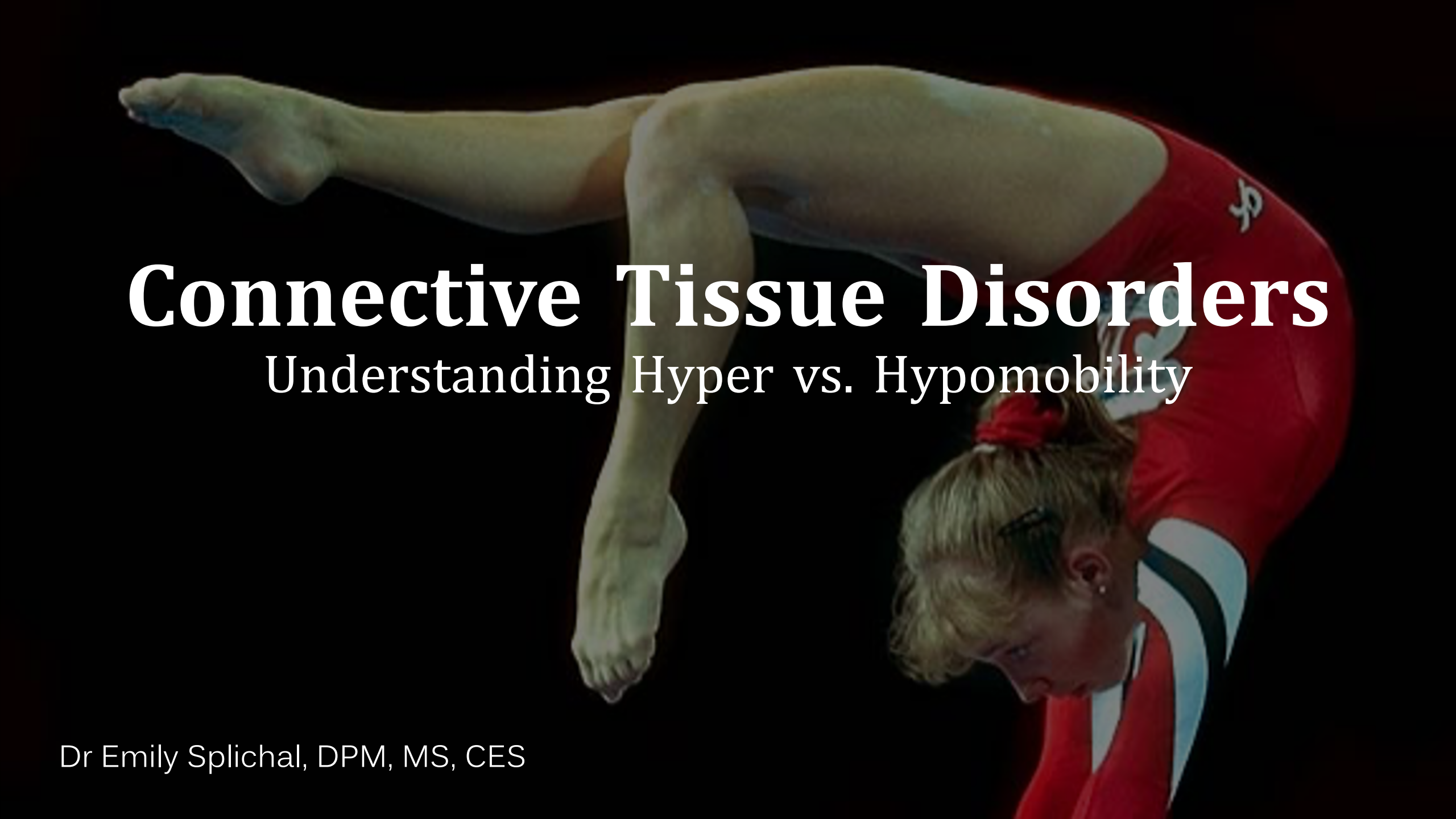


A person with blonde hair tied in a bun, wearing a red leotard with white and black accents, is performing a backbend. Their legs are raised and bent, with one leg extended upwards and the other bent at the knee. The background is dark.

