

The FIOR & GENTZ Orthosis Configurator

A Tool for Structuring the Orthotic Intervention of Patients with Neurological Gait Disorders

FIOR & GENTZ Gesellschaft für Entwicklung und Vertrieb von orthopädietechnischen Systemen mbH



Foundation of the Company:

- company founders: Jörg **Fior** & Ralf **Gentz**
- year of foundation: **1997**
- premises: **Lüneburg**, Germany

Portfolio:

therapeutic shoes, articulated side bars, preproduced orthosis, **system joints** for producing individual orthoses, **treatment concepts, production techniques**

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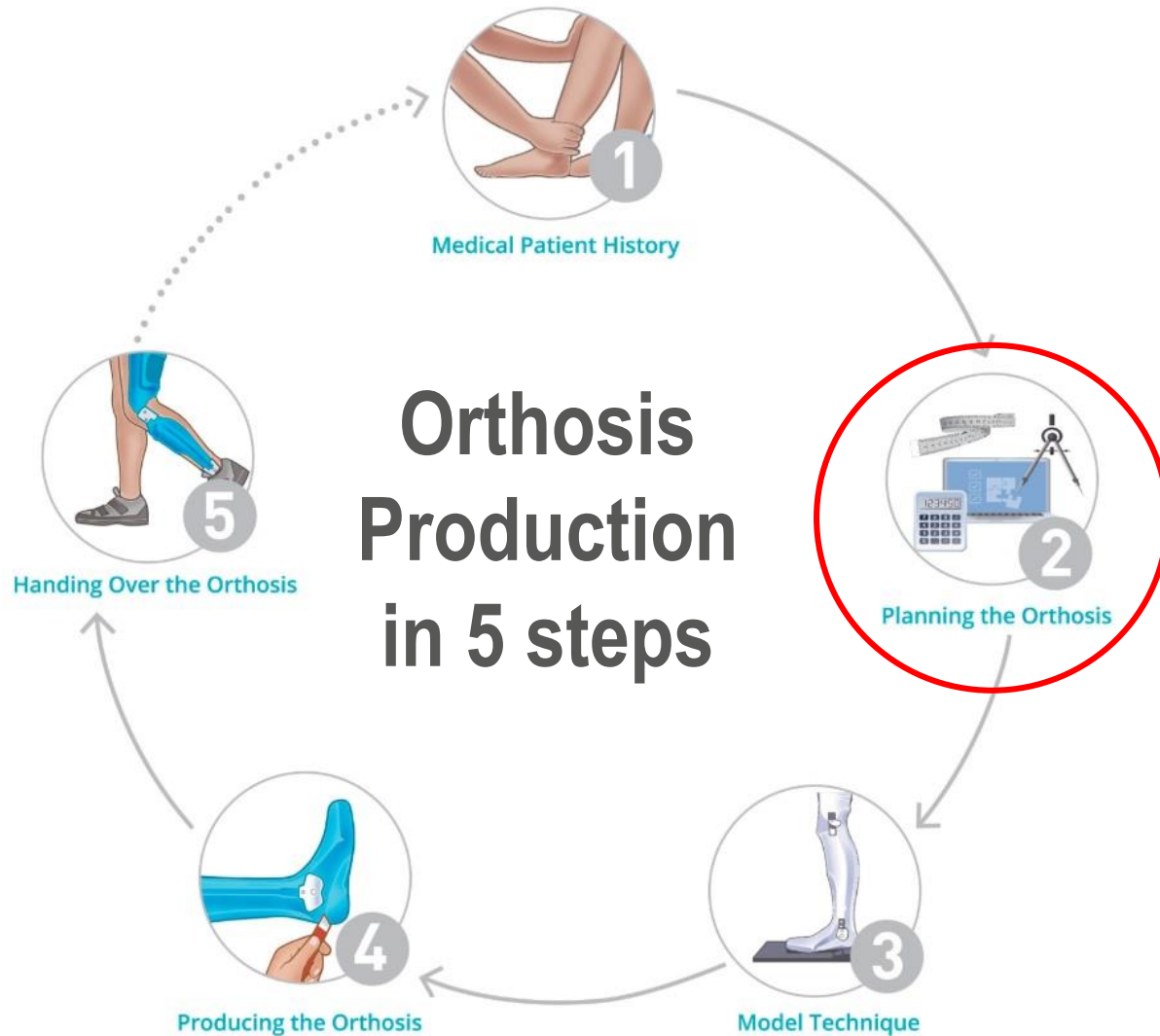
In (country):

DISTRIBUTOR CONTACT INFORMATION

- website:

Content of this presentation

- 360° Orthotics
- Load and Load Capacity of Orthoses
 - patient-related data
 - orthosis-related data
- Defining the Functionality of an Orthosis
 - classification by pathological gait patterns
 - classification by level of injury
 - determination of muscle strength
- The FIOR & GENTZ Orthosis Configurator





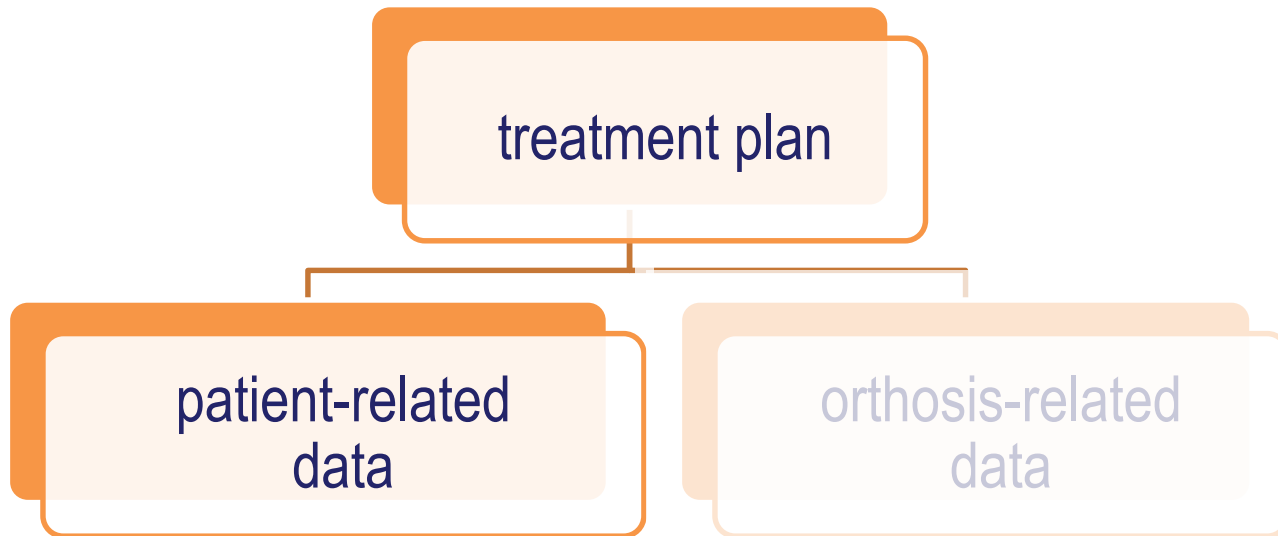
Load and Load Capacity of Orthoses

What is the goal of an orthotic intervention?

