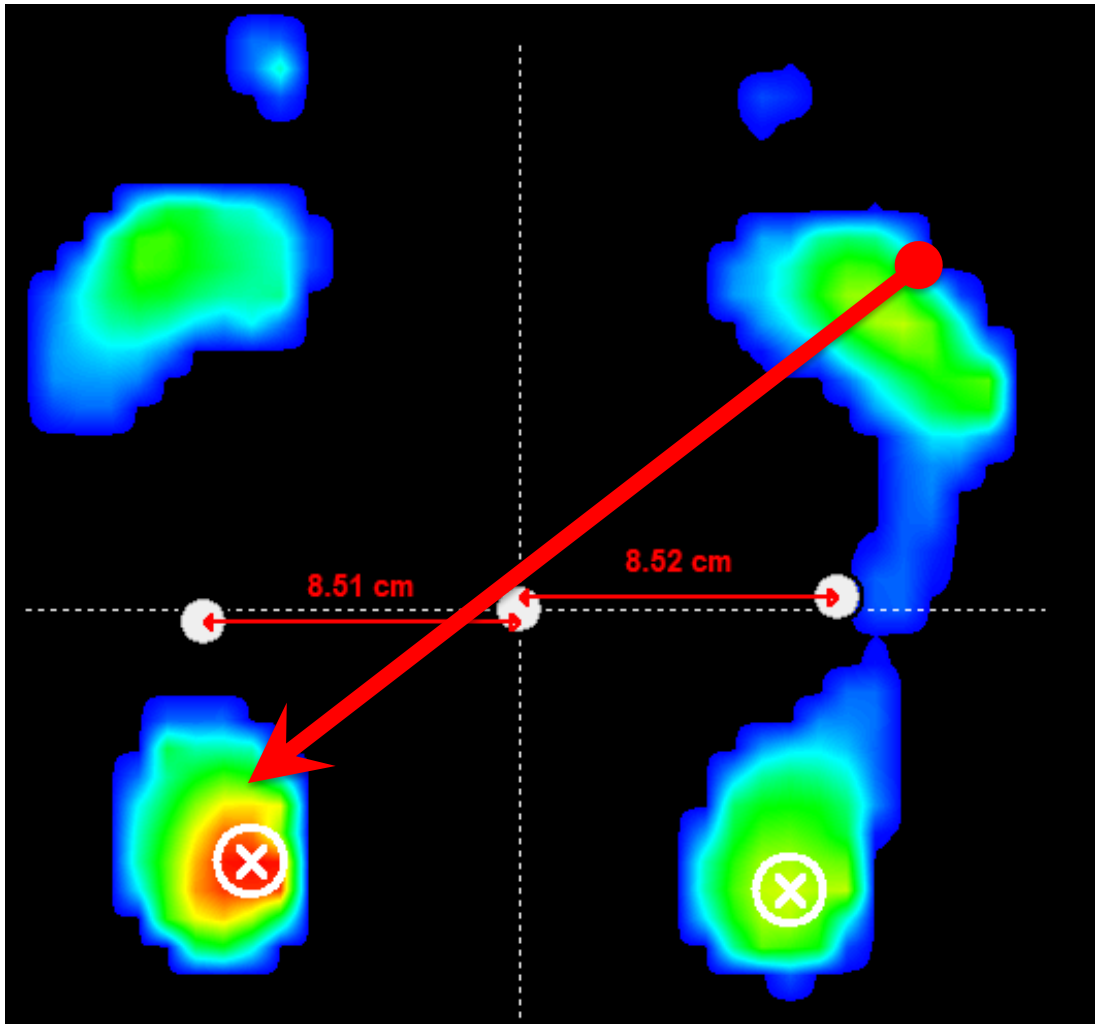
- Hip rotation – right side
- Skew foot
- Varus position - right foot

Action:

- Long pronation wedge right
- Short sub wedge left



Practice II



Asymetric Foot

Malposition

Example B II

Study Design

Deutsche Sporthochschule Köln
German Sport University Cologne

Dr. Achim Schmidt

Cyclus 2 Ergometer

Participants: 30 (hobby/amateur/pro)

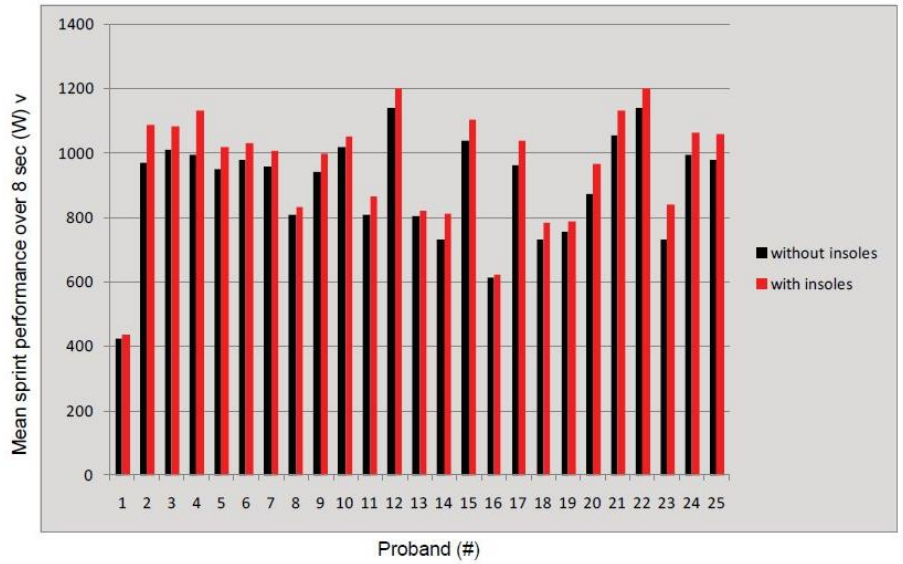
Pre-test: 3 x 8 sec sprint-test isokinetic maximum test with original insoles

