



ottobock.

3D L.A.S.A.R. Orthotics Tutorial

Overview of the adjustment options for lower limb orthoses, and their effects on the body statics and gait pattern

Quality for life

Introduction/

Introduction

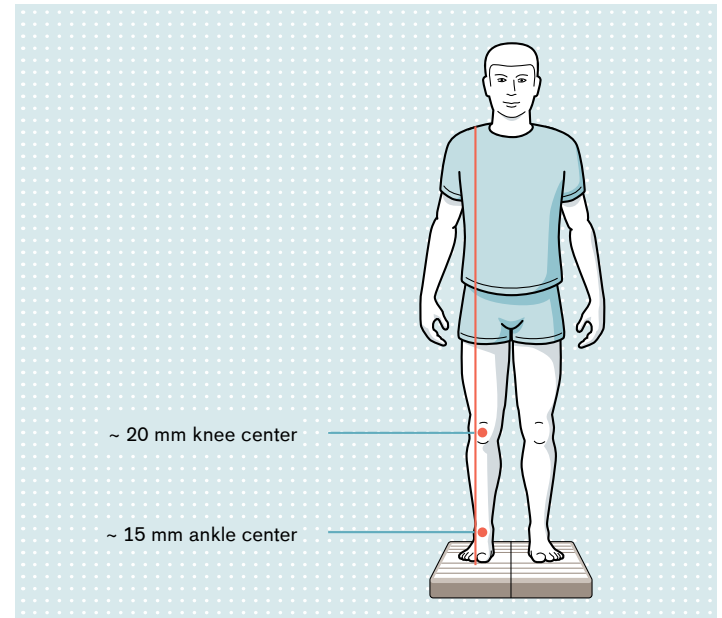
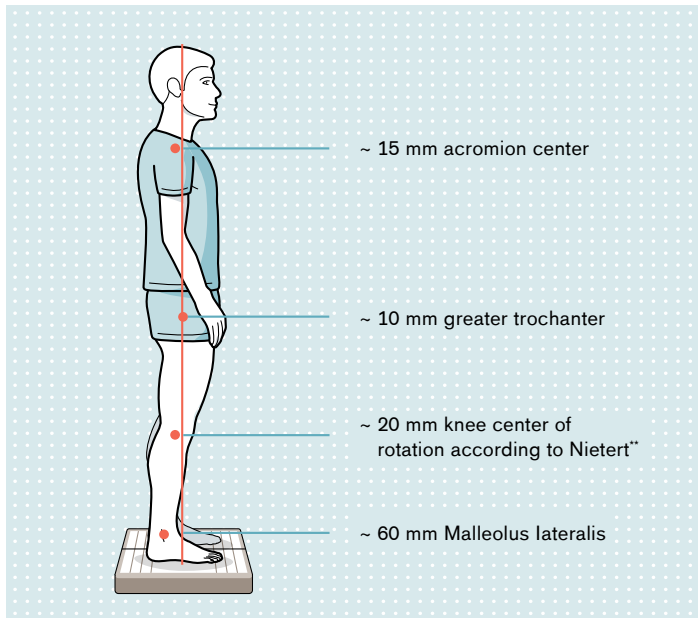
The 3D L.A.S.A.R. orthotics tutorial shows the basic setup and adjustment options to optimize orthosis alignment during fitting. Depending on the indication, a large number of the adjustment options can be immediately applied. In particular, the functional or structural leg length should always be considered for each patient.

For better illustration, the representations are deliberately “exaggerated,” and the implications for the musculoskeletal system have been simplified. For this reason, the view of the upper limb has been omitted. During the examination, however, the upper body inclination is also taken into account. The dimensions refer to the 2D L.A.S.A.R. posture mode (vertical, red load line) and are based on the average values that correspond to the posture of healthy individuals. In principle, the scale of these values should be reached or deliberately deviated from for therapeutic reasons. For the static adjustment of the orthosis alignment, the distances between the load line and the reference points of the knee joint are in most cases decisive. In practice,

a distance of 15 mm between the load line and reference point has proved useful for adjustments in the sagittal plane. This value is very close to the physiological comparison value. Following the static alignment, the focus during the dynamic fitting is on whether the desired knee movement is achieved in the stance phase or whether the alignment may have to be readjusted.

A compromise often has to be made due to the individual’s pathology. To do so, a detailed clinical examination focusing on joint status, muscle status, and sensitivity is required to assess and apply the results of the statics analysis.

Mean statics values of healthy persons (study of 2017)*



* Source: Bellmann, M., Blumentritt, S., Pusch, M., Schmalz, T., Schönemeier, M. Das 3D L.A.S.A.R. – eine neue Generation der Statik-Analyse zur Optimierung des Aufbaus von Prothesen und Orthesen (The 3D L.A.S.A.R. – a new generation of static analysis for optimisation of prosthetic and orthotic alignment). Orthopädie-Technik 2017 (12); 68: 18–25.

** Compromise knee rotation according to Nietert: approx. 2 cm above the medial tibial plateau 60%/40% in the a/p direction.