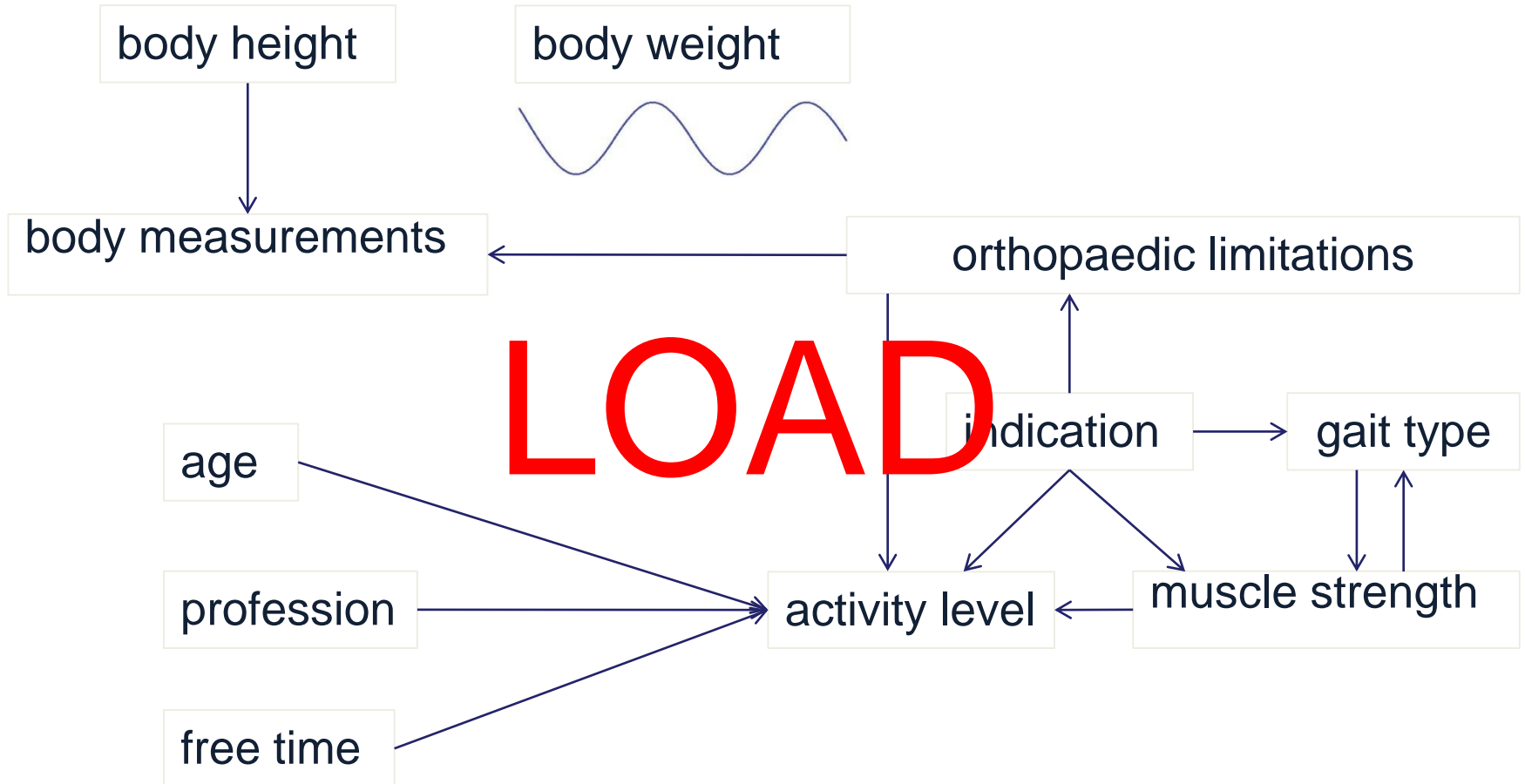
Producing a functional orthosis
that withstands all occurring loads
while fulfilling its purpose

A calculation of the **load capacity** is not possible without knowing the **load**.

Which parameters affect the load on an orthosis?



