Stability of Orthoses

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Goal of an Orthotic Treatment

Producing a functional orthosis which bears all occurring loads and serves its purpose.

Goal of an Orthotic Treatment

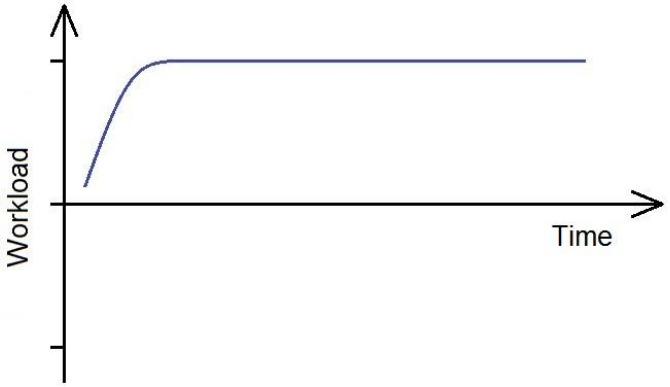
Functionality
Stability
Purpose

Stability calculation not possible without knowing the load

Load on Orthoses

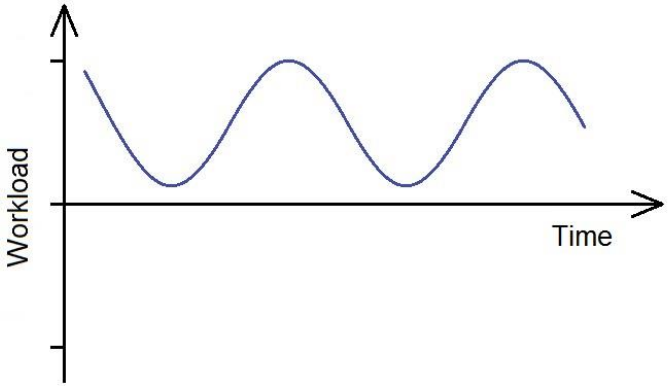
Excursion:
What are the basic loads on orthoses?

