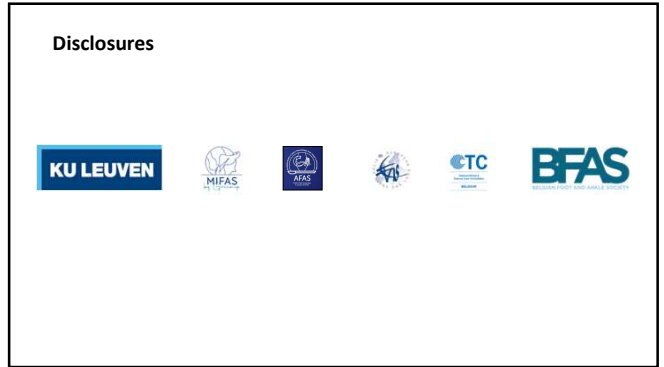
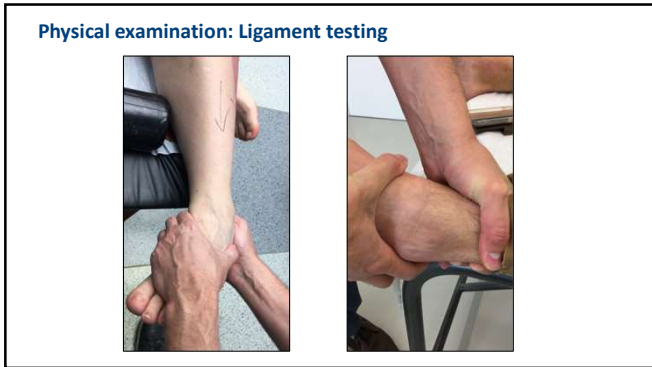


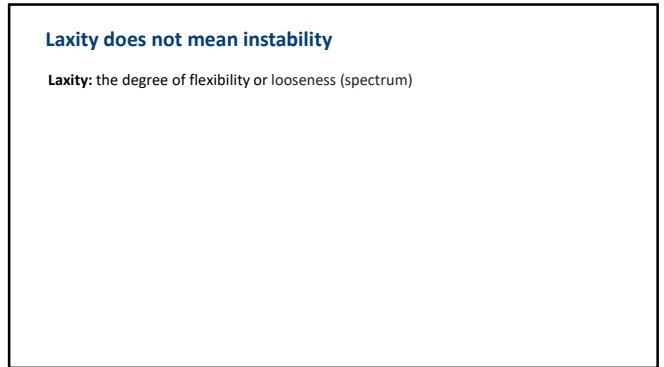
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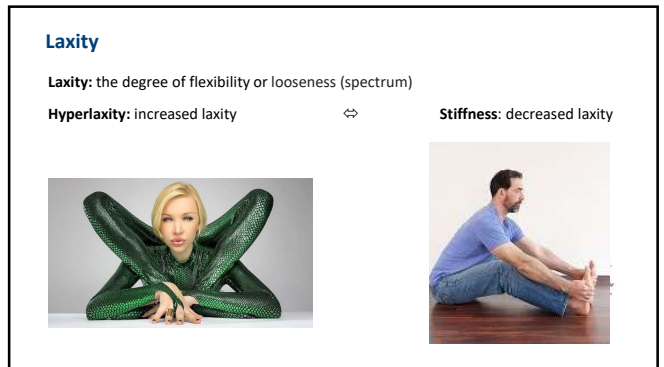
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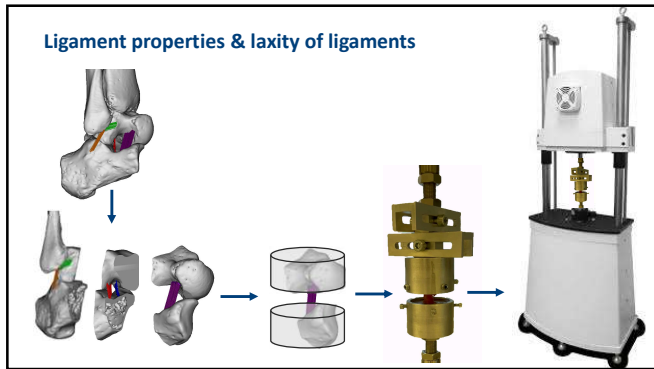
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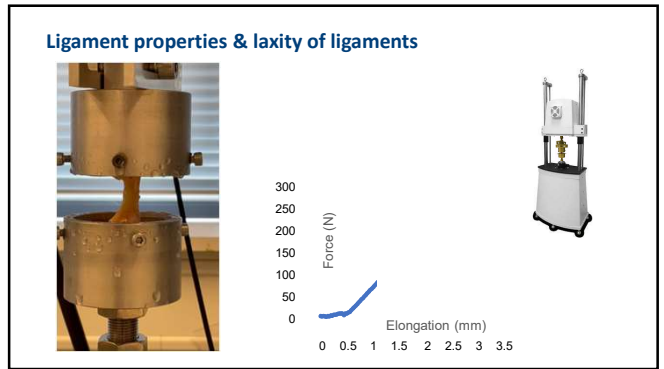
5



