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Introduction to orthotics

Main goal

- The student has a general knowledge of the role, function and application of orthoses
- The student can describe and assess gait deviations through the functional classification proposed by Perry model
- The student can explain the effectiveness of an orthosis on the basis of biomechanical principles
- The student can distinguish a pathological gait from a normal gait and also give an indication of the type of orthosis that can lead to optimization of the gait pattern.

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Chapter 1 : Background

Orthoses - Definition

- Orthosis = mechanical device that is attached to a limb for the purpose of influencing anatomical or physical properties
- Orthosis = externally worn device for support, compensation, immobilization, correction, stabilization and/or relief
- Orthosis = splint = brace
- Orthotic = splint = brace
- Bracket = brace: usually has a moving part
- Splint= splint: no moving part

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General objectives of an orthosis

- Clinical purpose of the orthosis = preventive - protect - optimize function
- Limiting future deformities/contractures/movements
- Correcting tissues and/or muscles
- Preventing/limiting unwanted movements
- Provide protection/support to weak muscles-tissues-joints

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General objectives of an orthosis

- Manage abnormalities due to abnormal muscle tension
- Improving the patient's quality of life
- Reduce pain/edema
- Facilitate/allow/enhance normal movements
- Promote Healing
- Offload proximal or distal joints

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Clinical objective => functional perspective

- Discuss your objective with the patient:

  - Depends on the mobility of the joints
  - Stability of your patients
  - Desired load redistribution

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Objective of an orthosis during walking

- Support or take over the function of a body part
- Supporting (too) weak muscle function (e.g. drop foot)
- Assistance: springs
- Immobilisation/limitation of movement (e.g. after ACL rupture)
- Relief (e.g. fracture)
- Prevent or improve joint abnormalities
- Correcting unwanted joint positions or movements (e.g. pointed foot)
- Prevention of unwanted joint positions or movements (e.g. contra

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Chapter 2: Classification of orthoses

Orthoses- classification

- According to:

  - *Material*
  - *Manufacturing mode*
  - *Static vs. Dynamic orthoses*
  - *Function*
  - *Anatomical location- Fixation on the musculoskeletal system*

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Orthoses- classification

- According to material :

- *Leather*
- *Metal*
- *Thermoplastic material*
- *Carbon Fiber*
- *Reinforced Plastic*
- *Carbon*
- *Elastic materials (lycra, neoprene, orthoprene…)*

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Orthoses- classification

- **According to manufacturing mode:**

- Customized
  - *'Interface' component (part in contact with the skin)*
  - *'Articulating' component (joint)*
  - *'Structural' component*
  - *'Cosmetic' component*

- Prefabricated (possible to make small adjustments in order to match it with the patients' geometry)

- Immediate fitting (made directly onto the patient)

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Orthoses- classification

- According to the function :

  - Prevention-Protection
  - Correct Positioning
  - Rest
  - Functional
  - Exercises

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Orthoses- classification

- **Static VS dynamic:**

❖ Static

➢ Provide support (e.g. in presence of skin burns, skin grafts)

➢ Stabilise (To support/facilitate motion in other joints)

➢ Immobilise

✓ Prevent development of deformities (e.g. equinus)

✓ Postoperative support in order to maintain correction

✓ Decrease muscle tone

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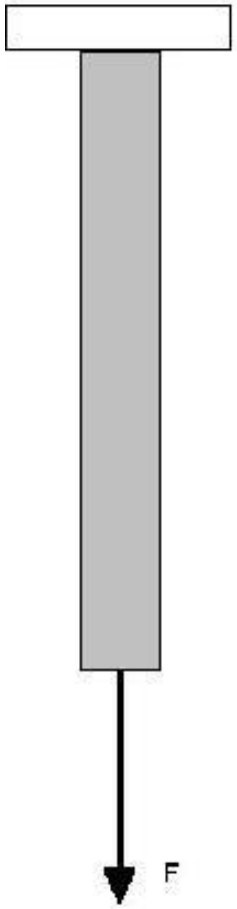
Orthoses- classification

- Static vs Dynamic
  - *Static orthoses*



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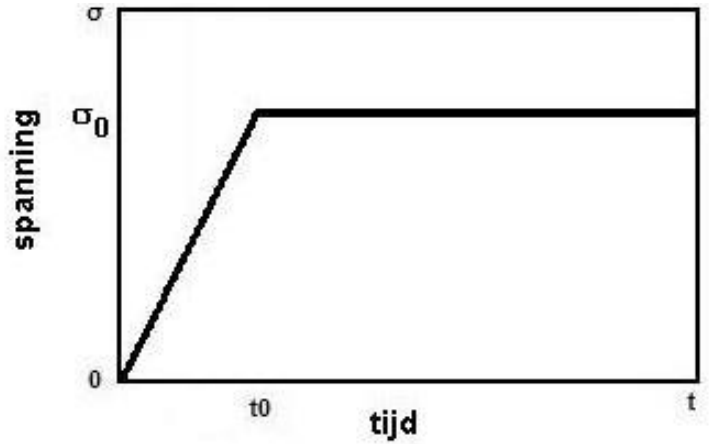