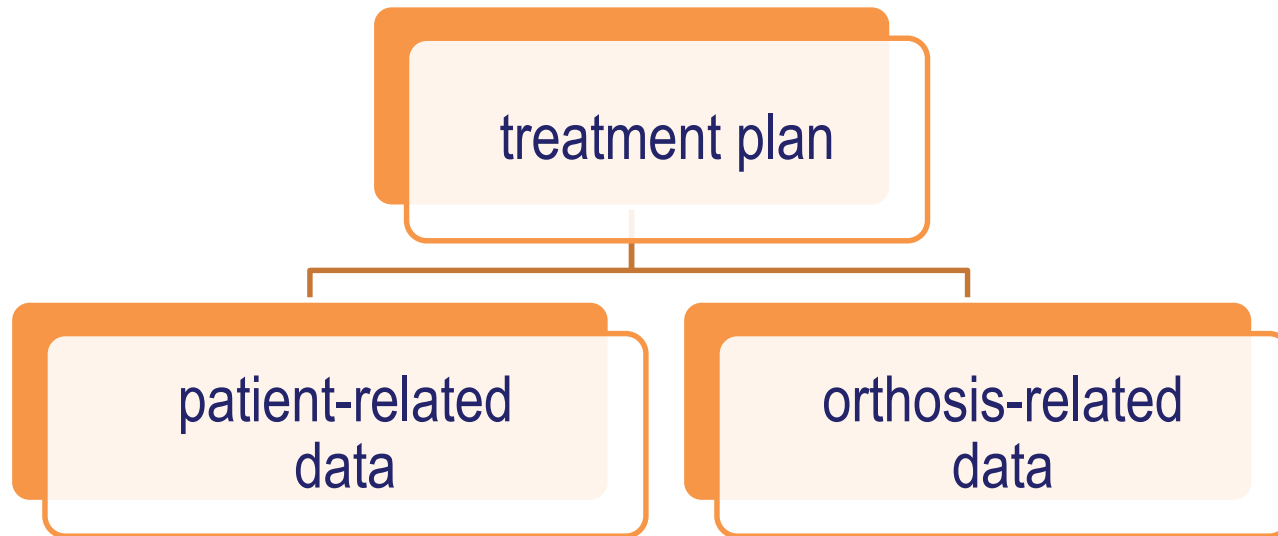
Load and Load Capacity of Orthoses



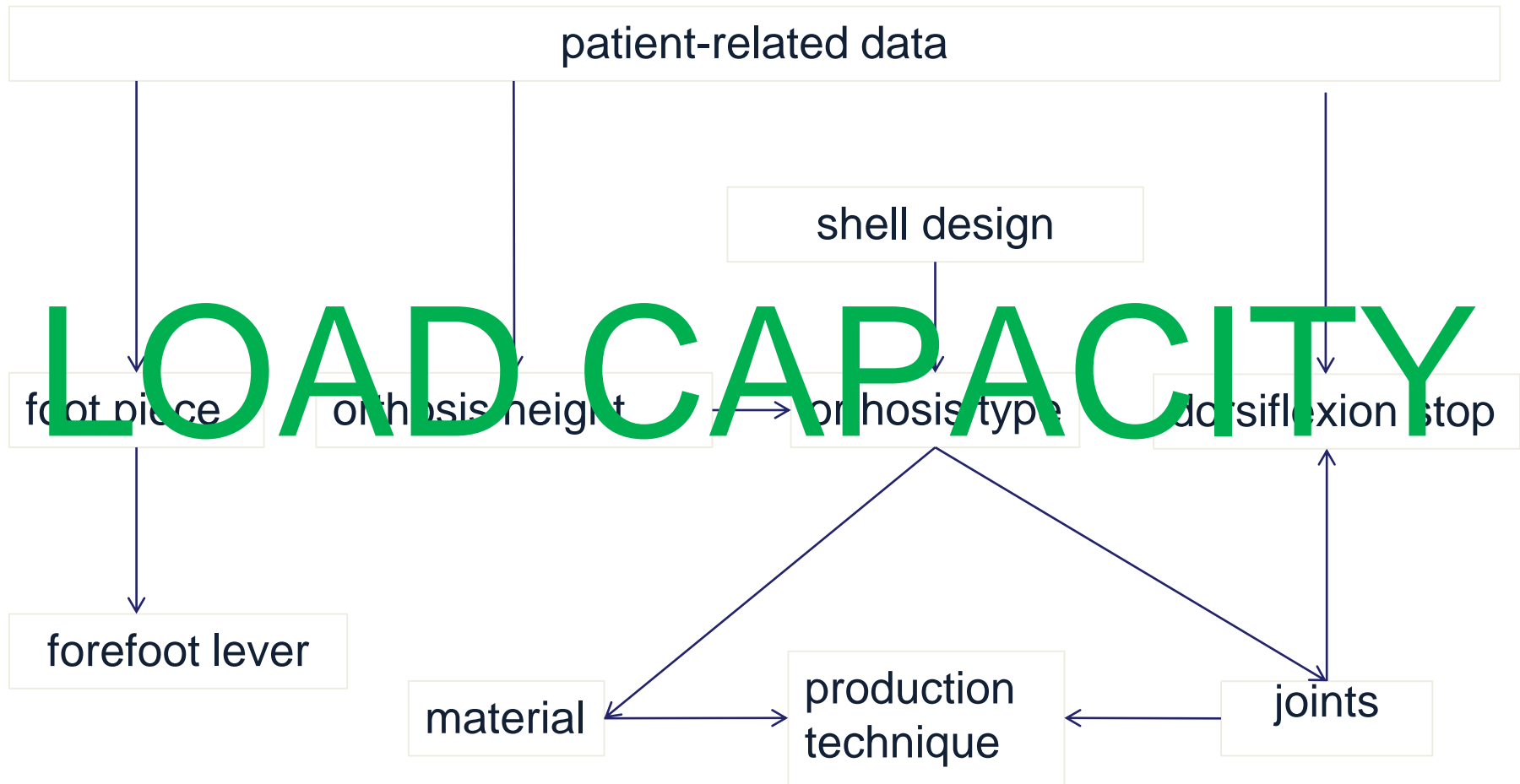
Load and Load Capacity of Orthoses



Which parameters affect the load capacity on an orthosis?



Load and Load Capacity of Orthoses



Load and Load Capacity 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 (I_{TS})
- length of the forefoot lever (I_{FFL})
- bending moment (M_B)

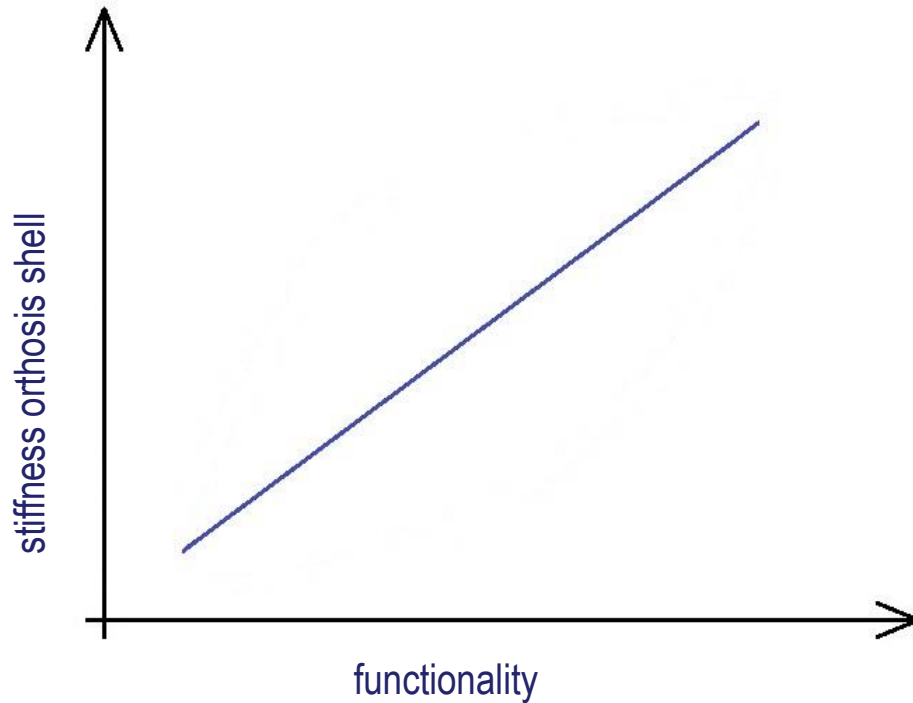
Load Capacity:

- material
- production technique
- bending stiffness

Functionality:

- ankle joint

Load and Load Capacity of Orthoses



Orthosis' Features:

- AFO
- ventral tibial shell
- long rigid foot piece

Load:

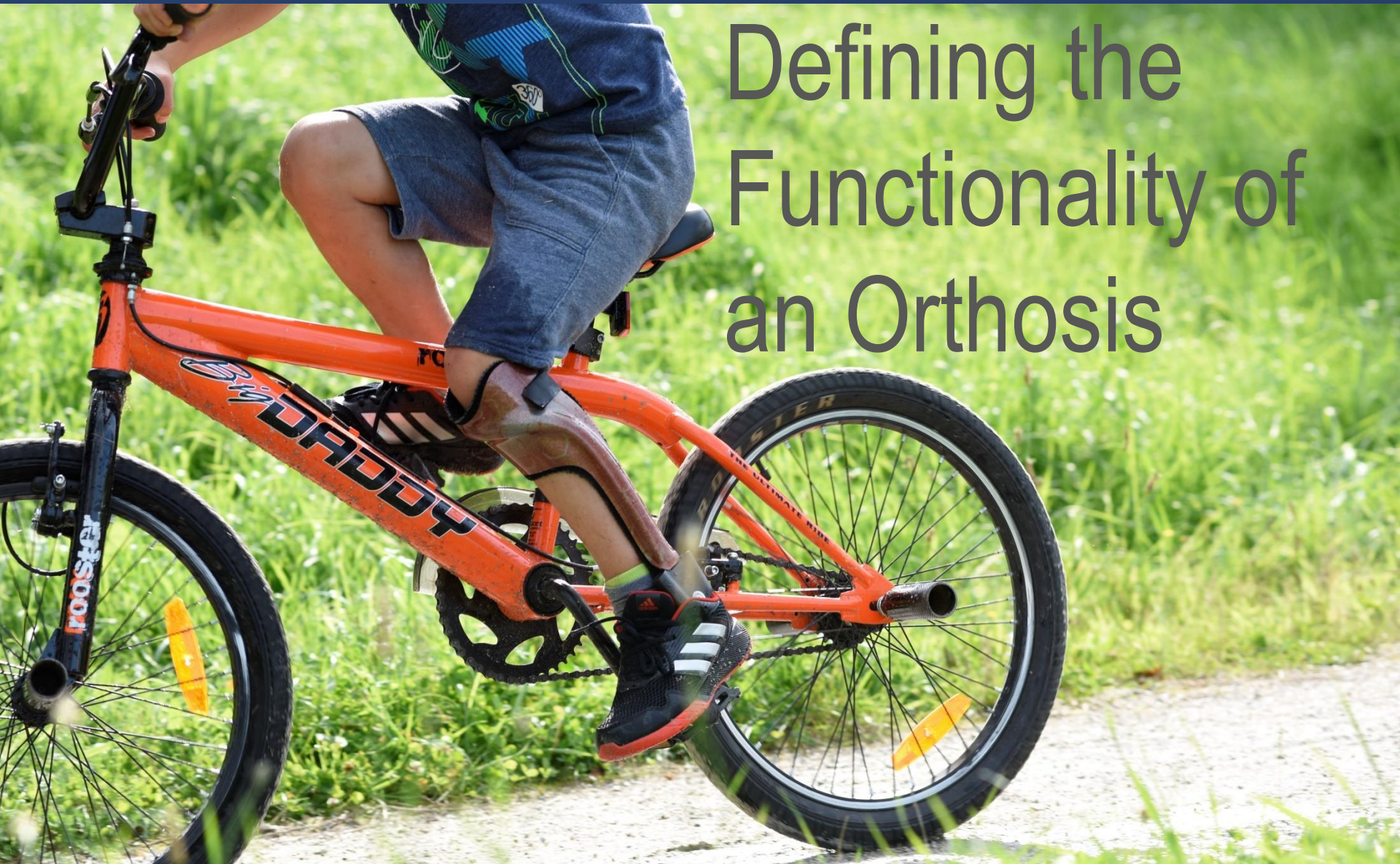
- force transmission (F_{KG})
- ground reaction force (F_{GRF})
- length of the tibial shell (l_{TS})
- length of the forefoot lever (l_{FFL})
- bending moment (M_B)

Load Capacity:

- material
- production technique
- bending stiffness

Functionality:

- ankle joint



Defining the Functionality of an Orthosis

Defining the Functionality of an Orthosis

Classification of Gait Patterns in Stroke Patients






GAIT TYPES ACCORDING TO THE N.A.P.® GAIT CLASSIFICATION				
KNEE	HYPEREXTENSION		HYPERFLEXION	
SAGITTAL				
FRONTAL				
FOOT	INVERSION	EVERSION	INVERSION	EVERSION
GAIT TYPE	TYPE 1A	TYPE 1B	TYPE 2A	TYPE 2B

- assessment of the gait pattern in mid stance
- easy detection of gait characteristics
- Sagittal and frontal planes

Defining the Functionality of an Orthosis

Classification of Gait Patterns in patient with CP

Gait Types According to the Amsterdam Gait Classification

GAIT TYPES ACCORDING TO THE AMSTERDAM GAIT CLASSIFICATION					
GAIT TYPES	TYPE 1	TYPE 2	TYPE 3	TYPE 4	TYPE 5
					
KNEE	NORMAL	HYPEREXTENDED	HYPEREXTENDED	FLEXED	FLEXED
FOOT CONTACT	COMPLETE	COMPLETE	INCOMPLETE	INCOMPLETE	COMPLETE
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- assessment of the gait pattern in mid stance
- easy detection of gait characteristics
- sagittal plane

Defining the Functionality of an Orthosis

AFO/KAFO/KO

www.orthosis-configurator.com

Muscle Strength (According to Janda)