6



7



8

**Laxity**

**Laxity:** the degree of flexibility or looseness (spectrum)  
**Hyperlaxity:** increased laxity  
 Causes: genetic, Syndrome (EDS, Marfan)

**Beighton Score**

9

**Laxity does not mean instability**

**Laxity:** the degree of flexibility or looseness (spectrum)  
**Hyperlaxity:** increased laxity

} → Connective tissue

**Stability:** a good function of your stabilizing system

10

**Laxity does not mean instability**

**Laxity:** the degree of flexibility or looseness (spectrum)  
**Hyperlaxity:** increased laxity

} → Connective tissue

**Stability:** a good function of your stabilizing system  
**Instability:** an issue with either (or both) your stabilizing system causing **symptoms**

- Pain
- Subjective instability
- Deformity
- ...

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**Stability**

**Stability:** normal function of your stabilizing system

**Passive stabilizers**                      **Active stabilizers**

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**Stability**

**Stability:** normal function of your stabilizing system

**Passive stabilizers**

- Ligament function

**Active stabilizers**

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**Stability**

**Stability:** normal function of your stabilizing system

**Passive stabilizers**

- Ligament function
  - Ligament laxity
  - Ligament strength

**Active stabilizers**

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**Stability & instability**

**Stability:** normal function of your stabilizing system

**Instability:** a pathologic function of you stabilizing system

**Passive stabilizers**

- Ligament function
  - Ligament laxity (*hyperlaxity*)
  - Ligament strength (*damage*)

**Active stabilizers**

15

**Stability & instability**

**Stability:** normal function of your stabilizing system

**Instability:** a pathologic function of you stabilizing system

**Passive stabilizers**

- Ligament function
  - Ligament laxity (*hyperlaxity*)
  - Ligament strength (*damage*)
- Bone function
  - Joint congruency
  - Bone strength

**Active stabilizers**

16

**Stability & instability**

**Stability:** normal function of your stabilizing system

**Instability:** a pathologic function of you stabilizing system

**Passive stabilizers**

- Ligament function
  - Ligament laxity (*hyperlaxity*)
  - Ligament strength (*damage*)
- Bone function
  - Joint congruency (*malunion*)
  - Bone strength (*fracture*)

**Active stabilizers**

17

**Stability & instability**

**Stability:** normal function of your stabilizing system

**Instability:** a pathologic function of you stabilizing system

**Passive stabilizers**

- Ligament function
  - Ligament laxity (*hyperlaxity*)
  - Ligament strength (*damage*)
- Bone function
  - Joint congruency (*malunion*)
  - Bone strength (*fracture*)
- Alignment

**Active stabilizers**

18

**Stability & instability**

**Stability:** normal function of your stabilizing system  
**Instability:** a pathologic function of you stabilizing system

<b>Passive stabilizers</b>	<b>Active stabilizers</b>
<ul style="list-style-type: none"> <li>Ligament function                             <ul style="list-style-type: none"> <li>Ligament laxity (hyperlaxity)</li> <li>Ligament strength (damage)</li> </ul> </li> <li>Bone function                             <ul style="list-style-type: none"> <li>Joint congruency (malunion)</li> <li>Bone strength (fracture)</li> </ul> </li> <li>Alignment (valgus – varus)</li> </ul>	

19

**Stability & instability**

**Stability:** normal function of your stabilizing system  
**Instability:** a pathologic function of you stabilizing system

<b>Passive stabilizers</b>	<b>Active stabilizers</b>
<ul style="list-style-type: none"> <li>Ligament function                             <ul style="list-style-type: none"> <li>Ligament laxity (hyperlaxity)</li> <li>Ligament strength (damage)</li> </ul> </li> <li>Bone function                             <ul style="list-style-type: none"> <li>Joint congruency (malunion)</li> <li>Bone strength (fracture)</li> </ul> </li> <li>Alignment (valgus – varus)</li> </ul>	<ul style="list-style-type: none"> <li>Sensory perceptual system</li> <li>Motor behavioral system</li> </ul>