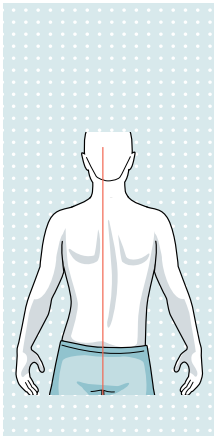
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Leg length compensation/ Heel height

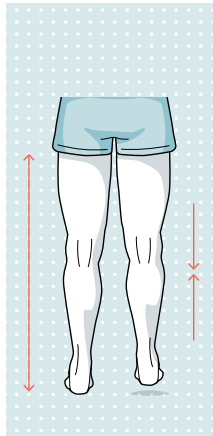
01 | Adjustment of leg length compensation and heel height

Initial situation



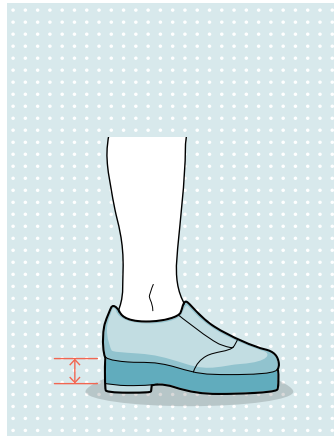
Scoliotic malposition

Possible main causes



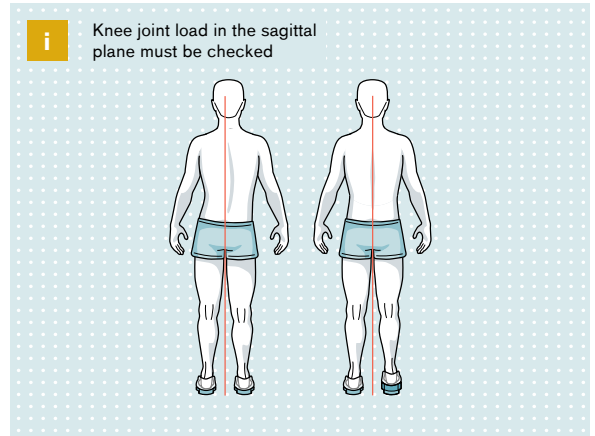
Leg length discrepancy (right)

Proposed design characteristics and design



Full-sole leg length compensation in or under the shoe

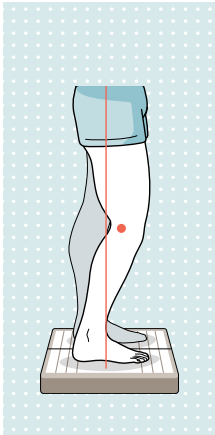
Adjustment option



Set leg length compensation so that the spine is straight and the body centerline runs through the cervical vertebra C7

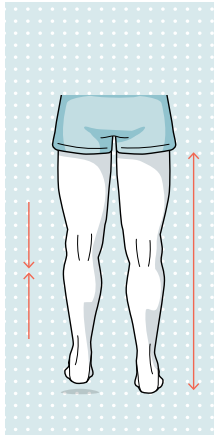
01 | Adjustment of leg length compensation and heel height

Initial situation



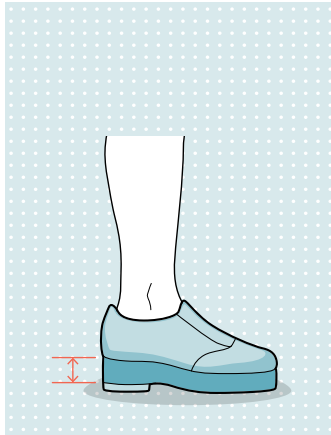
Load line is behind the knee center of rotation

Possible main causes



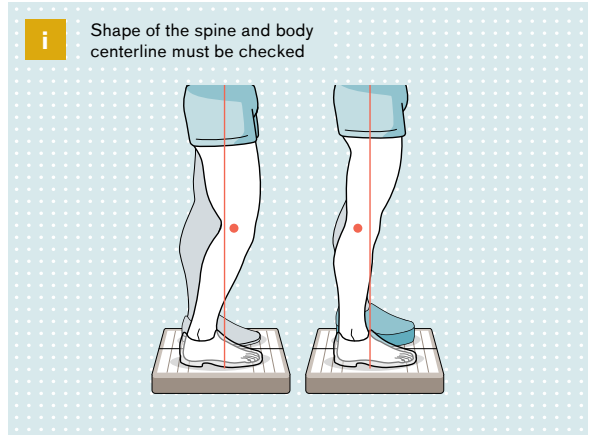
Leg length discrepancy (left)

Proposed design characteristics and design



Full-sole leg length compensation in or under the shoe

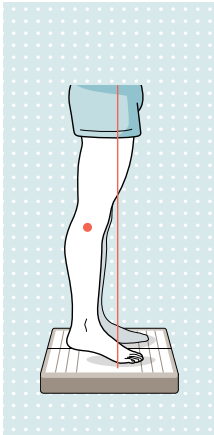
Adjustment option



Set leg length compensation so that the load line in physiological terms (~ 15 mm) is in front of the knee joint

01 | Adjustment of leg length compensation and heel height

Initial situation



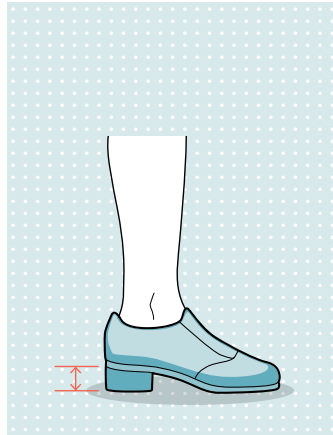
Load line is too far in front of the knee center of rotation; heel does not have floor contact