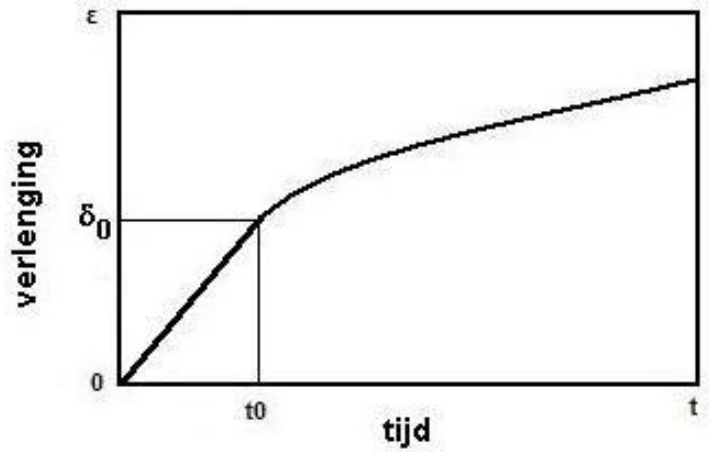

(b)

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Orthoses- classification

- Static vs Dynamic
  - *Static orthoses*

http://www.ongoingcare.com/

https://www.orfit.com

https://www.capital-medical.com

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Orthoses- classification

- **Static VS dynamic:**

- Dynamic orthoses
  - *To support motor function*
  - *External power: e.g. suspension system*
  - *Internal power: e.g. initiate movement by acting on another segment*
  - *OL gait orthoses*

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Orthoses- classification

- Static vs Dynamic
  - *Dynamic orthoses*

http://bme240.eng.uci.edu

https://musculoskeletalkey.com/

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Orthoses- classification

- Common international nomenclature: according to the anatomical location/fixation

- FO (foot orthosis)
- AO (ankle orthosis)
- AFO (ankle-foot orthosis)
- KO (knee orthosis)
- KAFO (knee-ankle-foot orthosis)
- HKAFO (hip-knee-ankle-foot orthosis)
- HO (hip orthosis)

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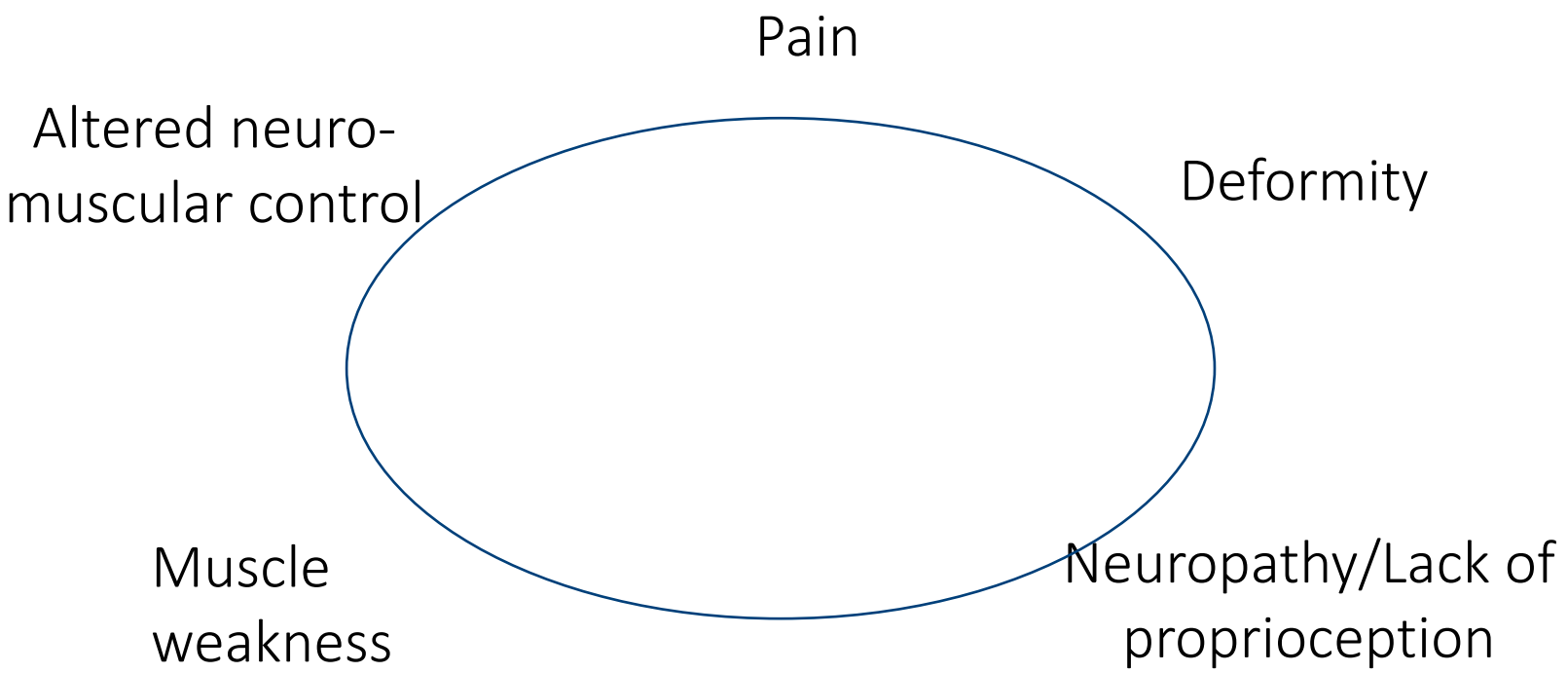
State-of-the art approach

Causes of gait deviations
(Perry et al 1992)



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