20

**Stability & instability**

**Stability:** normal function of your stabilizing system  
**Instability:** a pathologic function of you stabilizing system

<b>Passive stabilizers</b>	<b>Active stabilizers</b>
<ul style="list-style-type: none"> <li>Ligament function                             <ul style="list-style-type: none"> <li>Ligament laxity (hyperlaxity)</li> <li>Ligament strength (damage)</li> </ul> </li> <li>Bone function                             <ul style="list-style-type: none"> <li>Joint congruency (malunion)</li> <li>Bone strength (fracture)</li> </ul> </li> <li>Alignment (valgus – varus)</li> </ul>	<ul style="list-style-type: none"> <li>Sensory perceptual system                             <ul style="list-style-type: none"> <li>Normal sensations (pain, perceived instability, diminished somatosensation e.g. force sense, position sense)</li> </ul> </li> <li>Motor behavioral system</li> </ul>

21

**Stability & instability**

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**Instability:** a pathologic function of you stabilizing system

<b>Passive stabilizers</b>	<b>Active stabilizers</b>
<ul style="list-style-type: none"> <li>Ligament function                             <ul style="list-style-type: none"> <li>Ligament laxity (hyperlaxity)</li> <li>Ligament strength (damage)</li> </ul> </li> <li>Bone function                             <ul style="list-style-type: none"> <li>Joint congruency (malunion)</li> <li>Bone strength (fracture)</li> </ul> </li> <li>Alignment (valgus – varus)</li> </ul>	<ul style="list-style-type: none"> <li>Sensory perceptual system                             <ul style="list-style-type: none"> <li>Normal sensations (pain, perceived instability, diminished somatosensation e.g. force sense, position sense)</li> </ul> </li> <li>Motor behavioral system                             <ul style="list-style-type: none"> <li>Postural control</li> <li>Muscle function</li> </ul> </li> </ul>

22

**Stability & instability**

**Stability:** normal function of your stabilizing system  
**Instability:** a pathologic function of you stabilizing system

<b>Passive stabilizers</b>	<b>Active stabilizers</b>
<ul style="list-style-type: none"> <li>Ligament function                             <ul style="list-style-type: none"> <li>Ligament laxity (hyperlaxity)</li> <li>Ligament strength (damage)</li> </ul> </li> <li>Bone function                             <ul style="list-style-type: none"> <li>Joint congruency (malunion)</li> <li>Bone strength (fracture)</li> </ul> </li> <li>Alignment (valgus – varus)</li> </ul>	<ul style="list-style-type: none"> <li>Sensory perceptual system                             <ul style="list-style-type: none"> <li>Normal sensations (pain, perceived instability, diminished somatosensation e.g. force sense, position sense)</li> </ul> </li> <li>Motor behavioral system                             <ul style="list-style-type: none"> <li>Postural control (altered reflexes, balance deficits)</li> <li>Muscle function (muscle weakness)</li> </ul> </li> </ul>

23

**Stability & instability**

**Stability:** normal function of your stabilizing system  
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<b>Passive stabilizers</b>	<b>Active stabilizers</b>
<ul style="list-style-type: none"> <li>Ligament function                             <ul style="list-style-type: none"> <li>Ligament laxity (hyperlaxity)</li> <li>Ligament strength (damage)</li> </ul> </li> <li>Bone function                             <ul style="list-style-type: none"> <li>Joint congruency (malunion)</li> <li>Bone strength (fracture)</li> </ul> </li> <li>Alignment (valgus – varus)</li> </ul>	<ul style="list-style-type: none"> <li>Sensory perceptual system                             <ul style="list-style-type: none"> <li>Normal sensations (pain, perceived instability, diminished somatosensation e.g. force sense, position sense)</li> </ul> </li> <li>Motor behavioral system                             <ul style="list-style-type: none"> <li>Postural control (altered reflexes, balance deficits)</li> <li>Muscle function (muscle weakness)</li> </ul> </li> </ul>

Mechanical instability

Functional instability

24

**Stability & instability**

**Stability:** normal function of your stabilizing system  
**Instability:** a pathologic function of you stabilizing system

<p><b>Passive stabilizers</b></p> <ul style="list-style-type: none"> <li>Ligament function                     <ul style="list-style-type: none"> <li>Ligament laxity (hyperlaxity)</li> <li>Ligament strength (damage)</li> </ul> </li> <li>Bone function                     <ul style="list-style-type: none"> <li>Joint congruency (malunion)</li> <li>Bone strength (fracture)</li> </ul> </li> <li>Alignment (valgus – varus)</li> </ul>	<p><b>Active stabilizers</b></p> <p>Sensory perceptual system</p> <ul style="list-style-type: none"> <li>Normal sensations (pain, perceived instability, diminished somatosention e.g. force sense, position sense)</li> </ul> <p>Motor behavioral system</p> <ul style="list-style-type: none"> <li>Postural control (altered reflexes, balance deficits)</li> <li>Muscle function (muscle weakness)</li> </ul>
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Treatment?