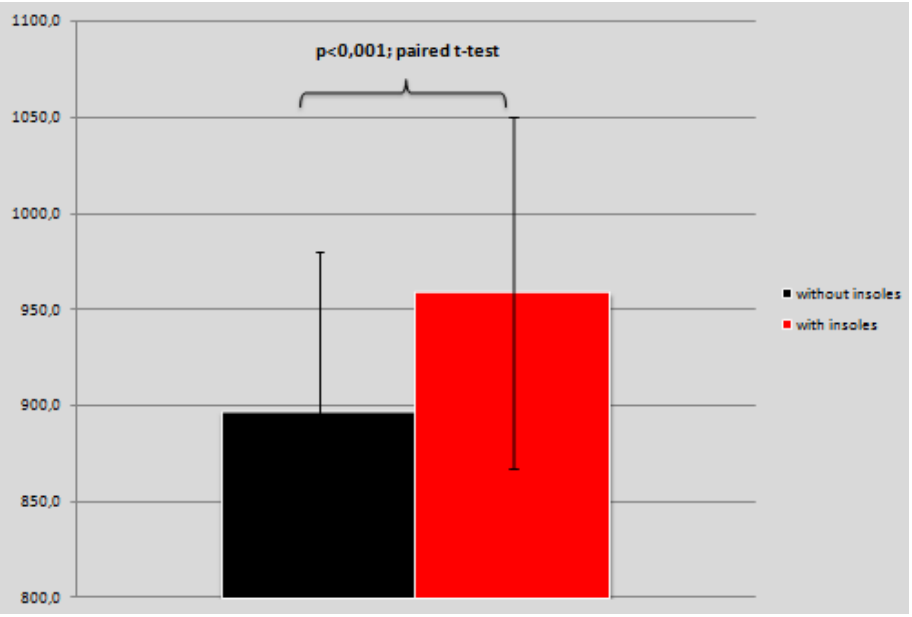
Test result: Peak – Cut

Treatment: 2 weeks adaption without any sprint specific training

Retest: Same as pretest

Study Results





Average sprint performance 8 seconds:

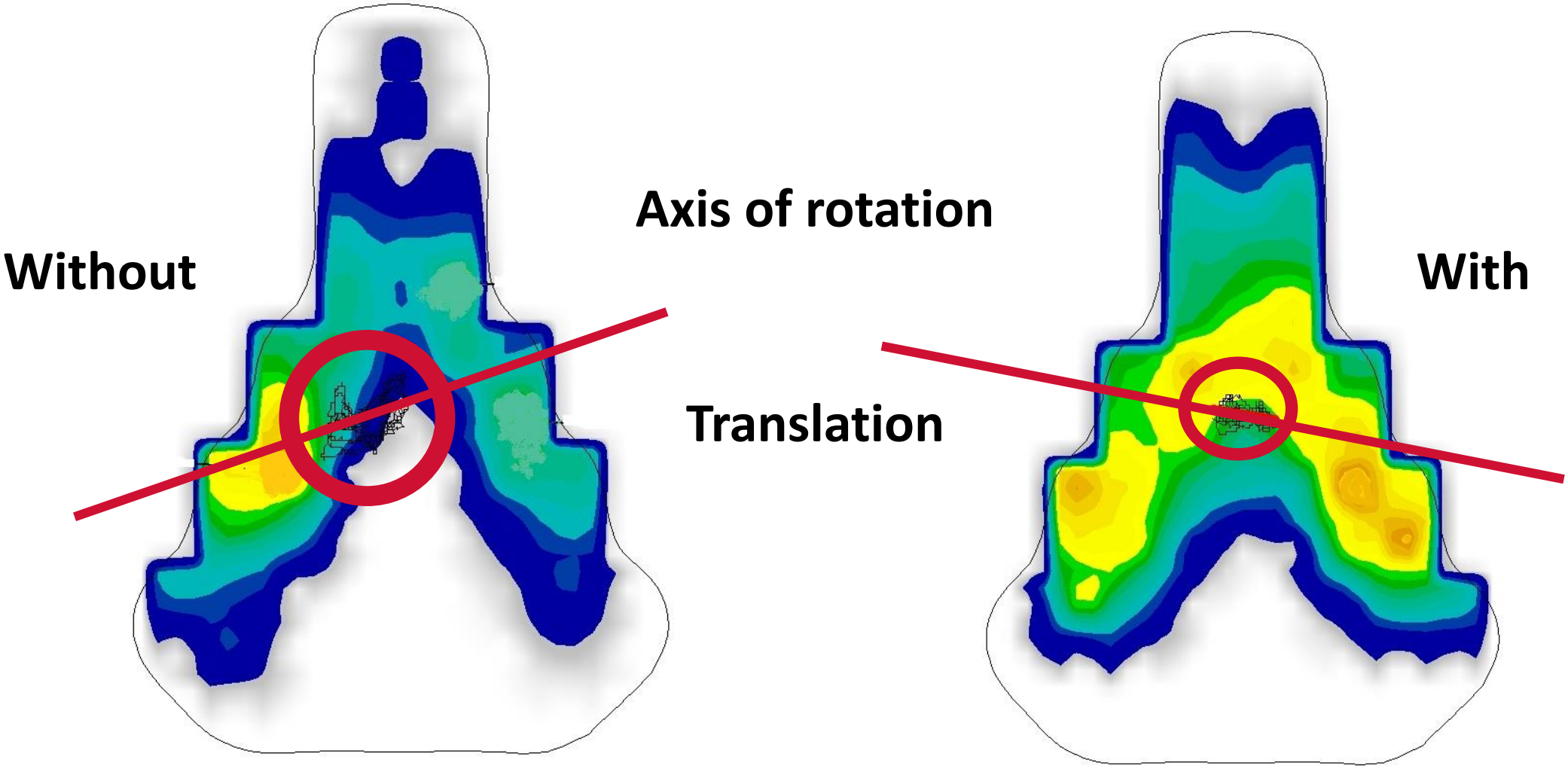
Without: 896.9 +/- 167.3 W

With: 958.7 +/- 183.0 W

+ 61.9 W = 6.9 %

Liverpool, UK, July 2011

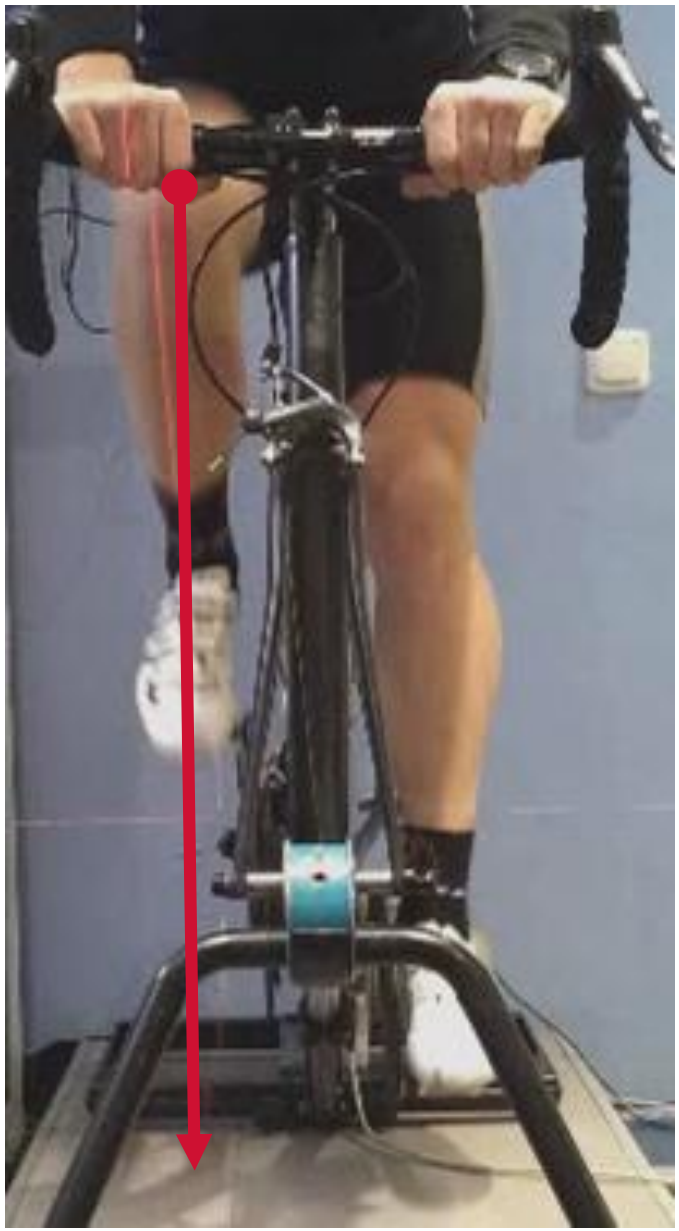