Possible main causes



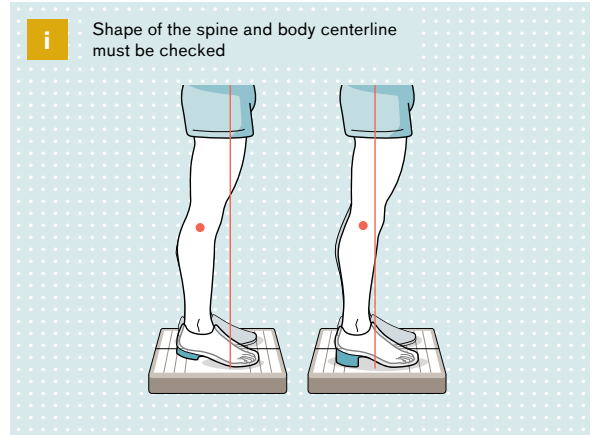
Pes equinus

Proposed design characteristics and design



Heel lift added to shoe

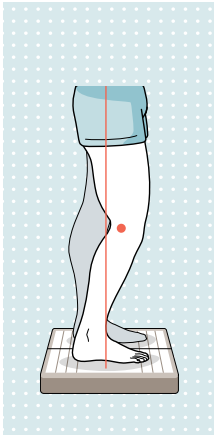
Adjustment option



Set heel height so that the load line in physiological terms (~ 15 mm) is in front of the knee joint

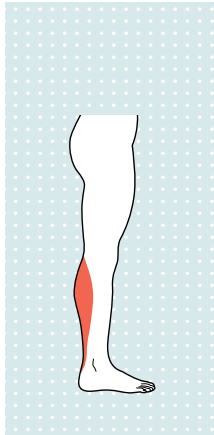
02 | Adjustment of the upper ankle joint angle in the sagittal plane

Initial situation



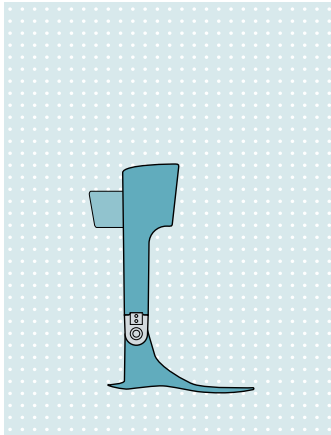
Load line is behind the knee center of rotation

Possible main causes



Insufficiency of the calf muscles

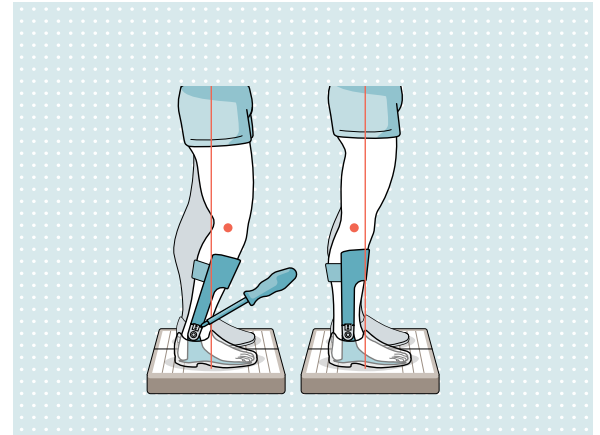
Proposed design characteristics and design



Ankle-foot orthosis

- Frontal support element
- Soft heel
- Forefoot with resistance

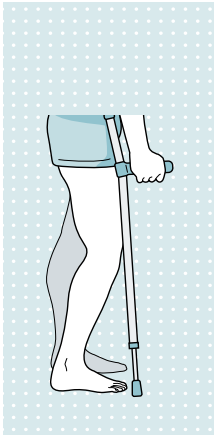
Adjustment option



Set dorsal stop so that the load line in physiological terms (~ 15 mm) is in front of the knee joint

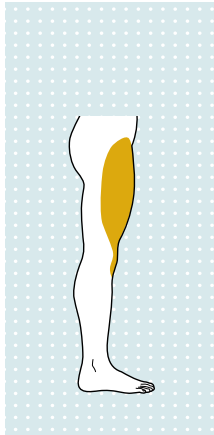
02 | Adjustment of the upper ankle joint angle in the sagittal plane

Initial situation



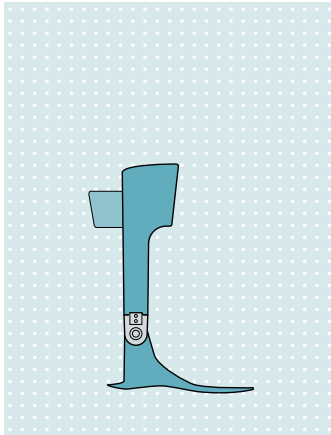
Leg not capable of bearing load

Possible main causes



Minor insufficiency of the knee extensors

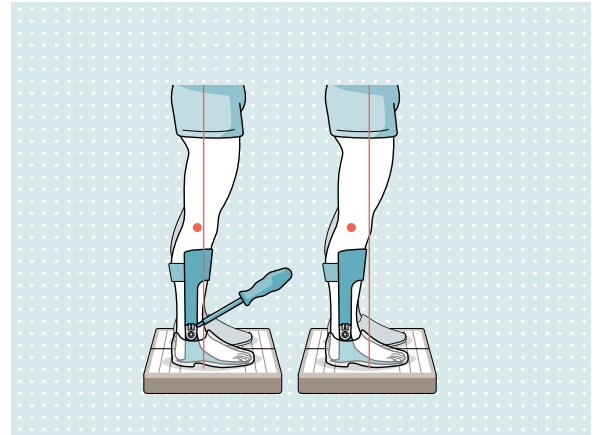
Proposed design characteristics and design