Static Load

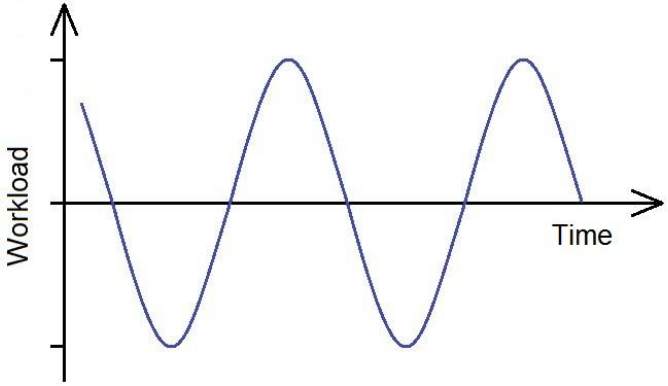


load at rest

Dynamic Load

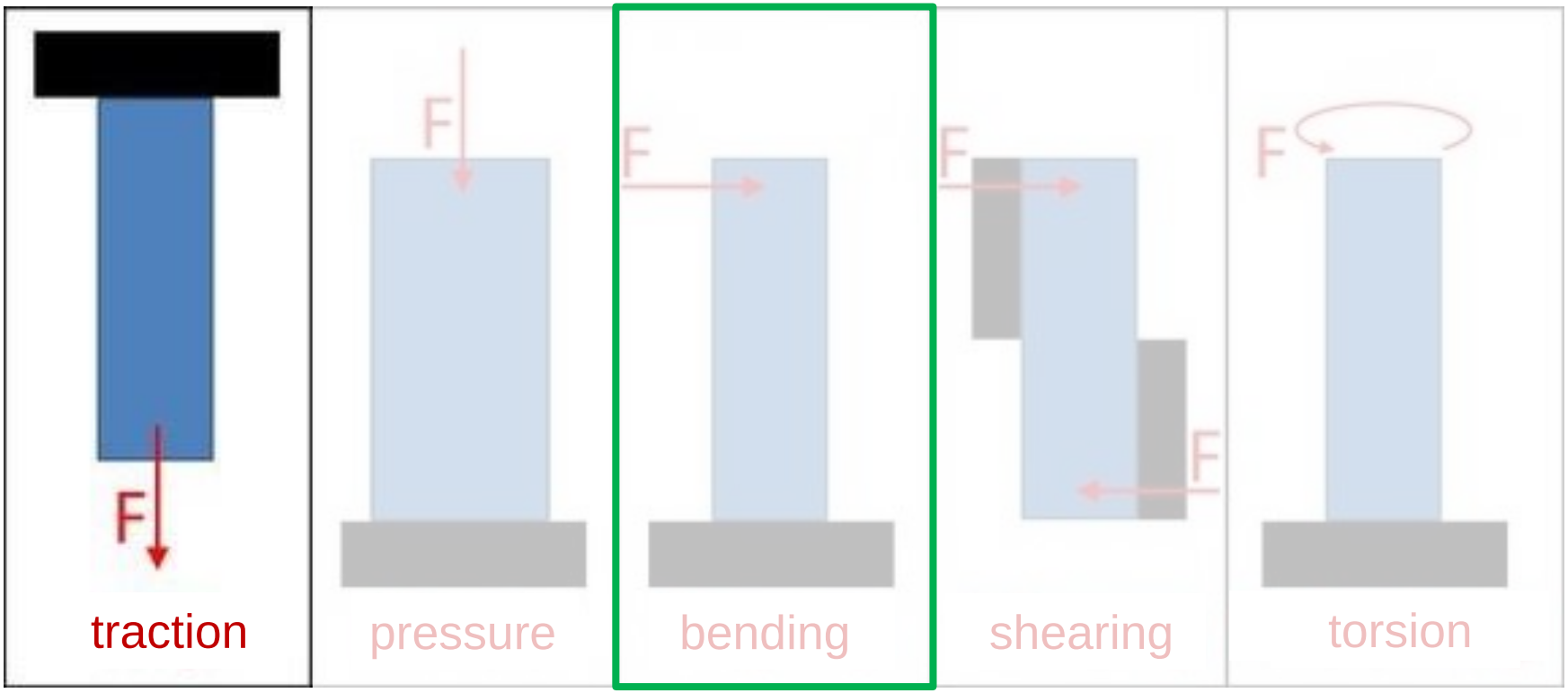


cyclic load



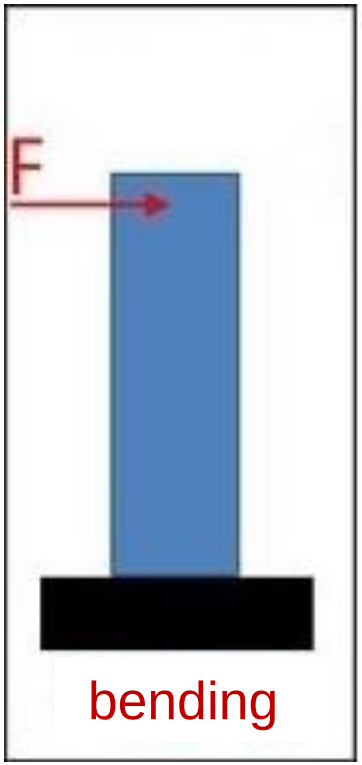
alternating load