# Connective Tissue Disorders

## Understanding Hyper vs. Hypomobility

Dr Emily Splichal, DPM, MS, CES



## A 4-Part Series

Part 1 – Peripheral Nervous System

Part 2 - Central Nervous System

**Part 3 – Connective Tissue Disorders**

Part 4 – Psychogenic Movement Disorders



**Movement Require Mobility**

**Is it muscle tone  
or connective  
tissue?**



# Connective Tissue Collagen & Elastin

**Collagen** the most prevalent protein that helps make up connective tissue. Like a suspension bridge cable, collagen imparts toughness and strength  
(80% of the weight of tendon)

**Elastin** is another protein that is not as strong as collagen but more flexible. Elastin is like a rubber band, allowing tissue to spring back.



# Types of Collagen

## Type I

The most abundant form of collagen in tendon

Fibrils are stiff structures that provide durability and strength

## Type II

Typically present in only in small amounts

Is generally concentrated near the bone insertion

## Type III

Fibrils are thinner than type I fibrils

Associated with healing process in tendon

Generally associated with scar tissue and injury

The ratio of type III/type I collagen increases with aging



**Generalized Hypermobility vs. Clinical Hypermobility (EDS)**

## **Generalized (Joint Specific) Hypermobility**

Range of motion is excessive  
when compared to age, sex  
and ethnic group

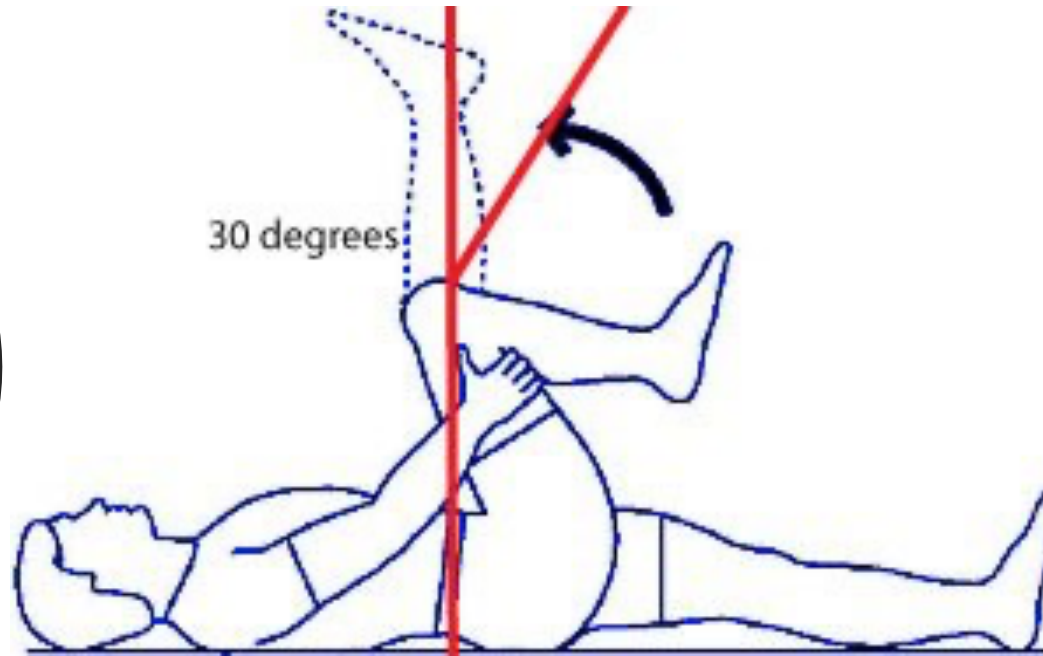
Females > males

Children > adults

Lower extremity > Upper  
extremity



## Testing Hypermobility



Beighton

Lower Limb Assessment Score

The Ankle Lunge Test

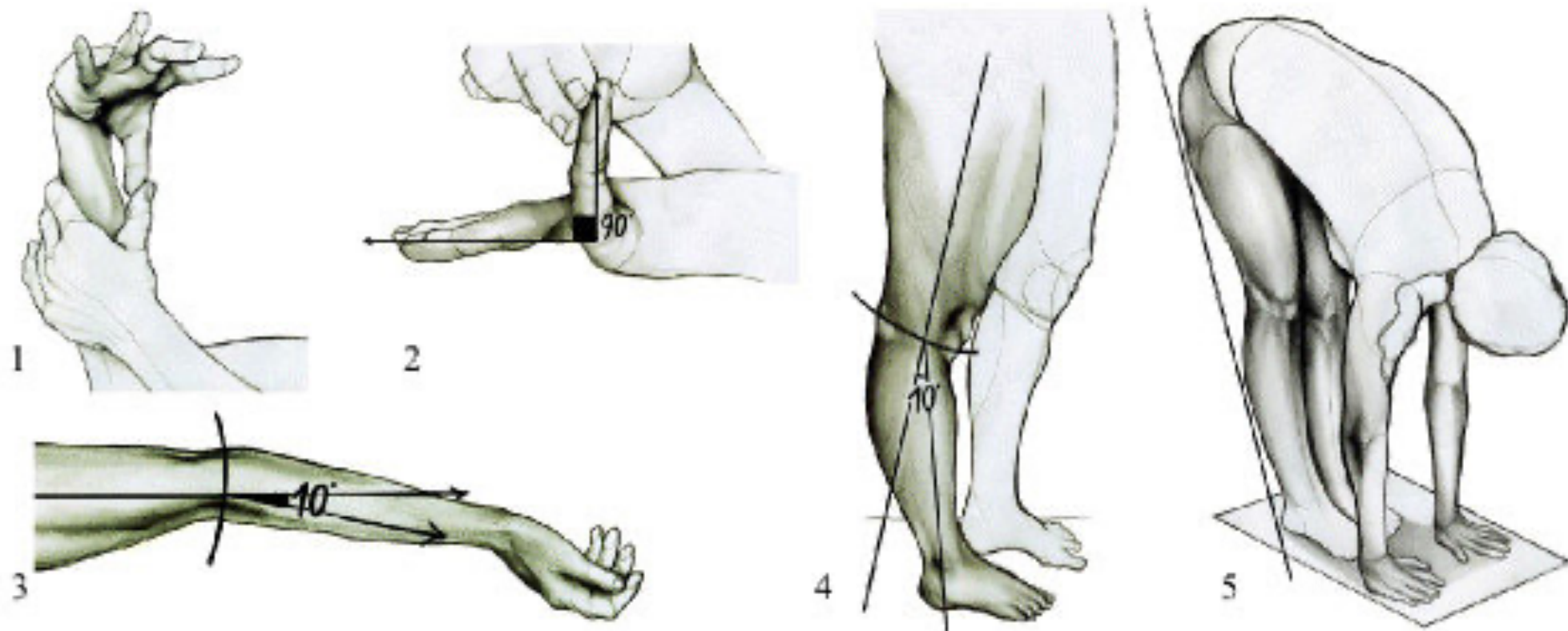
Foot Posture Index