Hip Flexion

0 1 2 3 4 5

Knee Extension

0 1 2 3 4 5

Dorsiflexion

0 1 2 3 4 5



Hip Extension

0 1 2 3 4 5

Knee Flexion

0 1 2 3 4 5

Plantar Flexion

0 1 2 3 4 5

0 (zero) – total paralysis, no evidence of contraction

1 (trace) – slight contraction, but no joint motion

2 (poor) – complete range of motion with gravity eliminated

3 (fair) – complete range of motion against gravity

4 (good) – complete range of motion against gravity with some resistance

5 (normal) – complete range of motion against gravity with full resistance

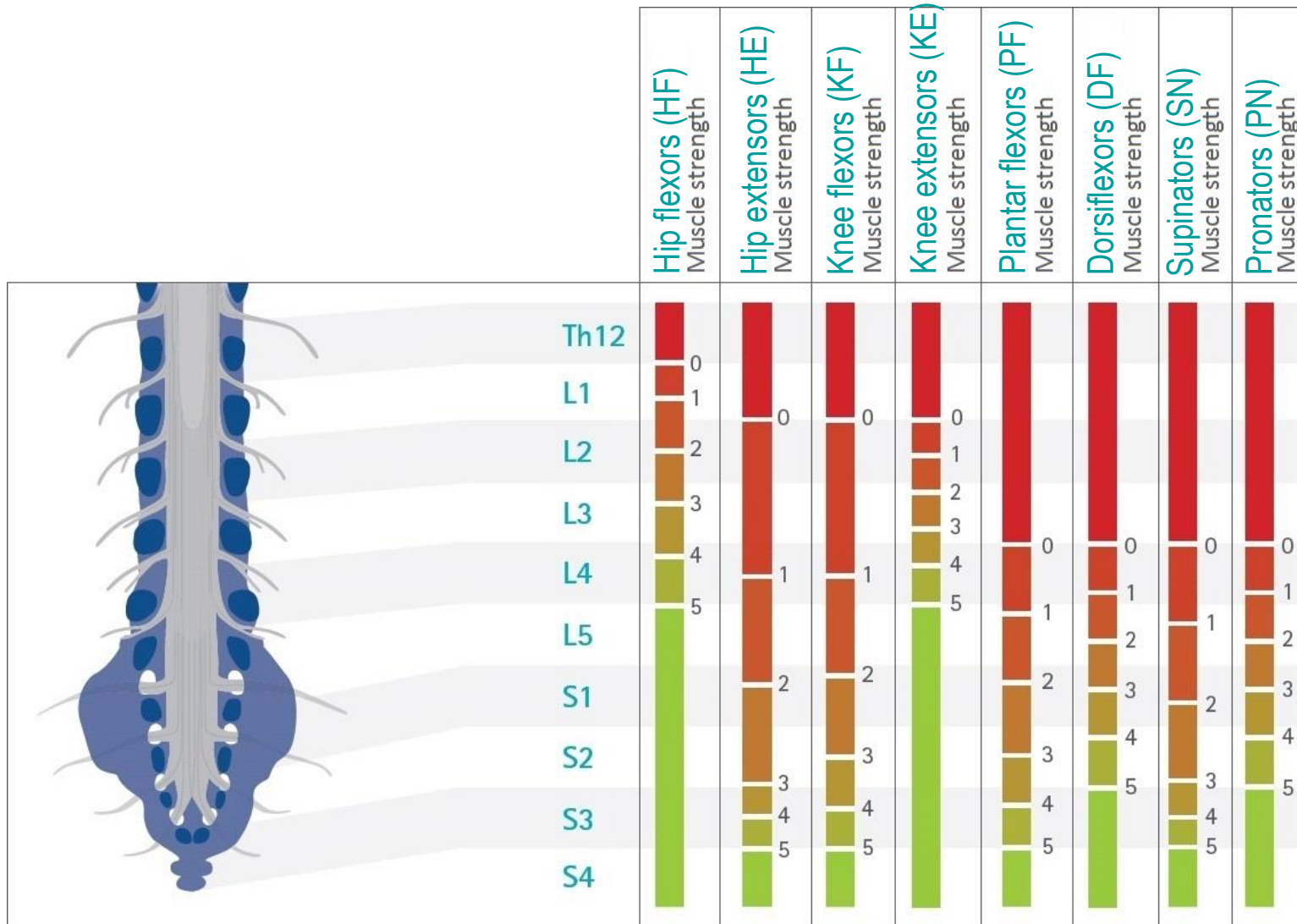
- Muscle strength -scale 0 – 5
- Determined by muscle groups

Innervating Spinal Segments

	Hip flexors	Hip extensors	Knee flexors	Knee extensors	Plantar flexors	Dorsiflexors	Supinators	Pronators
	M. psoas major M. iliacus M. gracilis M. adductor longus M. sartorius M. rectus femoris	M. gluteus maximus M. adductor magnus M. biceps femoris - caput longum M. biceps femoris - caput breve M. semitendinosus M. semimembranosus	M. gracilis M. sartorius M. popliteus M. gastrocnemius M. semitendinosus M. semimembranosus	M. rectus femoris M. vastus intermedius M. vastus lateralis M. vastus medialis	M. gastrocnemius M. soleus M. peroneus longus M. peroneus brevis M. tibialis posterior M. flexor digitorum longus M. flexor hallucis longus	M. tibialis anterior M. extensor hallucis longus M. extensor digitorum longus M. peroneus tertius	M. tibialis anterior M. extensor hallucis longus M. soleus M. flexor digitorum longus M. tibialis posterior	M. peroneus brevis M. peroneus longus M. peroneus tertius M. extensor digitorum longus
Th12								
L1								
L2								
L3								
L4								
L5								
S1								
S2								
S3								
S4								