5 Basic Types of Workloads



http://www.cnc-lehrgang.de/festigkeitslehre/

Workload on an Orthosis in Terminal Stance

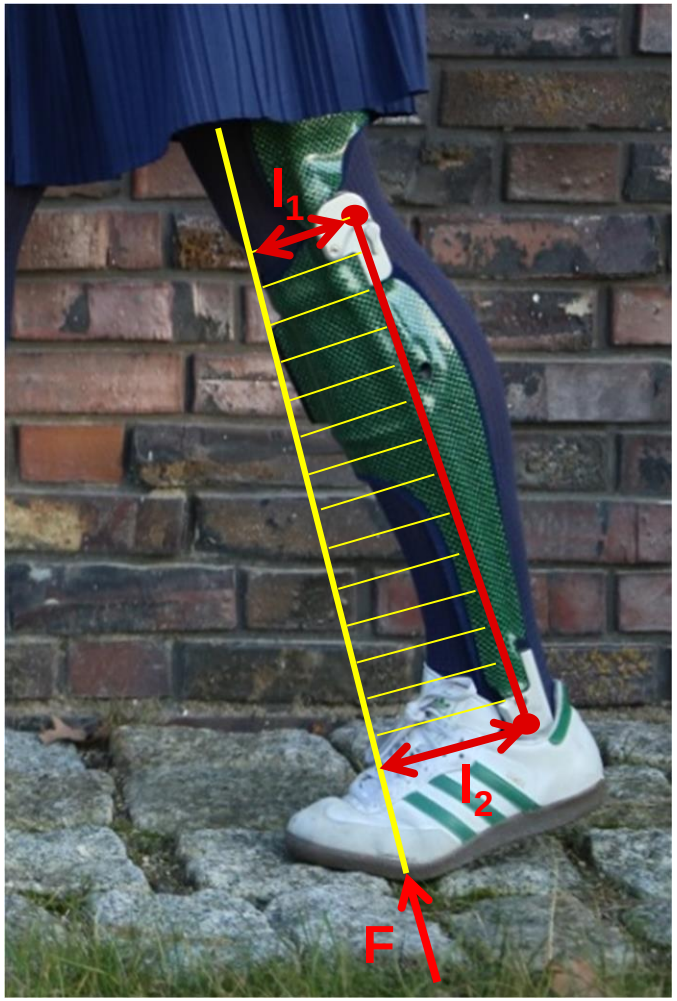


bending moment = force * lever arm

$M_B = F * l$