# Beighton Test

1. Passive dorsiflexion of the fingers beyond 90°;
2. Passive retro-positioning of the thumbs until they make contact with the forearm;
3. Hyperextension of the elbow beyond 10°;
4. Hyperextension of the knee beyond 10°;
5. Forward flexion of the torso with the knees fully extended and the palms of the hands resting on the floor.

| Specific joint laxity                                                 | YES                           |                                | NO                       |
|-----------------------------------------------------------------------|-------------------------------|--------------------------------|--------------------------|
| 1. Passive apposition of thumb to forearm                             | <input type="checkbox"/> Left | <input type="checkbox"/> Right | <input type="checkbox"/> |
| 2. Passive hyperextension of V-MCP > 90°                              | <input type="checkbox"/> Left | <input type="checkbox"/> Right | <input type="checkbox"/> |
| 3. Active hyperextension of elbow >10°                                | <input type="checkbox"/> Left | <input type="checkbox"/> Right | <input type="checkbox"/> |
| 4. Active hyperextension of knee >10°                                 | <input type="checkbox"/> Left | <input type="checkbox"/> Right | <input type="checkbox"/> |
| 5. Ability to flex spine placing palms to floor without bending knees | <input type="checkbox"/>      |                                | <input type="checkbox"/> |

\*Each "YES" is 1 point. A score  $\geq 4$  out of 9 is generally considered an indication of JH. (MCP: metacarpophalangeal).