Saddle



Comparison Bike

SOLESTAR

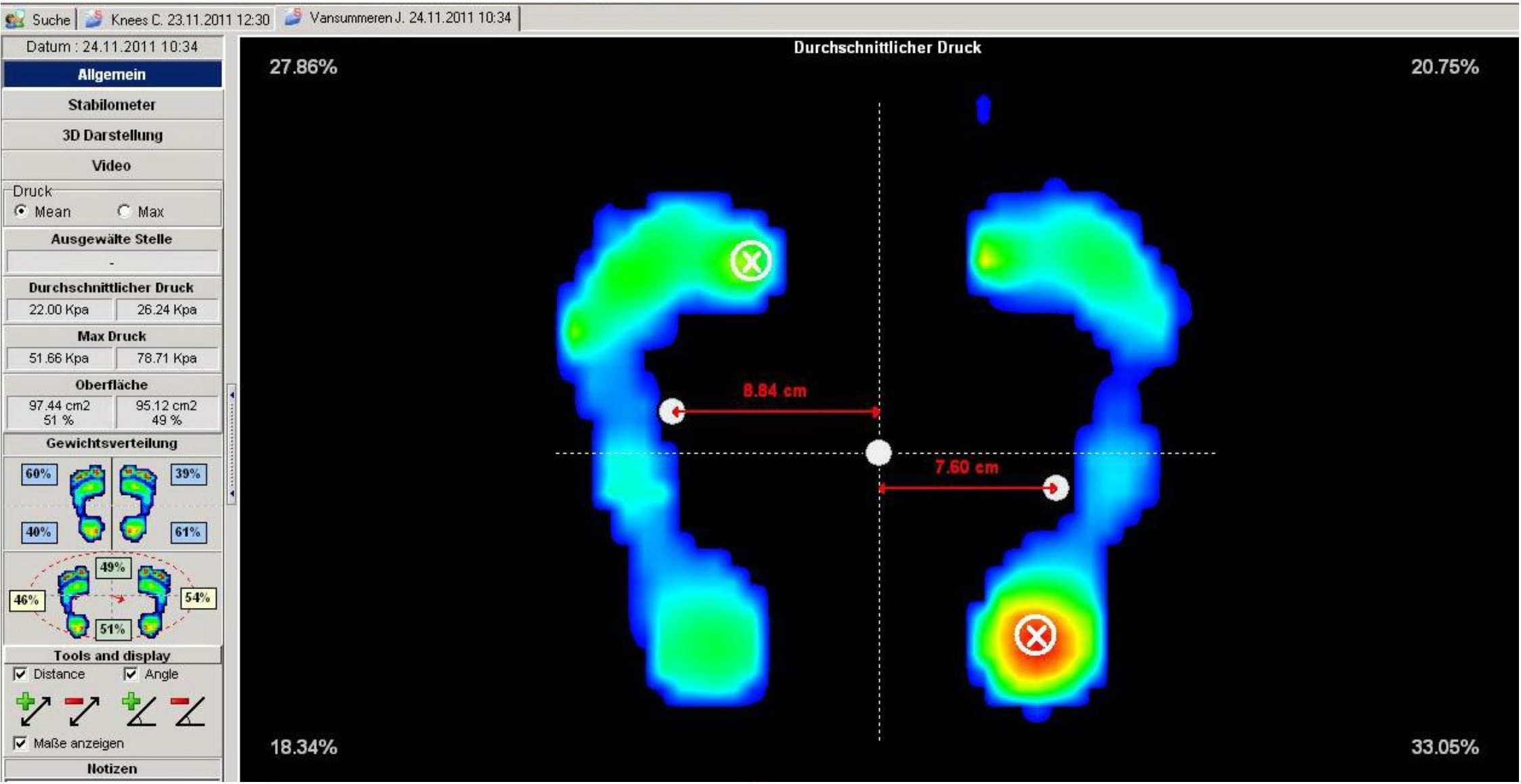
Without

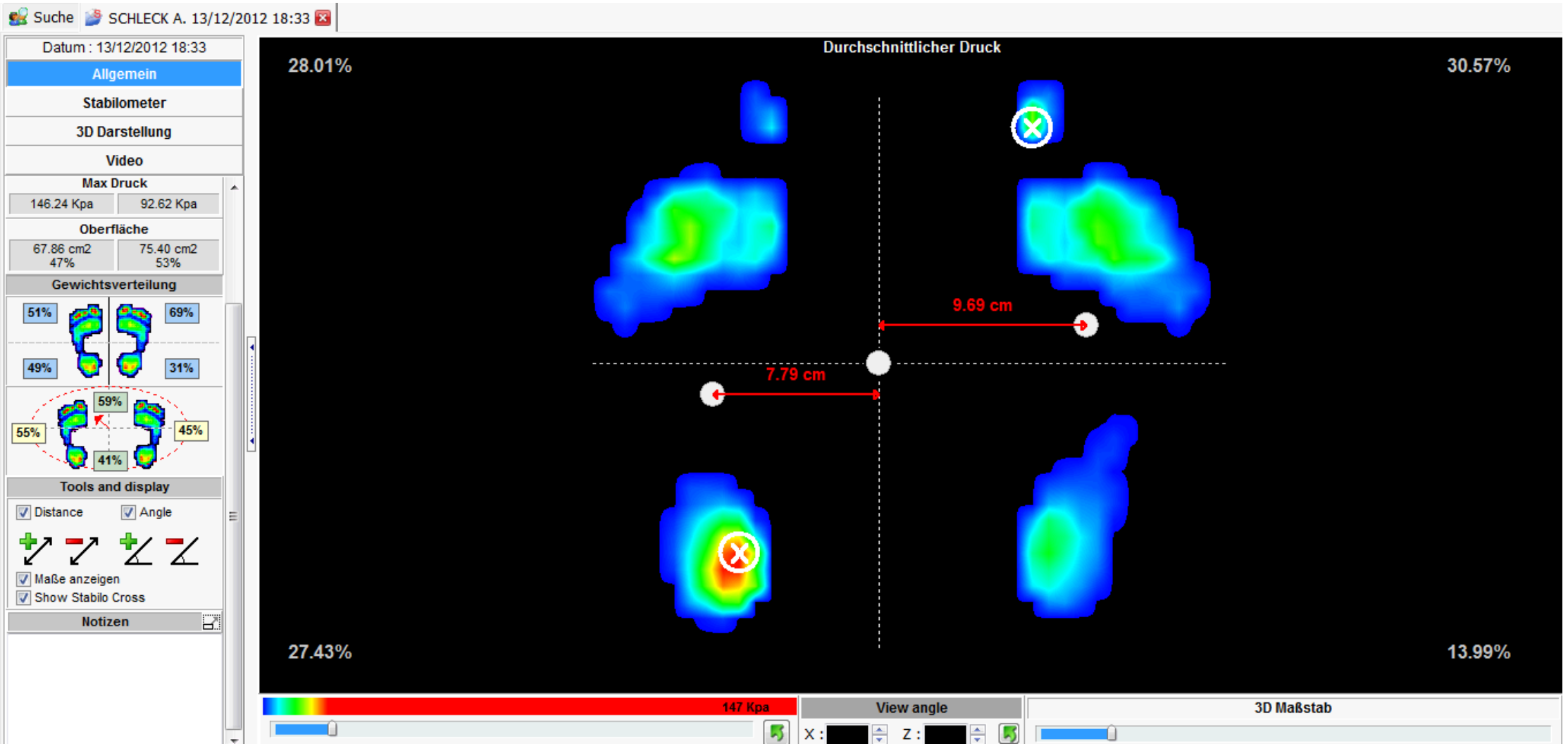


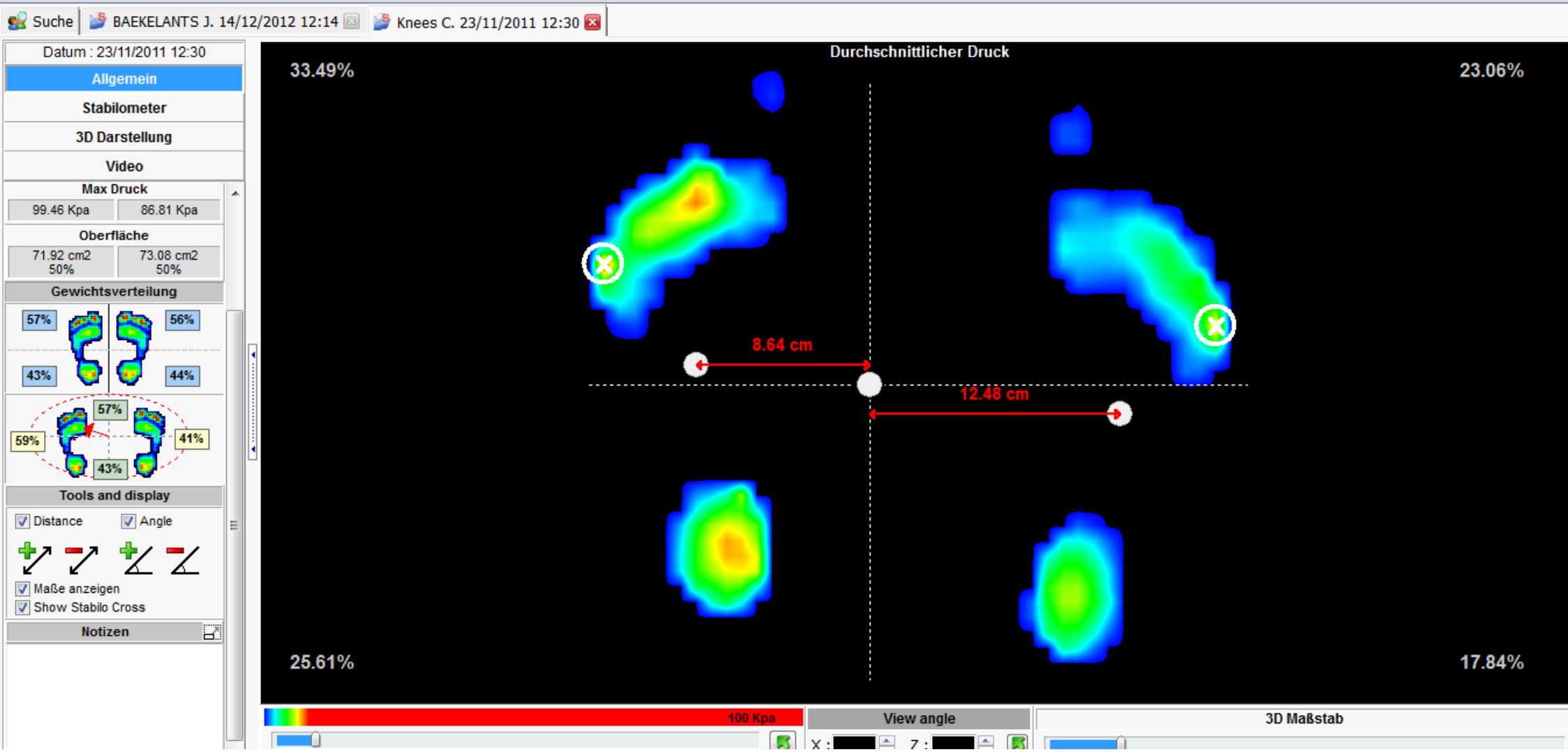
With