Ankle-foot orthosis

- Ventral support element
- Soft heel
- Forefoot with resistance

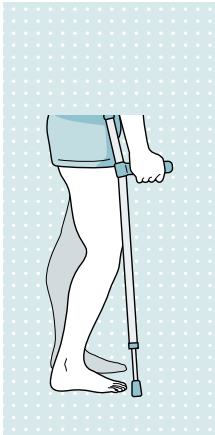
Adjustment option



Set dorsal stop so that the load line is 20 to 35 mm in front of the knee center of rotation

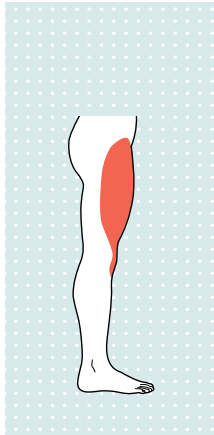
02 | Adjustment of the upper ankle joint angle in the sagittal plane

Initial situation



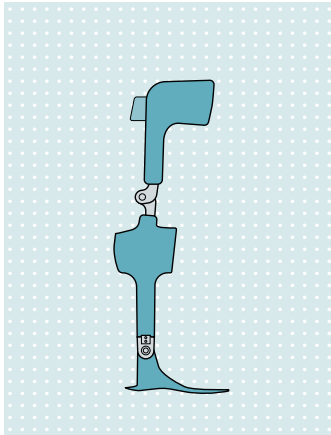
Leg not capable of bearing load

Possible main causes



Insufficiency of the knee extensors

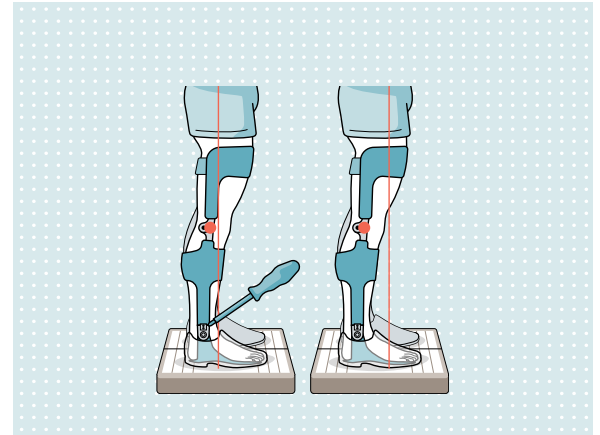
Proposed design characteristics and design



Knee-ankle-foot orthosis

- Ventral support on the thigh
- Ventral and dorsal support on the lower leg
- Free motion knee joint, set to the posterior
- Soft heel
- Possibly forefoot with resistance

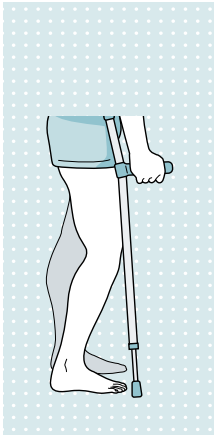
Adjustment option



Set dorsal stop so that the load line is 40 to 60 mm in front of the knee center of rotation

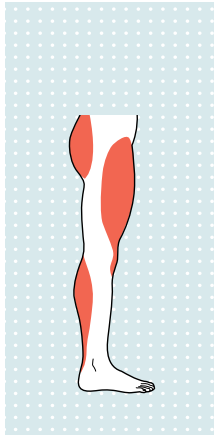
02 | Adjustment of the upper ankle joint angle in the sagittal plane

Initial situation



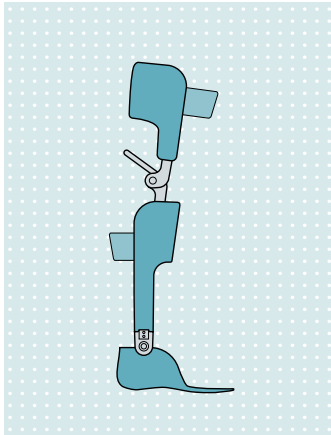
Leg not capable of bearing load

Possible main causes



Insufficiency of the extensor chain

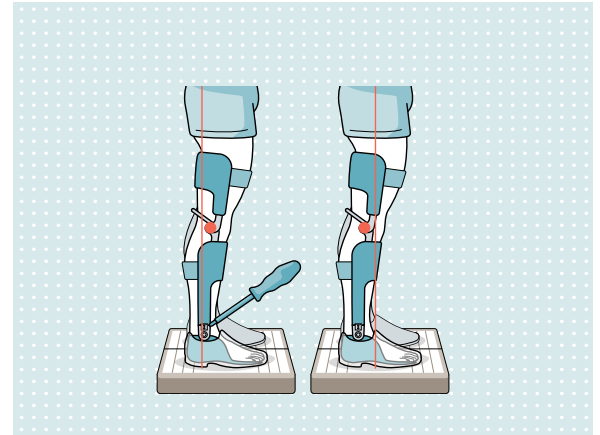
Proposed design characteristics and design



Knee-ankle-foot orthosis

- Dorsal support on the thigh
- Ventral support on the lower leg
- Foot with heel support
- Locked knee joint, E-MAG Active or C-Brace

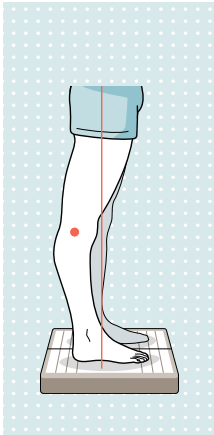
Adjustment option



The knee angle has already been corrected. Set dorsal stop so that the load line in physiological terms is in front of the knee center of rotation. A physiological alignment is indicated in connection with the C-Brace. If necessary, the load line must be further advanced in order to achieve the necessary stabilization of the knee.