# Lower Limb Assessment Score (LLAS)

Hip Flexion

Hip Abduction

Knee Hyperextension

Knee Anterior Drawer

Knee Rotation

Ankle DF

Ankle Anterior Drawer

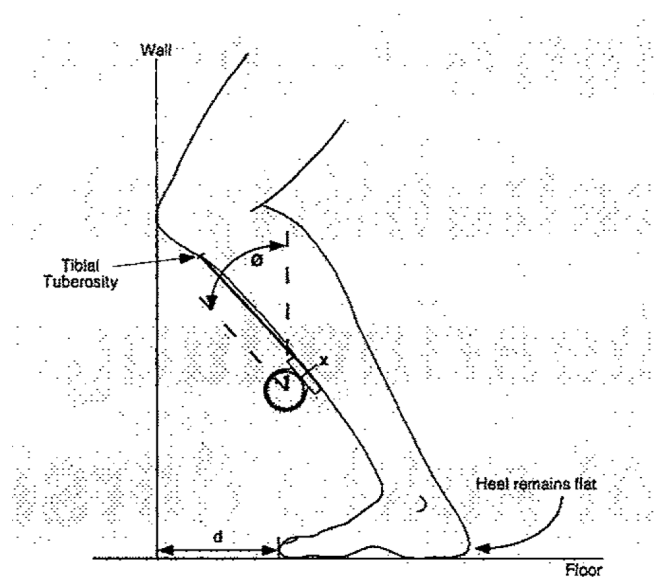
STJ Inversion

Midfoot

1st MPJ

Score >7/12

# The Ankle Lunge Test



Where:

- x 1.5 cm along anterior tibial shaft
- $\theta$  angle between anterior tibial border and the vertical (degrees)
- d distance from the wall to big toe (cm)





## Foot Posture Index

Clinical tool used to quantify the degree to which a foot is pronated, neutral or supinated

### Rearfoot

Talar head position  
Calc eversion/ inversion

### Forefoot

Medial arch  
Forefoot abduction

# Scoring the Foot Posture Index

A final score is a number between -12 and +12

The more **negative** the total number, the more **supinated** the **foot**

The more **positive** the total number, the more **pronated** the foot

A foot that is considered **neutral** will have a value of **0 to +5**

A woman in a black long-sleeved top and leggings is performing a handstand in a large, brightly lit gymnasium. She is holding a white object, possibly a shoe, in her right hand. The background shows large windows and a high ceiling.

# Clinical Hypermobility

# Ehlers Danlos Syndrome

The Ehlers-Danlos syndrome is inherited as an autosomal dominant trait

50 per cent chance that any child of an affected patient will have the condition.