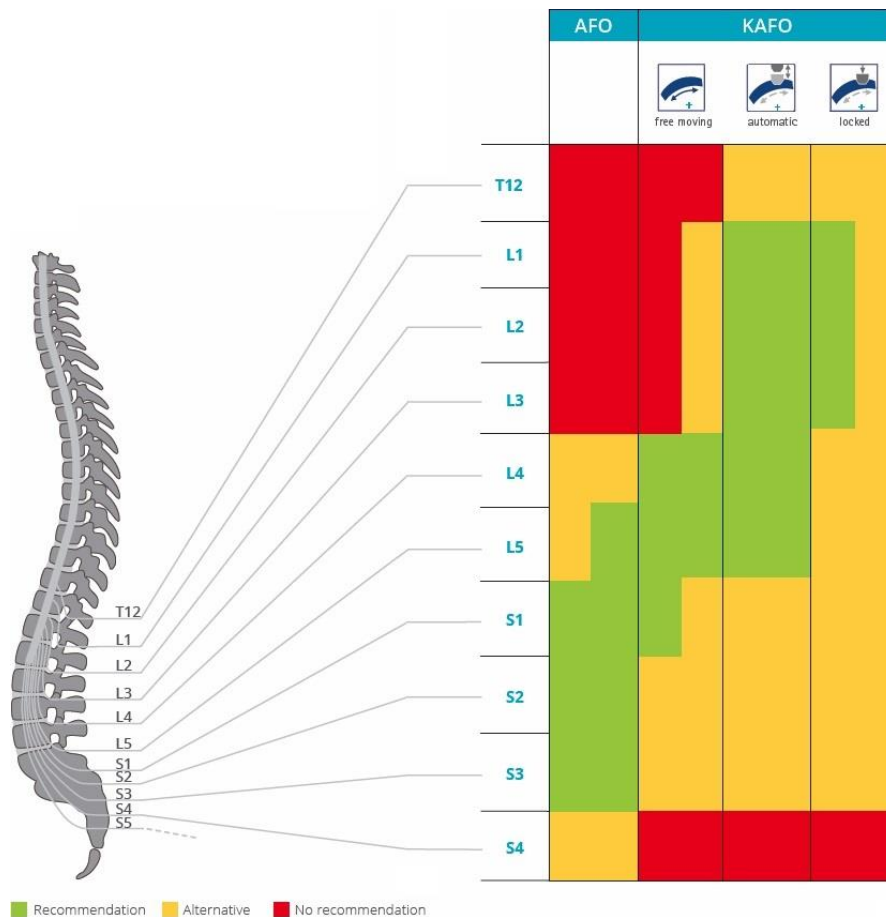
(Gray, Sobotta, Kendall etc.)

Determination of the Muscle Strength



Defining the Functionality of an Orthosis

SCI: Orthosis Types at Certain Level of Injury





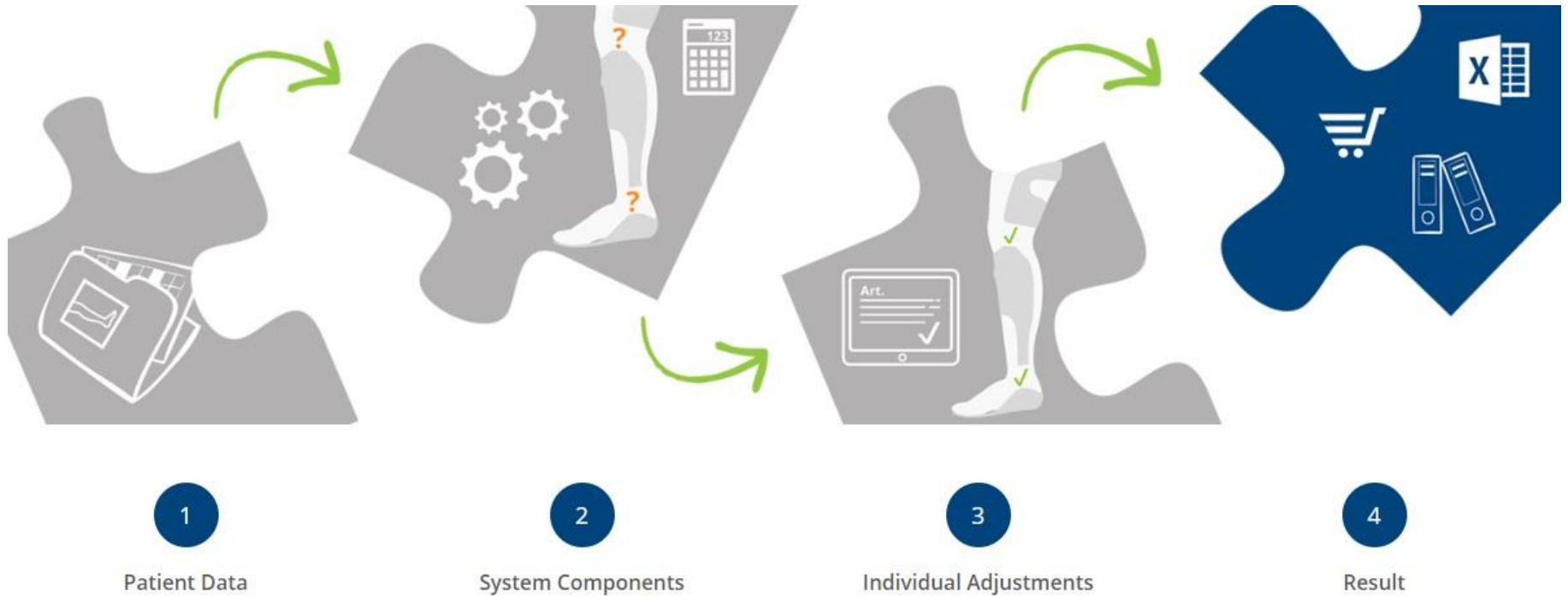
The FIOR & GENTZ Orthosis Configurator

Purpose and Use

- consider all relevant patient-related data
- rigorously calculates load on the orthosis
- Choose the right orthosis type (AFO, KAFO or KO)
- Select the correct system joints and widths for the orthosis
- Detailed patient documentation for further communication
- Information for in-depth technical support

Designed for orthotists but free accessible for everyone

The FIOR & GENTZ Orthosis Configurator



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General Data

Please select. | * required field

<p>First Name</p> <input type="text" value="da"/>	<p>Surname</p> <input type="text" value="sa"/>	<p>Year of Birth</p> <input type="text" value="1983"/>	<p>Body Weight*</p> <input type="text" value="58 kg"/>	<p>Start Configuration of*</p> <p><input checked="" type="radio"/> left leg</p> <p><input type="radio"/> right leg</p>
<p>ⓘ For reasons of data privacy, you may only enter the first two letters of the first name and the surname.</p>		<p>Sex</p> <p><input checked="" type="radio"/> female</p> <p><input type="radio"/> male</p>	<p>Body Height*</p> <input type="text" value="160 cm"/>	<p>ⓘ After having finished the configuration for the first leg, you can start the configuration for the second leg.</p>
<p><input checked="" type="checkbox"/> I have read and accepted the Data Privacy Policy. *</p>		<p><input checked="" type="checkbox"/> I have read and accepted the General Terms and Conditions of Business Transactions as well as the Terms of Use. *</p>		

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Diseases and Disabilities

Please select. | Multiple selection possible

Central Paralyses due to

- cerebral palsy
- stroke (apoplexy)
- traumatic brain injury

Spinal Paralyses due to

- spina bifida
- meningomyelocele
- spinal cord injuries

Peripheral Paralyses due to

- poliomyelitis
- vascular disorders
- peripheral paralyses and plexus paralyses

Neuromuscular Paralyses due to

- muscular dystrophy
- osteogenesis imperfecta
- spinal muscular atrophy
- multiple sclerosis
- arthrogryposis multiplex congenita
- amyotrophic lateral sclerosis

Structural Deformities/Malfunctions due to

- injury to the anterior cruciate ligament (ACL)
- injury to the posterior cruciate ligament (PCL)
- medial gonarthrosis
- lateral gonarthrosis
- (partial) rupture of the lateral collateral ligament
- (partial) rupture of the medial collateral ligament

Surgical Restrictions due to

- amputation according to Borggreve
- surgical errors
- other

other surgeries

Other

- disease/disability unknown
- other

other indications

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Show current configuration



Continue

Shoe and Upper Ankle Joint Measurements

Please select.