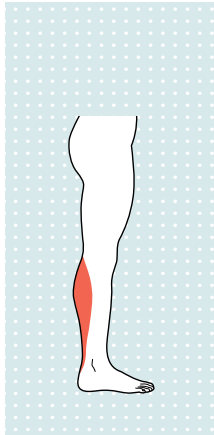
02 | Adjustment of the upper ankle joint angle in the sagittal plane

Initial situation



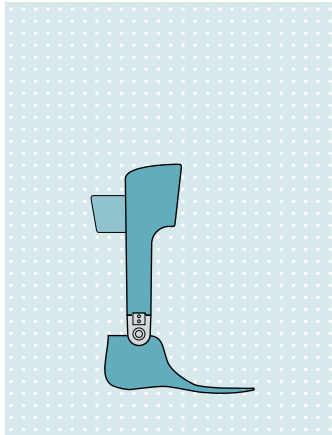
Load line is far in front of the knee center of rotation

Possible main causes



Insufficiency of the calf muscles

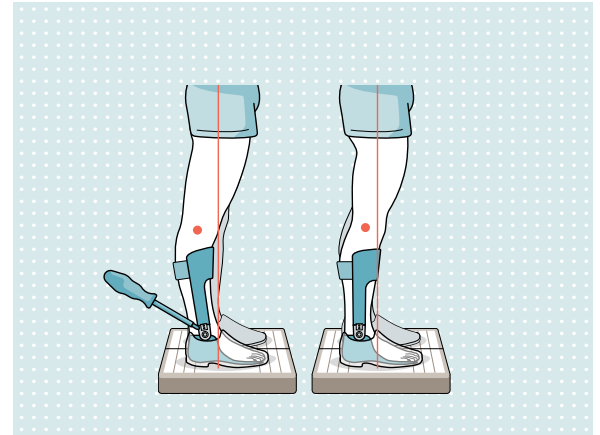
Proposed design characteristics and design



Ankle-foot orthosis

- Ventral support element
- Stiff heel
- Forefoot with little resistance

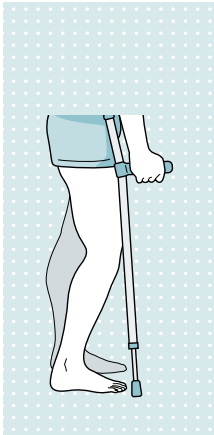
Adjustment option



Set knee angle so that the load line in physiological terms (~ 15 mm) is in front of the knee joint

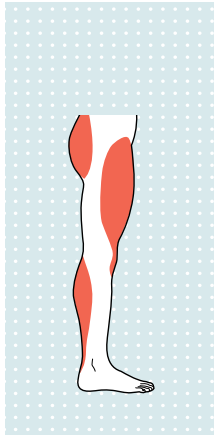
03 | Adjustment of the knee joint angle in the sagittal plane

Initial situation



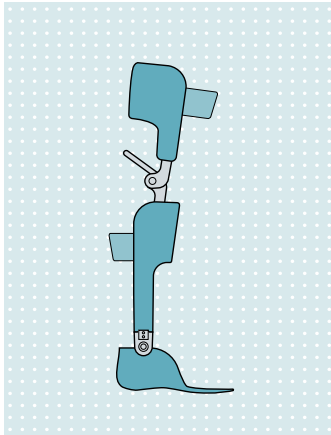
Leg not capable of bearing load

Possible main causes



Insufficiency of the extensor chain

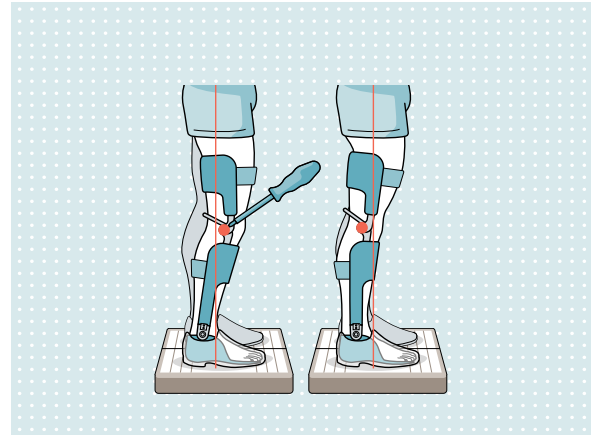
Proposed design characteristics and design



Knee-ankle-foot orthosis

- Dorsal support on the thigh
- Ventral support on the lower leg
- Foot with heel support
- Locked knee joint, E-MAG Active, or C-Brace

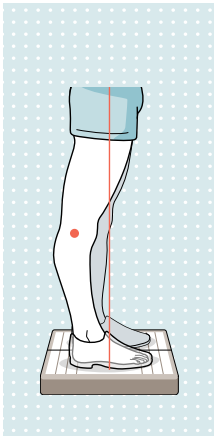
Adjustment option



Set knee angle so that the load line in physiological terms (~ 15 mm) is in front of the knee joint