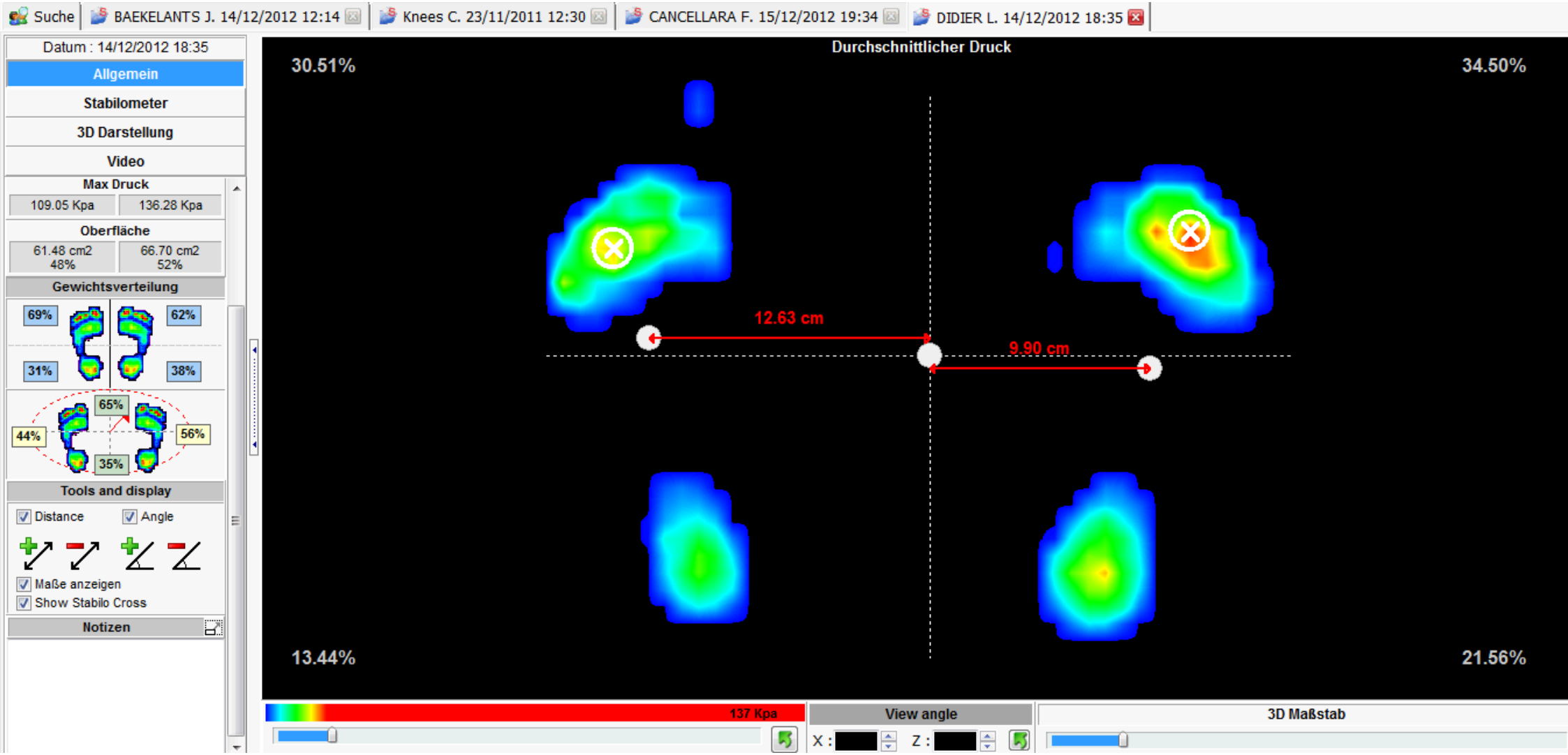
WORKSHOP

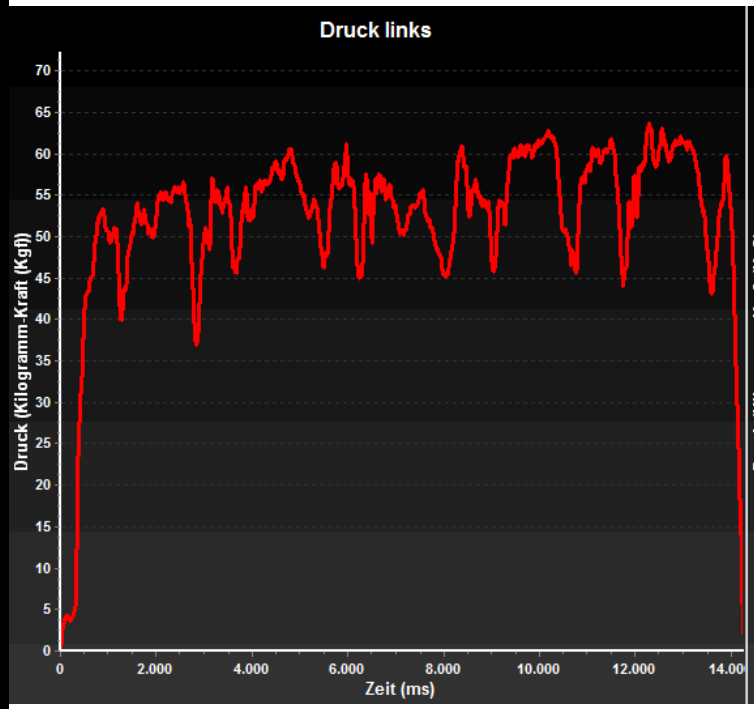
Foot pressure

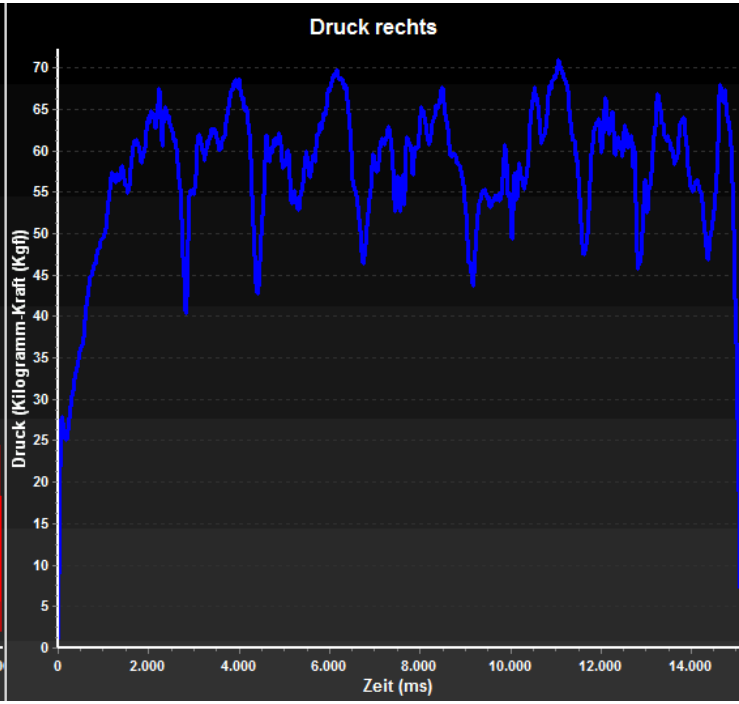



Suche
SCHLECK A. 13/12/2012 18:33
Datum : 13/12/2012 18:33
Allgemein
Stabilometer
3D Darstellung
Video
Max Druck
146.24 Kpa
92.62 Kpa
Oberfläche
67.86 cm2
47%
75.40 cm2
53%
Gewichtsverteilung
51%
69%
49%
31%
59%
55%
45%
41%
Tools and display
Distance
Angle
Maße anzeigen
Show Stabilo Cross
Notizen
Durchschnittlicher Druck
28.01%
30.57%
9.69 cm
7.79 cm
27.43%
13.99%
147 Kpa
View angle
X :
Z :
3D Maßstab