25

**Stability & instability**

**Stability:** normal function of your stabilizing system  
**Instability:** a pathologic function of you stabilizing system

<p><b>Passive stabilizers</b></p> <ul style="list-style-type: none"> <li>Ligament function                     <ul style="list-style-type: none"> <li>Ligament laxity (hyperlaxity)</li> <li>Ligament strength (damage)</li> </ul> </li> <li>Bone function                     <ul style="list-style-type: none"> <li>Joint congruency (malunion)</li> <li>Bone strength (fracture)</li> </ul> </li> <li>Alignment (valgus – varus)</li> </ul>	<p><b>Active stabilizers</b></p> <p>Sensory perceptual system</p> <ul style="list-style-type: none"> <li>Normal sensations (pain, perceived instability, diminished somatosention e.g. force sense, position sense)</li> </ul> <p>Motor behavioral system</p> <ul style="list-style-type: none"> <li>Postural control (altered reflexes, balance deficits)</li> <li>Muscle function (muscle weakness)</li> </ul>
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**Non-surgical treatment**  
Bracing, shoe modification

26

**Stability & instability**

**Stability:** normal function of your stabilizing system  
**Instability:** a pathologic function of you stabilizing system

<p><b>Passive stabilizers</b></p> <ul style="list-style-type: none"> <li>Ligament function                     <ul style="list-style-type: none"> <li>Ligament laxity (hyperlaxity)</li> <li>Ligament strength (damage)</li> </ul> </li> <li>Bone function                     <ul style="list-style-type: none"> <li>Joint congruency (malunion)</li> <li>Bone strength (fracture)</li> </ul> </li> <li>Alignment (valgus – varus)</li> </ul>	<p><b>Active stabilizers</b></p> <p>Sensory perceptual system</p> <ul style="list-style-type: none"> <li>Normal sensations (pain, perceived instability, diminished somatosention e.g. force sense, position sense)</li> </ul> <p>Motor behavioral system</p> <ul style="list-style-type: none"> <li>Postural control (altered reflexes, balance deficits)</li> <li>Muscle function (muscle weakness)</li> </ul>
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**Non-surgical treatment**  
Bracing, shoe modification, insoles,

27

**Stability & instability**

**Stability:** normal function of your stabilizing system  
**Instability:** a pathologic function of you stabilizing system

<p><b>Passive stabilizers</b></p> <ul style="list-style-type: none"> <li>Ligament function                     <ul style="list-style-type: none"> <li>Ligament laxity (hyperlaxity)</li> <li>Ligament strength (damage)</li> </ul> </li> <li>Bone function                     <ul style="list-style-type: none"> <li>Joint congruency (malunion)</li> <li>Bone strength (fracture)</li> </ul> </li> <li>Alignment (valgus – varus)</li> </ul>	<p><b>Active stabilizers</b></p> <p>Sensory perceptual system</p> <ul style="list-style-type: none"> <li>Normal sensations (pain, perceived instability, diminished somatosention e.g. force sense, position sense)</li> </ul> <p>Motor behavioral system</p> <ul style="list-style-type: none"> <li>Postural control (altered reflexes, balance deficits)</li> <li>Muscle function (muscle weakness)</li> </ul>
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**Non-surgical treatment**  
Bracing, shoe modification, insoles, cast, non-weightbearing,

28

**Stability & instability**

**Stability:** normal function of your stabilizing system  
**Instability:** a pathologic function of you stabilizing system

<p><b>Passive stabilizers</b></p> <ul style="list-style-type: none"> <li>Ligament function                     <ul style="list-style-type: none"> <li>Ligament laxity (hyperlaxity)</li> <li>Ligament strength (damage)</li> </ul> </li> <li>Bone function                     <ul style="list-style-type: none"> <li>Joint congruency (malunion)</li> <li>Bone strength (fracture)</li> </ul> </li> <li>Alignment (valgus – varus)</li> </ul>	<p><b>Active stabilizers</b></p> <p>Sensory perceptual system</p> <ul style="list-style-type: none"> <li>Normal sensations (pain, perceived instability, diminished somatosention e.g. force sense, position sense)</li> </ul> <p>Motor behavioral system</p> <ul style="list-style-type: none"> <li>Postural control (altered reflexes, balance deficits)</li> <li>Muscle function (muscle weakness)</li> </ul>
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**Non-surgical treatment**  
Bracing, shoe modification, insoles, cast, non-weightbearing, physiotherapy.