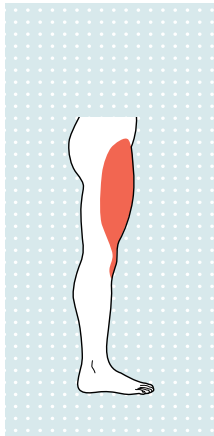
03 | Adjustment of the knee joint angle in the sagittal plane

Initial situation



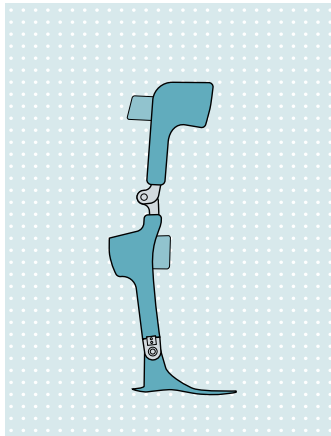
Knee joint is hyperextended, load line is far in front of the knee center of rotation

Possible main causes



Insufficiency of the knee extensors

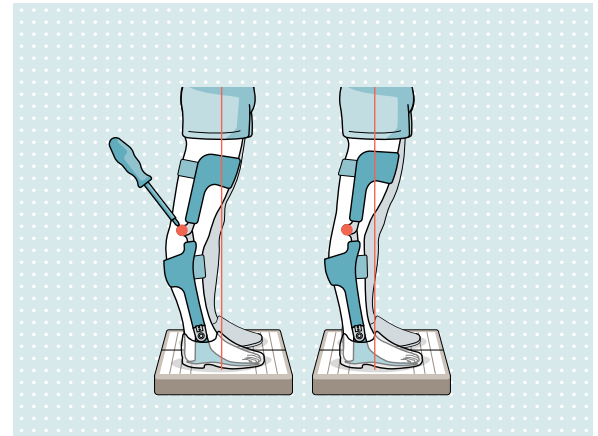
Proposed design characteristics and design



Knee-ankle-foot orthosis

- Ventral support on the thigh
- Dorsal support on the lower leg
- Soft heel
- Free-motion knee joint (pushed back if necessary)

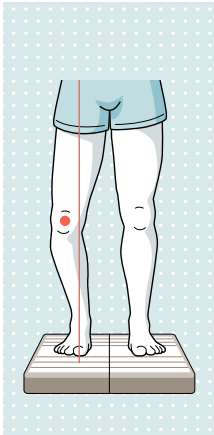
Adjustment option



Set knee angle so that the load line is 40 to 60 mm in front of the knee center of rotation

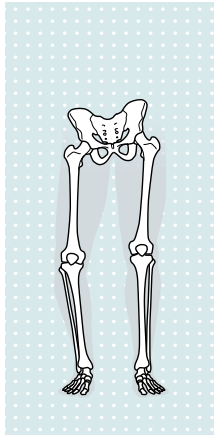
04 | Adjustment of the knee angle in the frontal plane

Initial situation



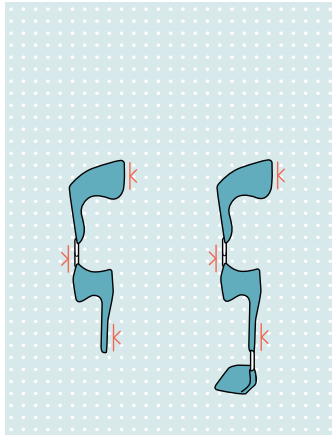
Load line is medially next to the knee center

Possible main causes



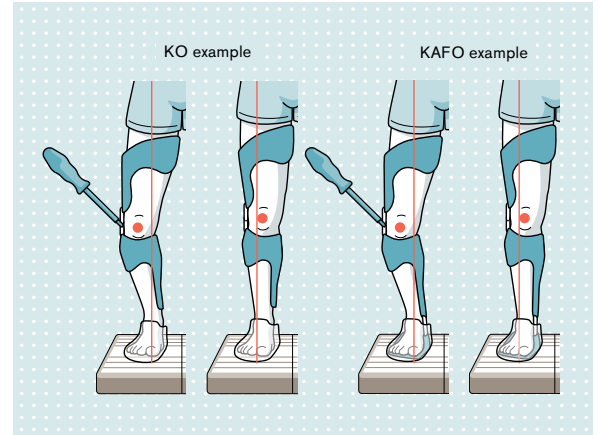
Genu varum

Proposed design characteristics and design



Knee orthosis or knee-ankle-foot orthosis
• Valgus 3-point principle

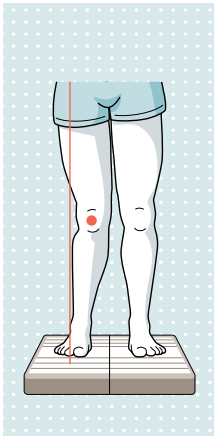
Adjustment option



Correct knee axis until the load line in physiological terms (~ 20 mm) is laterally next to the knee center

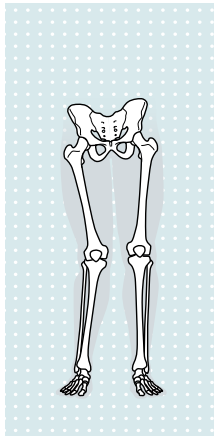
04 | Adjustment of the knee angle in the frontal plane