Shoe Size (Continental European System)*

please choose

Sole and Compensation Measurements



Height Compensation C

0 - 5 mm

Shoe Pitch x

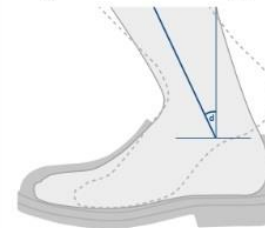
0 - 5 mm

$x = A - B$

Sole Thickness B

<= 5 mm

Range of Motion of the Upper Ankle Joint



Dorsal

30 °



Plantar

50 °

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Continue

Knee and Hip Position

Please select.

Varus Deformity	Valgus Deformity	Hyperextension	Extension Limitation
<p>Maximum 0°</p> <p>Corrected 0°</p>	<p>Maximum 0°</p> <p>Corrected 0°</p>	<p>Maximum 0°</p> <p>Corrected 0°</p>	<p>Hip 0°</p> <p>Knee 0°</p>

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Muscle Strength

Please select.

<p>Classification According to Janda</p> <p>Hip Flexion</p> <p>5</p> <p>Knee Extension</p> <p>1</p> <p>Dorsiflexion</p> <p>2</p>		<p>Hip Extension</p> <p>5</p> <p>Knee Flexion</p> <p>1</p> <p>Plantar Flexion</p> <p>1</p>	<p>Explanation of Muscle Strength</p> <p>0 (zero) total paralysis, no evidence of contraction</p> <p>1 (trace) slight contraction, but no joint motion</p> <p>2 (poor) complete range of motion with gravity eliminated</p> <p>3 (fair) complete range of motion against gravity</p> <p>4 (good) complete range of motion against gravity with some resistance</p> <p>5 (normal) complete range of motion against gravity with full resistance</p>
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OR use a type of gait

- Amsterdam Gait Classification for CP
- N.A.P.® GAIT CLASSIFICATION for stroke

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Orthosis
Configurator

New configuration

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Show current configuration

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Activity Level

Please select.

1. indoor walker

i

2. restricted outdoor walker

i

3. unrestricted outdoor walker

i

4. unrestricted outdoor walker with especially high demands

i

1 – Patient Data

- general data
- diseases and disabilities
- shoe and upper ankle joint measurements
- knee and hip position
- muscle strength (0–5) or type of gait
- activity level (1–4)

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Orthosis Type

recommendation

alternative

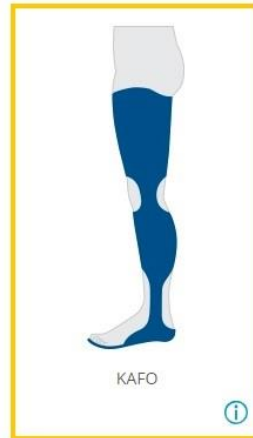
function-related exclusion

function-/load-related exclusion

Please select.



AFO



KAFO



KO



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Continue

Ankle Joint Function – Ventral

■ recommendation ■ alternative ■ function-related exclusion ■ function-/load-related exclusion

Please select.

 <p>no dorsiflexion stop</p> <p><i>i</i></p>	 <p>static dorsiflexion stop</p> <p><i>i</i></p>	 <p>dynamic dorsiflexion stop</p> <p><i>i</i></p>	 <p>without system ankle joint</p> <p><i>i</i></p>
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Ankle Joint Function – Ventral

recommendation alternative function-related exclusion function-/load-related exclusion Please select.

no dorsiflexion stop

static dorsiflexion stop

dynamic dorsiflexion stop

without system ankle joint

Ventral Spring Unit (Counteracts Dorsiflexion)

spring force: normal

spring force: medium

spring force: strong

spring force: very strong

spring force: extra strong

maximum range of motion: 4.0°

maximum range of motion: 4.0°

maximum range of motion: 4.0°

maximum range of motion: 4.0°

maximum range of motion: 0°

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Orthosis Shells

■ recommendation ■ alternative ■ function-related exclusion ■ function-/load-related exclusion Please select.

Femoral Shell

Tibial Shell

Foot Piece

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Ankle Joint Function – Dorsal

■ recommendation ■ alternative ■ function-related exclusion ■ function-/load-related exclusion

Please select.

<p>no plantar flexion stop</p> <p><i>i</i></p>	<p>no plantar flexion stop, with dorsiflexion assist</p> <p><i>i</i></p>	<p>dynamic plantar flexion stop, with dorsiflexion assist</p> <p><i>i</i></p>	<p>static plantar flexion stop</p> <p><i>i</i></p>
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New configuration

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Show current configuration

Continue

Ankle Joint System Width

■ recommendation ■ alternative ■ function-related exclusion ■ function-/load-related exclusion Please select.



unilateral



with supporting joint



bilateral

10 mm

12 mm

14 mm

16 mm

20 mm



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Dorsal Spring Unit (Counteracts Plantar Flexion)

■ recommendation ■ alternative ■ function-related exclusion ■ function-/load-related exclusion Please select.

<p>spring force: normal</p> <p>maximum range of motion: 15°</p>	<p>spring force: medium</p> <p>maximum range of motion: 15°</p>	<p>spring force: strong</p> <p>maximum range of motion: 10°</p>	<p>spring force: very strong</p> <p>maximum range of motion: 10°</p>	<p>spring force: extra strong</p> <p>maximum range of motion: 5°</p>
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Orthosis
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Knee Joint Function

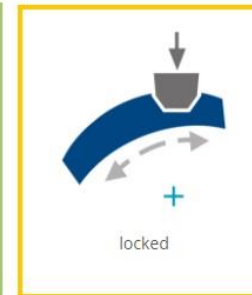
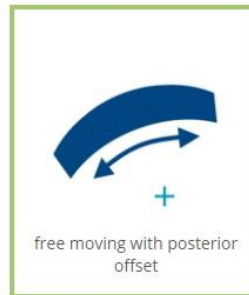
recommendation

alternative

function-related exclusion

function-/load-related exclusion

Please select.