$M_{B1} = F * l_1$

$M_{B2} = F * l_2$



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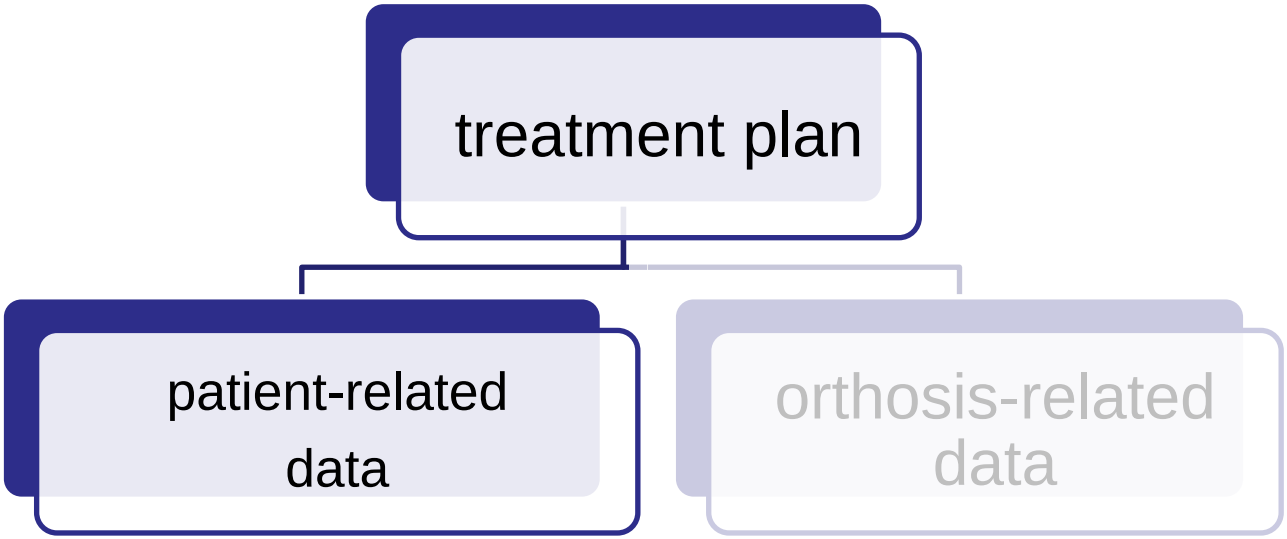
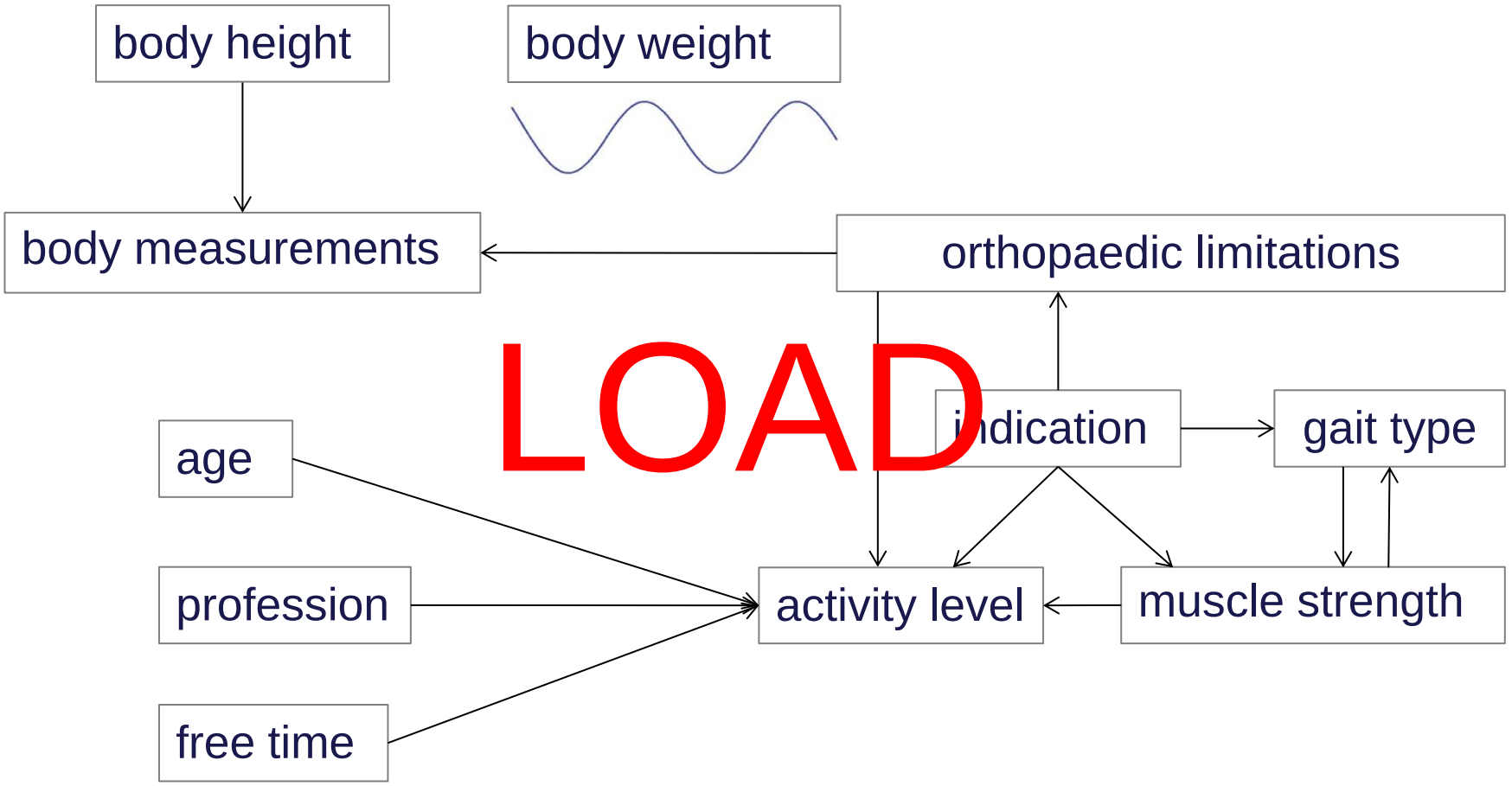
Factors Influencing the Load