Initial situation



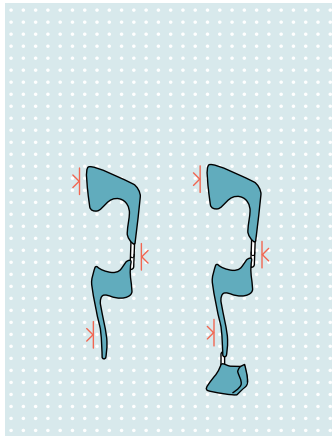
Load line is far laterally next to the knee center

Possible main causes



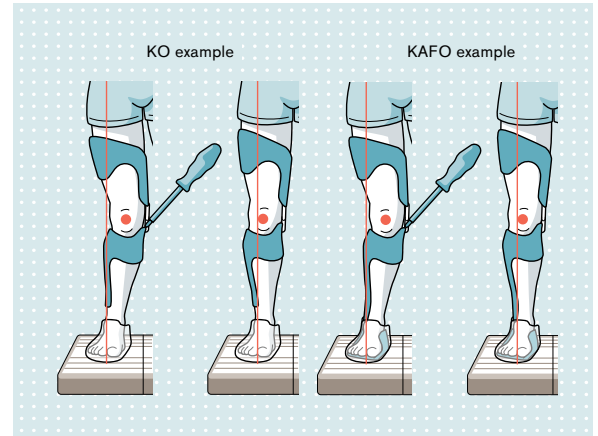
Genu valgum

Proposed design characteristics and design



Knee orthosis or knee-ankle-foot orthosis
• Varus 3-point principle

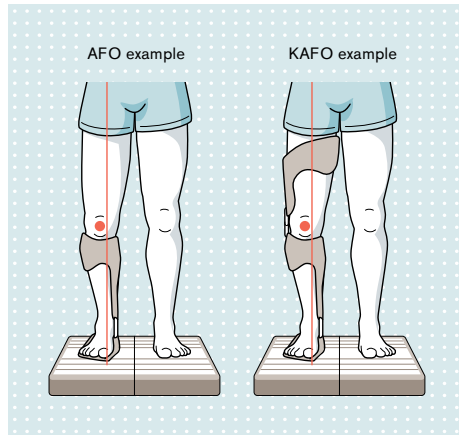
Adjustment option



Correct knee axis until the load line in physiological terms (~ 20 mm) is laterally next to the knee center

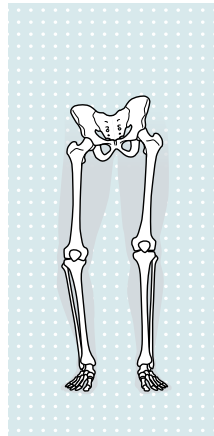
05 | Adjustment of the foot position in the frontal plane

Initial situation



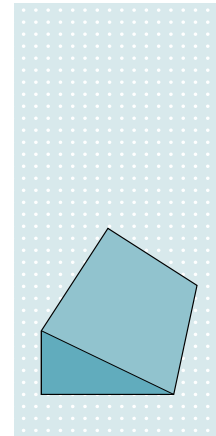
Load line is medially next to the knee center, knee axis cannot be corrected or has already undergone maximum correction

Possible main causes



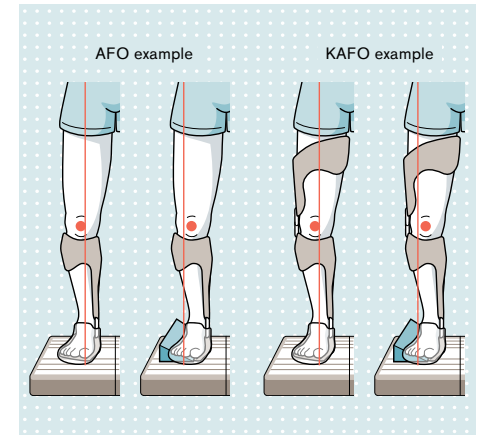
Genu varum

Proposed design characteristics and design



Lateral wedge

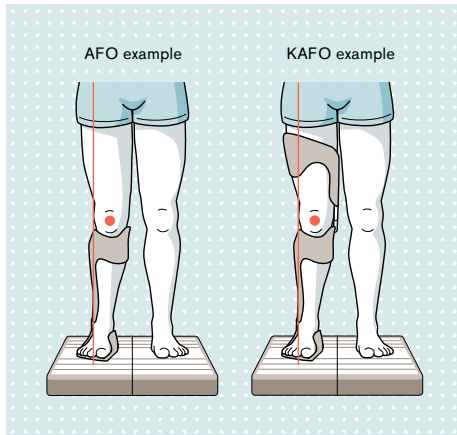
Adjustment option



Set lateral wedge in such a way that the load line in physiological terms (~ 20 mm) is laterally next to the knee center

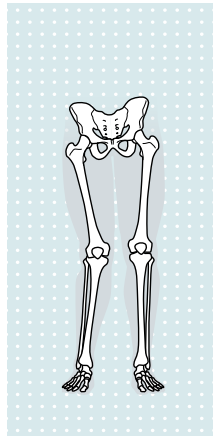
05 | Adjustment of the foot position in the frontal plane

Initial situation



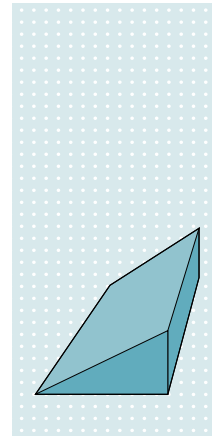
Load line is far laterally next to the knee center, knee axis cannot be corrected or has already undergone maximum correction