The 2017 classification describes 13 types of Ehlers-Danlos syndrome

Most common is **Hypermobile EDS**

Children with hypermobility characteristically walk late and fell frequently,

Leg cramps at night, bruise easily, abnormal scarring

# Hypermobile EDS (hEDS)

## Orthopedic & Mobility Concerns

- Joint Hypermobility

- Joint Dislocation

- Joint Effusions

- Joint Instability

- Osteoarthritis \*\*\*Will speak about this soon\*\*\*

Pes planus by far most common foot deformity

- Many patients developed hallux valgus

# Hypermobile Flat Feet?

Orthotics UCBL

Surgical options

Understand risk for bunions

Balance support & sensory





# **UCBL & Hypermobile Flat Floot**

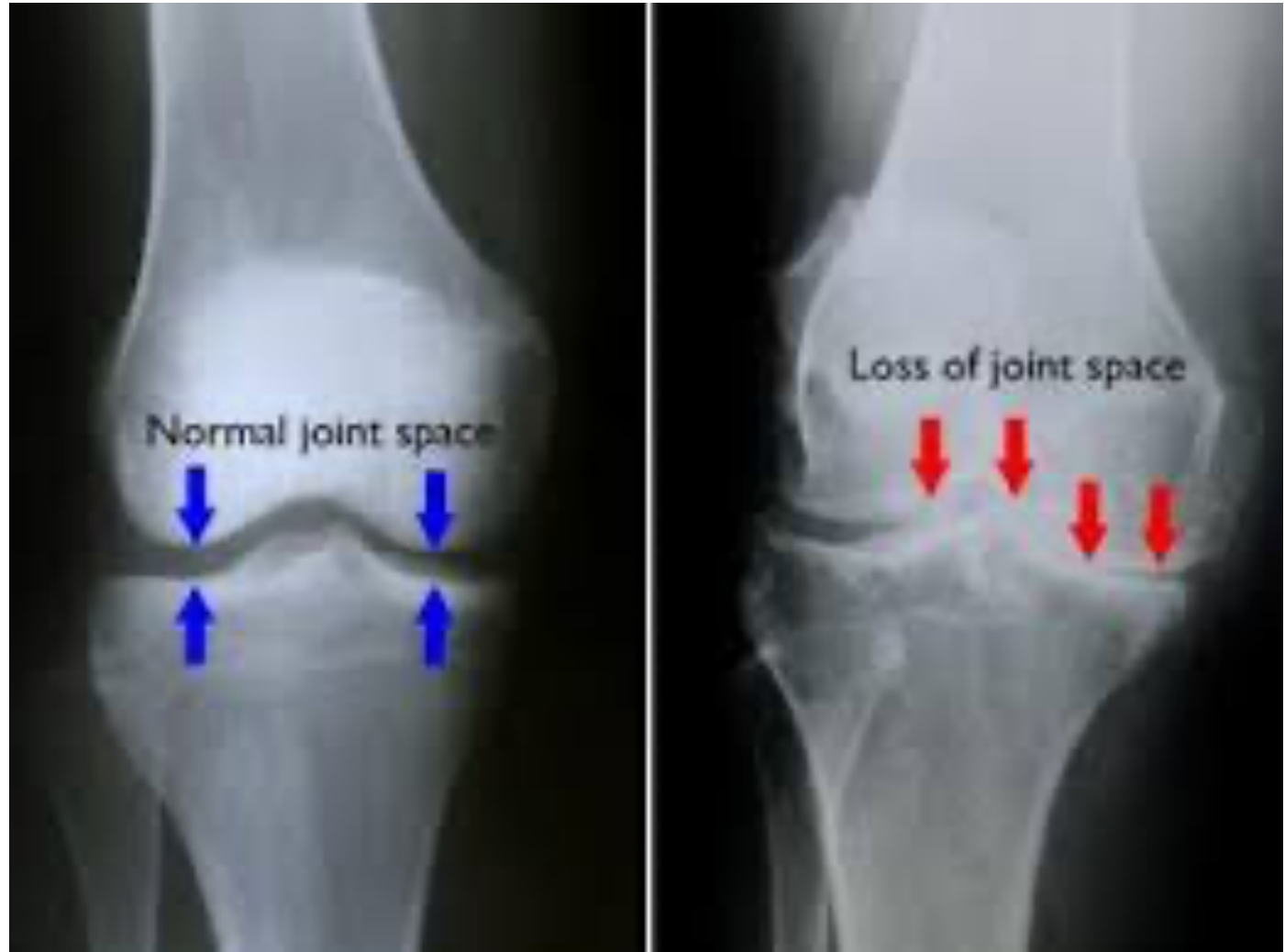
# Arthroreisis





## The Role of Proprioception

## Understanding Joint Stress



## **Rheumatoid Arthritis vs. Osteoarthritis**



# Rheumatoid Arthritis

Most common type of inflammatory arthritis. Autoimmune condition that has shown genetic and stress associations.

Up to 90% of people with this condition will report associated foot problems. For some people, the foot is the first area of the body to present with signs and symptoms of RA.