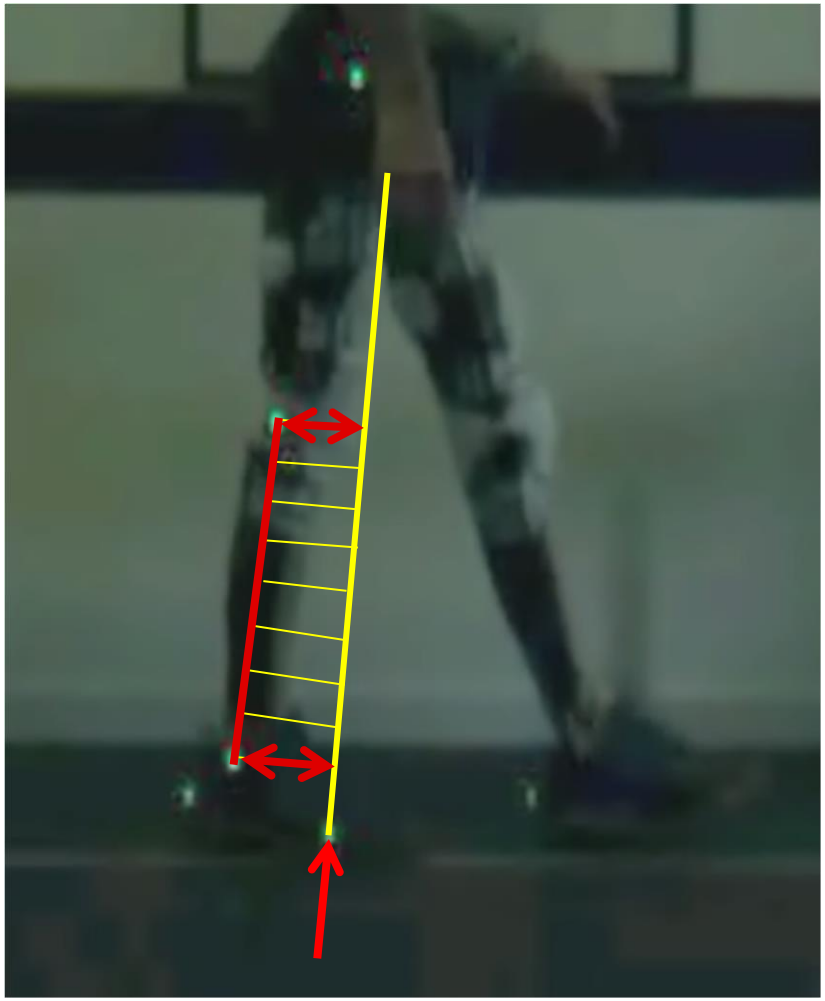
Which parameters affect the load on an orthosis?