Possible main causes



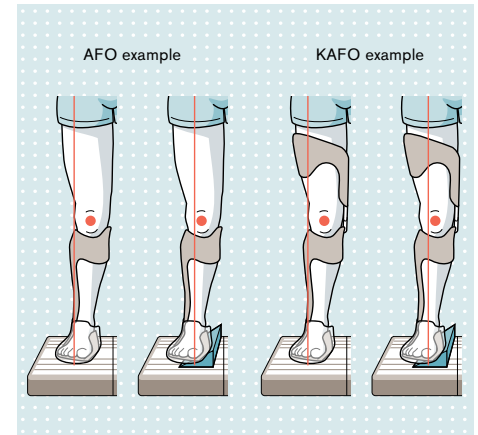
Genu varum

Proposed design characteristics and design



Medial wedge

Adjustment option



Set medial wedge so that the load line in physiological terms (~ 20 mm) is laterally next to the knee center

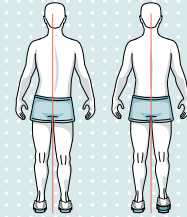
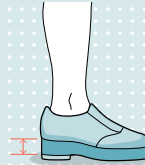
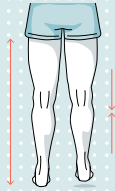
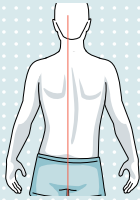
Initial situation

Possible main causes

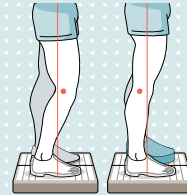
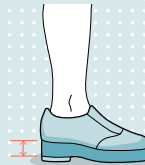
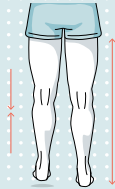
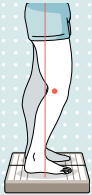
Proposed design characteristics and design

Adjustment option

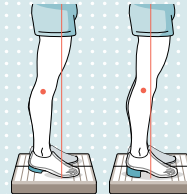
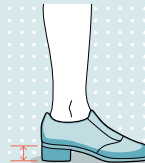
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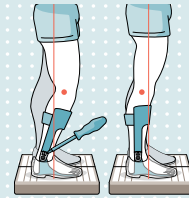
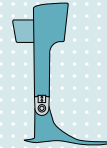
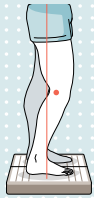
Initial situation

Possible main causes

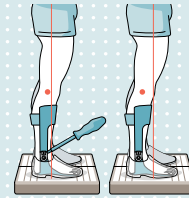
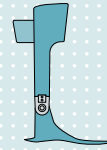
Proposed design characteristics and design

Adjustment option

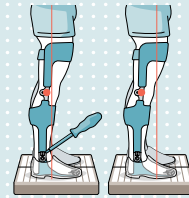
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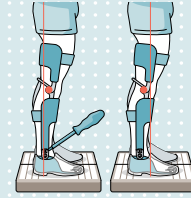
Initial situation

Possible main causes

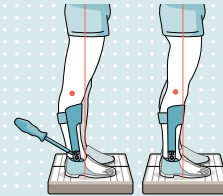
Proposed design characteristics and design

Adjustment option

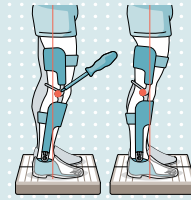
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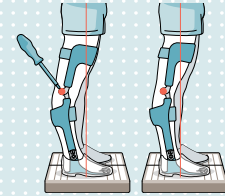
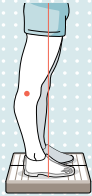
Initial situation

Possible main causes

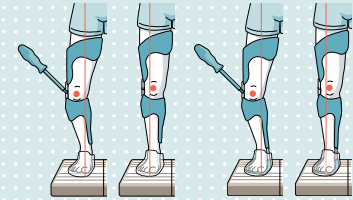
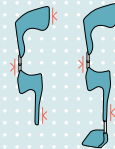
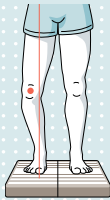
Proposed design characteristics and design

Adjustment option

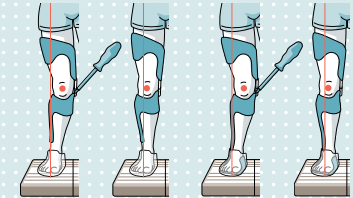
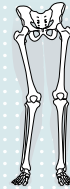
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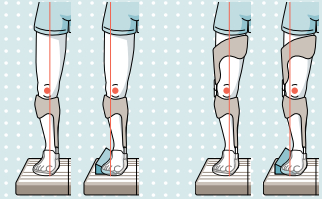
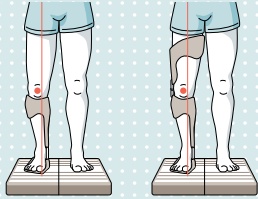
Initial situation

Possible main causes

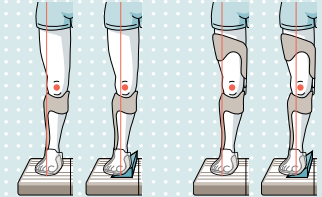
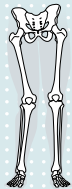
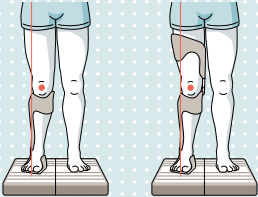
Proposed design characteristics and design

Adjustment option

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