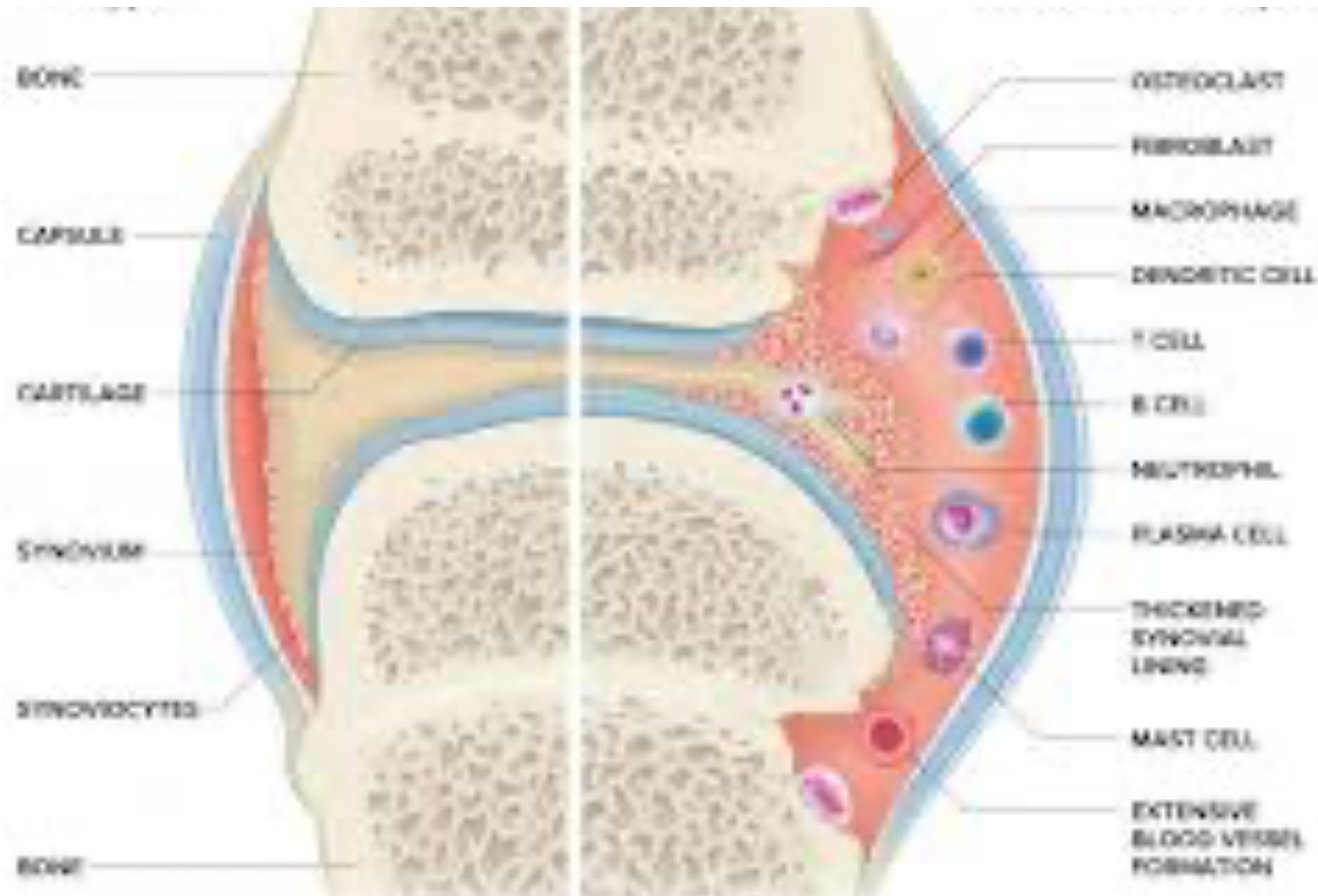
# RA & Foot Pain

Up to 90% of people with RA report associated foot problems

For some people, the foot is the first area of the body to present with signs and symptoms of RA.

Typically impacts the smaller joints of the toes, the 'metatarsophalangeal (MP) joints' in the forefoot, the 'subtalar' joint and less commonly, the ankle joint.