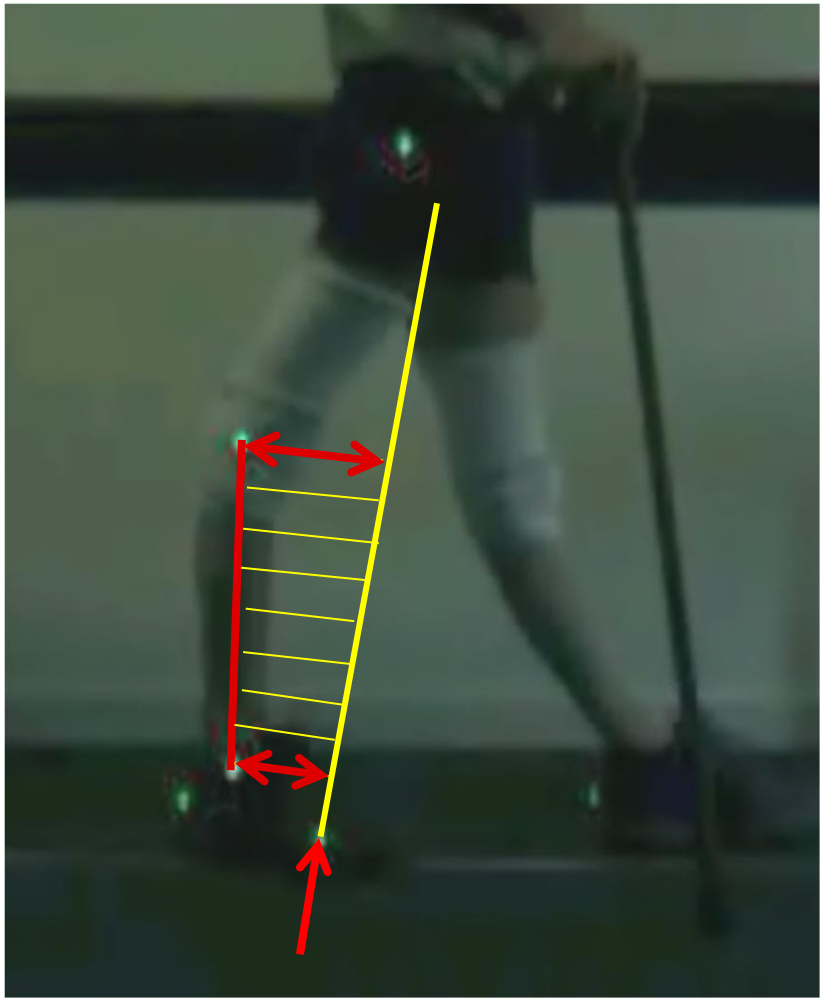


Patient-related Data



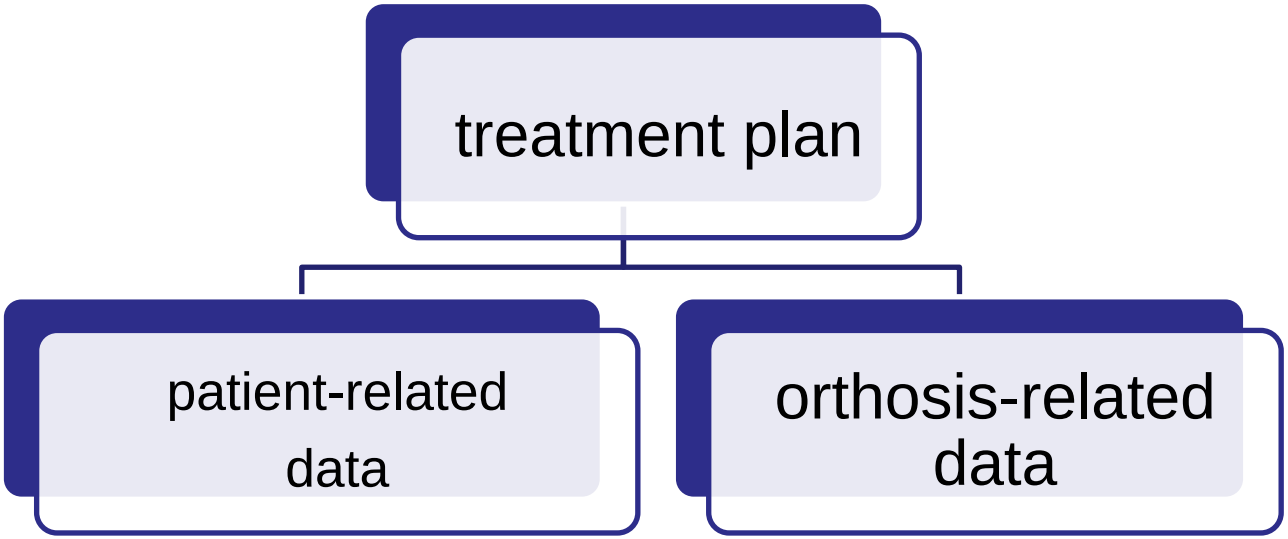
Example: Influence of a Genu Recurvatum



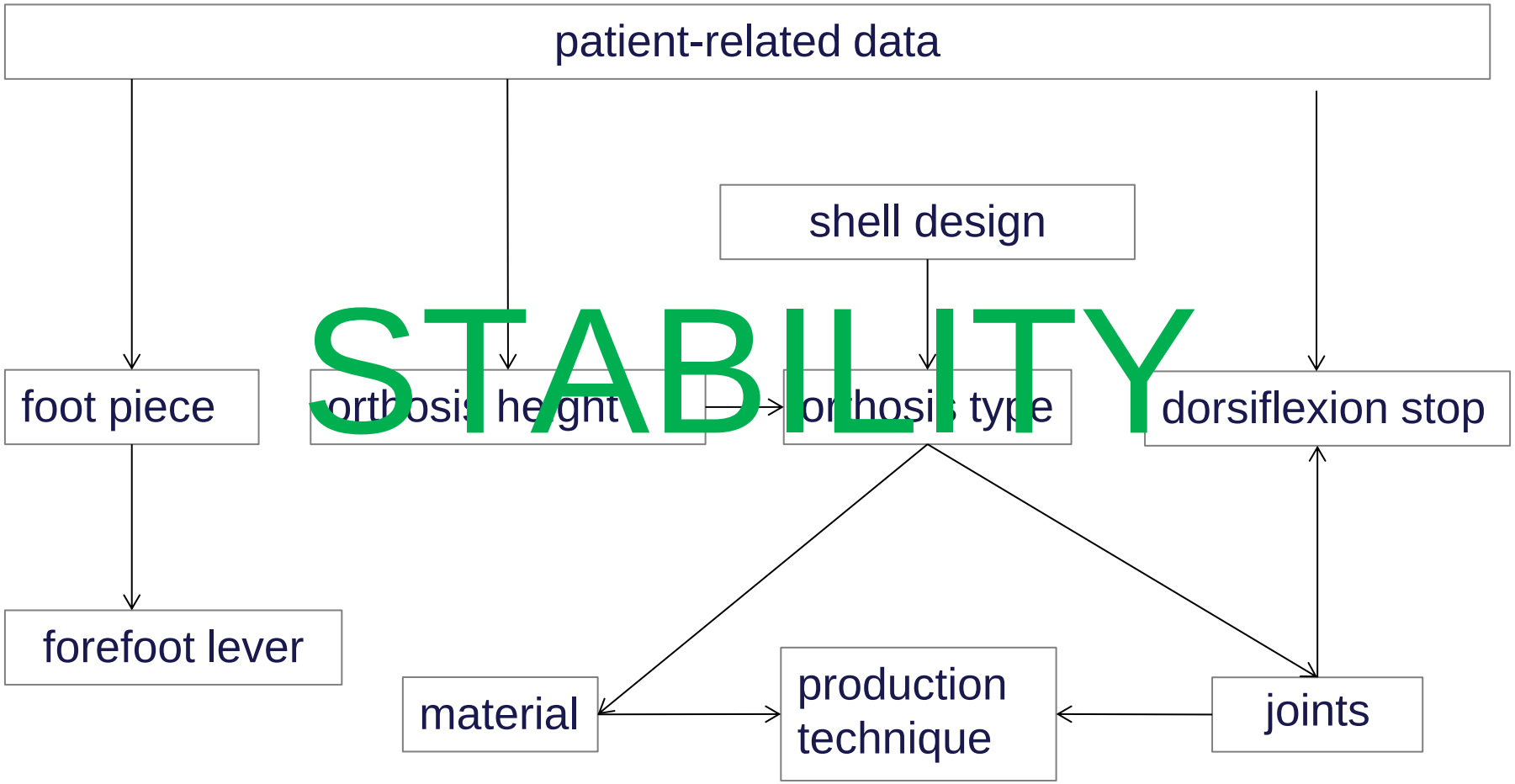


Factors Influencing Stability

Which parameters affect the stability of an orthosis?



Orthosis-related Data



Example: Stability of Orthoses

Orthosis' features:

- AFO
- ventral tibial shell
- long rigid foot piece

Load:

- force transmission (F_{KG})
- ground reaction force (F_{GRF})