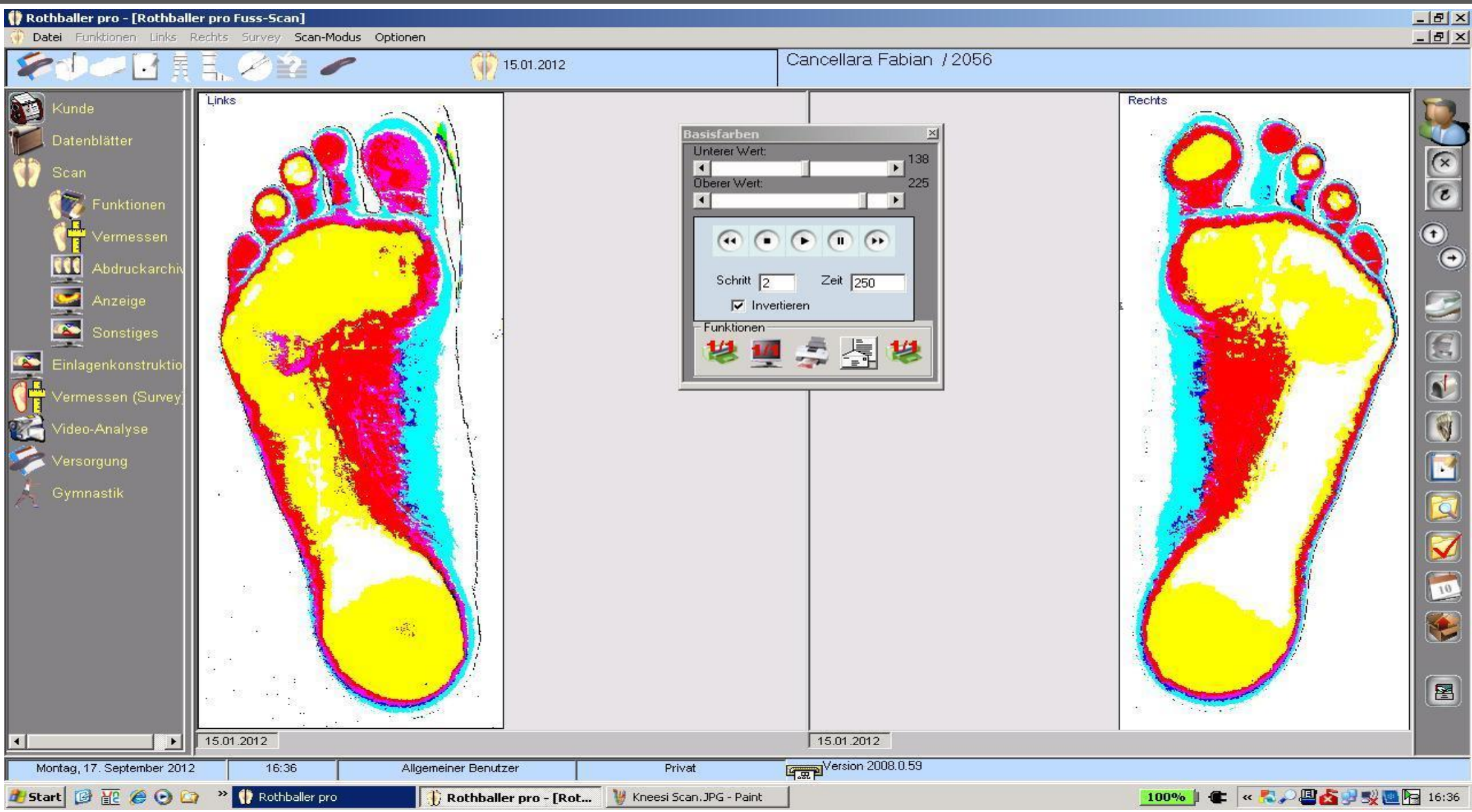

Suche
BAEKELANTS J. 14/12/2012 12:14
Knees C. 23/11/2011 12:30
Datum : 23/11/2011 12:30
Allgemein
Stabilometer
3D Darstellung
Video
Max Druck
99.46 Kpa
86.81 Kpa
Oberfläche
71.92 cm2
50%
73.08 cm2
50%
Gewichtsverteilung
57%
56%
43%
44%
57%
59%
41%
43%
Tools and display
Distance
Angle
Maße anzeigen
Show Stabilo Cross
Notizen
Durchschnittlicher Druck
33.49%
23.06%
8.64 cm
12.48 cm
25.61%
17.84%
100 Kpa
View angle
3D Maßstab


Suche
BAEKELANTS J. 14/12/2012 12:14
Knees C. 23/11/2011 12:30
CANCELLARA F. 15/12/2012 19:34
DIDIER L. 14/12/2012 18:35
Datum : 14/12/2012 18:35
Allgemein
Stabilometer
3D Darstellung
Video
Max Druck
109.05 Kpa
136.28 Kpa
Oberfläche
61.48 cm2
48%
66.70 cm2
52%
Gewichtsverteilung
69%
62%
31%
38%
65%
44%
56%
35%
Tools and display
Distance
Angle
Maße anzeigen
Show Stabilo Cross
Notizen
Durchschnittlicher Druck
30.51%
34.50%
12.63 cm
9.90 cm
13.44%
21.56%
137 Kpa
View angle
X :
Z :
3D Maßstab


Druck links
Druck (Kilogramm-Kraft (Kgf))
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
0
2.000
4.000
6.000
8.000
10.000
12.000
14.000
Zeit (ms)


Druck rechts
Druck (Kilogramm-Kraft (Kgf))
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
0
2.000
4.000
6.000
8.000
10.000
12.000
14.000
Zeit (ms)

Foot scan


Rothballer pro - [Rothballer pro Fuss-Scan]
Datei Funktionen Links Rechts Survey Scan-Modus Optionen
15.01.2012
Cancellara Fabian / 2056
Kunde
Datenblätter
Scan
Funktionen
Vermessen
Abdruckarchiv
Anzeige
Sonstiges
Einlagenkonstruktio
Vermessen (Survey)
Video-Analyse
Versorgung
Gymnastik
Links
Basisfarben
Unterer Wert:
138
Oberer Wert:
225
Schritt 2
Zeit 250
Invertieren
Funktionen
Rechts
15.01.2012
15.01.2012
Montag, 17. September 2012
16:36
Allgemeiner Benutzer
Privat
Version 2008.0.59
Start
Rothballer pro
Rothballer pro - [Rot...
Kneesi Scan.JPG - Paint
100%
16:36

Podotrack

Practice II

Diagnosis:

Hip rotation – right side

Action:

Long pronation wedge right

Practice III

Diagnosis:

Difference in Leg Length -- functional or anatomical

Action:

Long pronation wedge right

Short sub wedge right