# Overactivity of Synovium

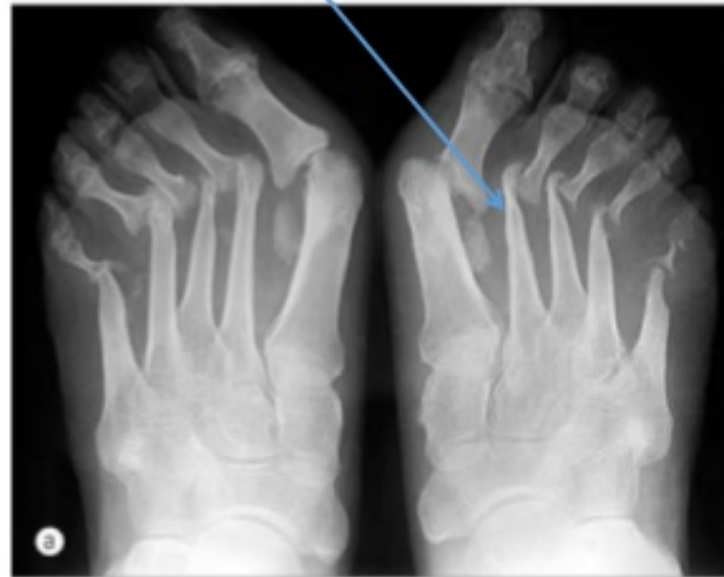


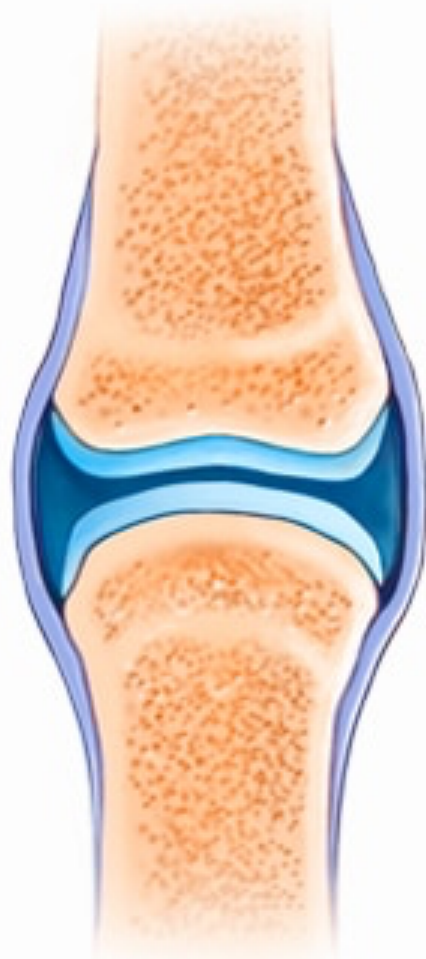
# Deviation of Joints

Arthritis mutilans

Pencil and cup deformity

Pencilling

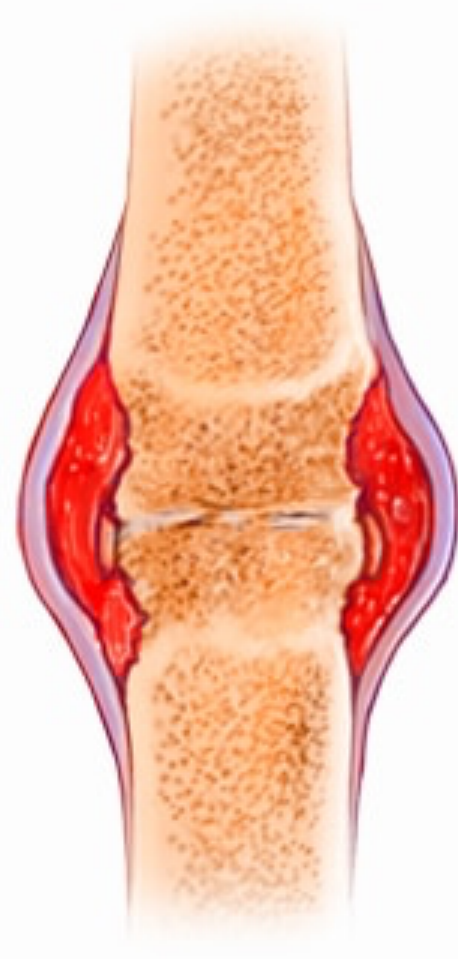




Healthy joint



Osteoarthritis



Rheumatoid arthritis

# Osteoarthritis

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According to the CDC, **more than 54 million adults** in the U.S. have a type of arthritis, with osteoarthritis being the most common.