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Knee Joint System Width

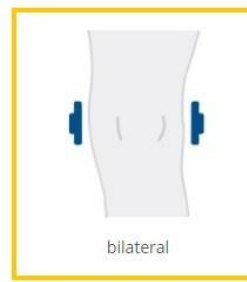
recommendation alternative function-related exclusion function-/load-related exclusion Please select.



unilateral



with supporting joint



bilateral

10 mm

12 mm

14 mm

16 mm

20 mm



2 – System Components

- orthosis type
- production technique
- ankle joint function & spring units – ventral & dorsal
- orthosis shells
- ankle joint system & system width
- system stirrups
- knee joint function
- knee joint system & system width

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New configuration

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Show current configuration



Continue

Individual Adjustments

recommendation alternative function-related exclusion function-/load-related exclusion Please select.



In the menus listed below, you can adapt the system joints' material and shape, if required.

Ankle - lateral

Ankle - medial

Knee - lateral

Knee - medial

Joint Material

carbon fibre

Joint Shape

straight

Stirrup Shape

bent

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Continue

Individual Adjustments

■ recommendation ■ alternative ■ function-related exclusion ■ function-/load-related exclusion Please select.

In the menu listed below, you can adapt the system joints' material and shape, if required.

Ankle - lateral Ankle - medial Knee - lateral Knee - medial

Joint Material: titanium

Joint Shape: bent outwards distally

3 – Individual Adjustments

- ankle & knee joint material
- ankle & knee joint shape
- ankle stirrup shape
- stops

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New configuration

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- 1
 - 2
 - 3
 - 4
- Show current configuration



Your configuration for the left leg was successful. You now have the following options:

Left Leg



No Sign In Required

- Edit the article list
- Save documentation as PDF file
- Send

Sign In Required

- Save configuration
- Add articles to shopping cart
- Calculate configuration

Right Leg

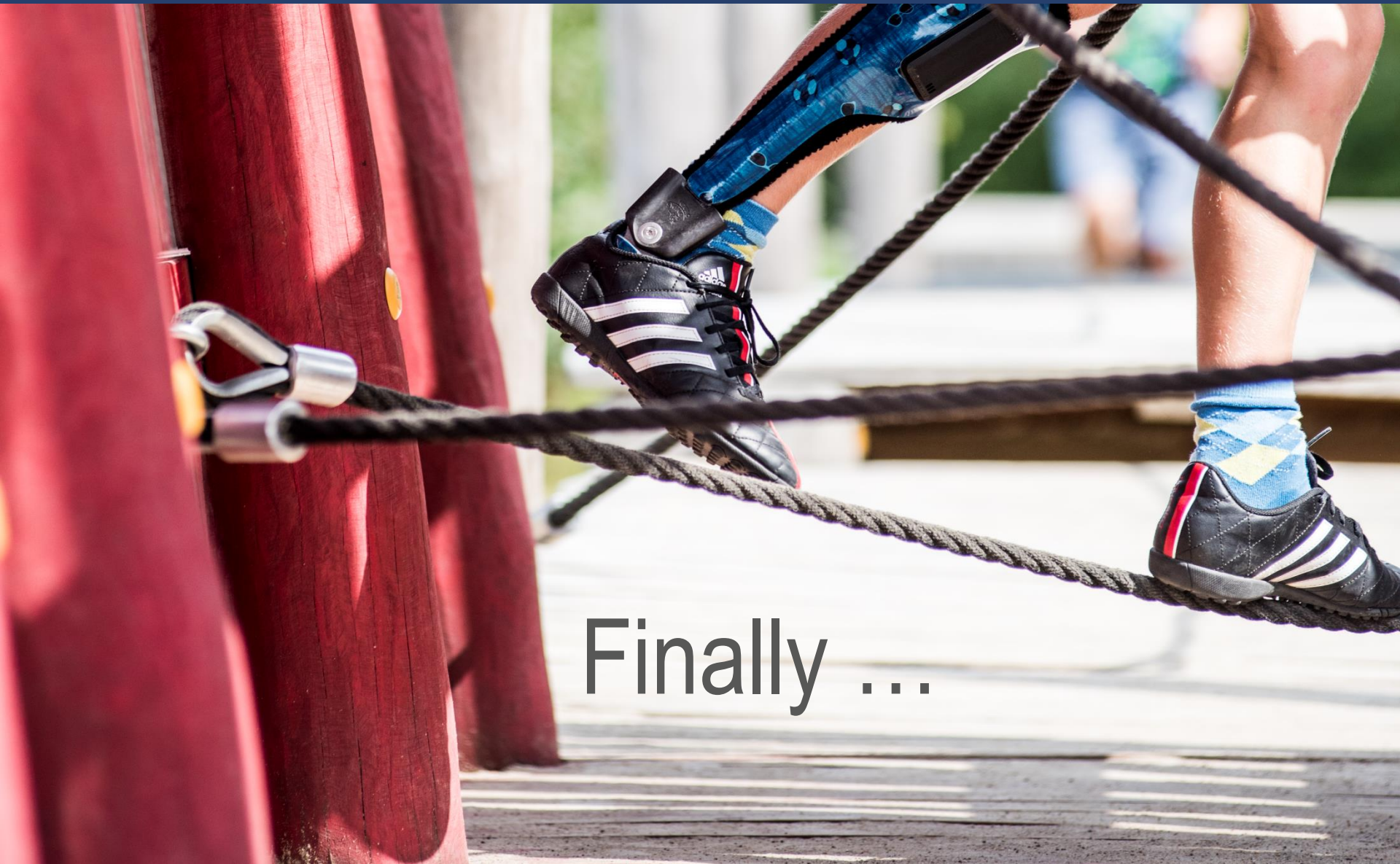


Start configuration of the right leg

Conclusion

- Applied **load** is a prerequisite for calculation of the **load capacity**.
- **Patient-related AND orthosis-related** parameters are relevant.
- Different ways for classifying **functional demands** on an orthosis
- Individual consideration of **each patient**
- Each orthosis must be **planned** and **produced individually**.

The FIOR & GENTZ Orthosis Configurator is the best and easiest tool for recognising all individual factors of an orthotic intervention.



Finally ...

What is Our Idea of a Modern Orthotic Intervention?

1. Dynamic
2. Non restrictive, support remaining movements
3. Adjustable to the patient's needs
4. Adaptability during the course of therapy
5. As little as necessary, as much as possible



Thank you
for your attention!