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**Stability & instability**

**Stability:** normal function of your stabilizing system  
**Instability:** a pathologic function of you stabilizing system

<p><b>Passive stabilizers</b></p> <ul style="list-style-type: none"> <li>Ligament function                     <ul style="list-style-type: none"> <li>Ligament laxity (hyperlaxity)</li> <li>Ligament strength (damage)</li> </ul> </li> <li>Bone function                     <ul style="list-style-type: none"> <li>Joint congruency (malunion)</li> <li>Bone strength (fracture)</li> </ul> </li> <li>Alignment (valgus – varus)</li> </ul>	<p><b>Active stabilizers</b></p> <p>Sensory perceptual system</p> <ul style="list-style-type: none"> <li>Normal sensations (pain, perceived instability, diminished somatosention e.g. force sense, position sense)</li> </ul> <p>Motor behavioral system</p> <ul style="list-style-type: none"> <li>Postural control (altered reflexes, balance deficits)</li> <li>Muscle function (muscle weakness)</li> </ul>
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**Surgical treatment**  
Ligament surgery, fracture revision, re-alignment osteotomy.

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**Instability in clinical practice**

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**Case 1**

Woman 54 years, nurse

History:

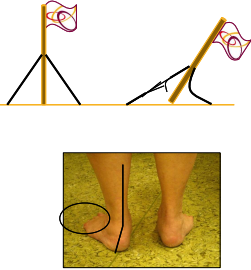
- Pedes planivalgi
- Generalised hyperlaxity
- Ankle fracture 1 year ago

Current symptoms:  
Posteromedial ankle pain (left ankle).

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**Case 1: valgus laxity → valgus instability**



**Ligaments**

- Genetic hyperlaxity
- Torn deltoid ligament

**Alignment**


- Genetic valgus

**Active stabilizers**

- Weakened tibial posterior

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**Case 1: valgus laxity → valgus instability**



**Ligaments**

- Genetic hyperlaxity
- Torn deltoid/spring ligament

**Alignment**

- Genetic valgus

**Active stabilizers**


- Weakened tibial posterior

**Non-surgical treatment**

- Brace
- Insoles, shoe modification
- Physiotherapy

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**Case 1: valgus laxity → valgus instability**



**Ligaments**

- Genetic hyperlaxity
- Torn deltoid/spring ligament

**Alignment**

- Genetic valgus

**Active stabilizers**

- Weakened tibial posterior

**Non-surgical treatment**

- Brace
- Insoles, shoe modification
- Physiotherapy

**Surgical treatment**

- Ligament repair/reconstruction
- Re-alignment osteotomy
- Tendon repair/transfer

35

**Case 2**


Woman, 26 years

History:

- Generalised hyperlaxity
- Ankle sprain 5 years ago
- Asymmetric varus

Current symptoms:

- Subjective instability
- Painful lateral retromalleolar area
- Mechanical laxity/instability



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**Case 2: ankle sprain → chronic lateral instability**

<b>Ligaments</b> <ul style="list-style-type: none"><li>• Genetic hyperlaxity</li><li>• Torn lateral ligaments</li></ul>	<b>Non-surgical treatment</b> <ul style="list-style-type: none"><li>• Brace</li><li>• Insoles, shoe modification</li><li>• Physiotherapy</li></ul>
<b>Alignment</b> <ul style="list-style-type: none"><li>• Progressive varus</li></ul>	<b>Surgical treatment</b> <ul style="list-style-type: none"><li>• Ligament repair/reconstruction</li><li>• Re-alignment osteotomy</li><li>• Tendon repair</li></ul>
<b>Active stabilizers</b> <ul style="list-style-type: none"><li>• Weakened peroneal tendons</li></ul>	

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**Take home messages**

**Laxity**

- Laxity is normal.
- Hyperlaxity is most commonly genetic.
- Hyperlaxity may be a cause of instability.

**Instability (symptoms)**

- In case of instability mostly multiple causes are involved.
- Malalignment may increase instability.
- Muscle weakness may be a cause of instability.
- Ligament injury may be a cause of instability.

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