The majority of those are aged 65 or older, at a prevalence of 49.8%

## Most common joints in the foot affected by OA

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- Ankle
- Subtalar joint
- Midfoot (talonavicular joint)
- 1<sup>st</sup> MPJ (great toe joint)



Most common contributor to foot & ankle arthritis is: **FLAT FEET!**





**The reality is an  
arthritic foot is  
very painful**

**33 JOINTS IN THE FOOT**

**(20 OF WHICH ARE ACTIVELY ARTICULATED)**



Creating support  
to reduce painful  
movement

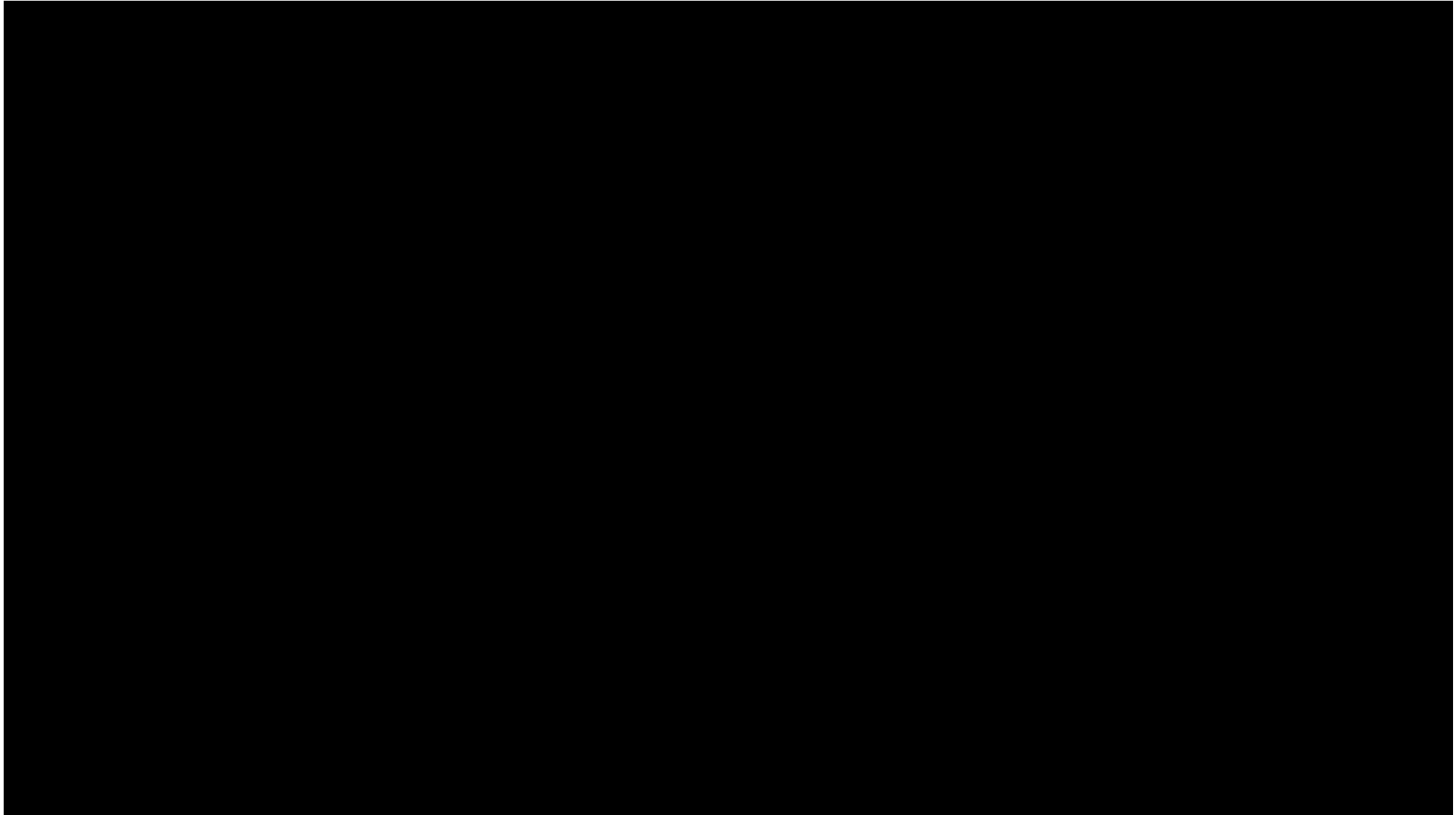


Combating ankle arthritis

**But what  
about hypo-  
mobility?**



## Early heel lift or idiopathic toe walking



# **Structurally short Achilles tendon cannot be lengthened by stretching**

Work within your structural limits

Avoid prolonged barefoot and zero drop shoes if symptomatic

Daily foot release and SMR to calves

Night splint prn



# Part 4 Psychogenic “Functional” Movement Disorders