- length of the tibial shell (l_{TS})
- length of the forefoot lever (l_{FFL})
- bending moment (M_B)

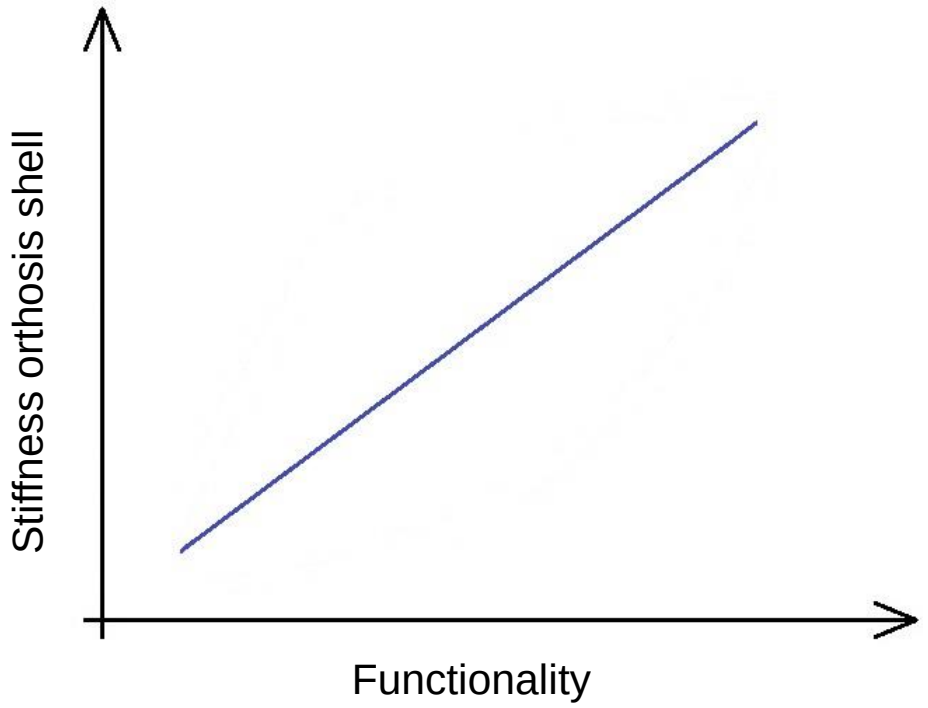
Stability:

- material
- production technique
- bending stiffness

Functionality:

- ankle joint

Stability vs. Functionality



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Stability vs. Functionality

Example:

classic side bars orthosis

Strong Light Technique

Rivet Attachment Technique

Example:

laminated orthosis (carbon, epoxy resin)

Fibre Composite Technique

JOINT Lamination Technique

The **stiffer** the connection between the joints, the more **load** is on the joints.

Summary

- stability calculation not possible without knowing the load
- patient-related AND orthosis-related data
- weight is known to vary significantly in some cases
- load-related AND function-related parameter
- a wide range of relevant influence factors

Each orthosis must be calculated individually.

Thank you for your attention!