Workplace Arthritis

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Disclosures

- Consultant: Smith & Nephew
- Editorial Board: Arthroplasty Today
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Tired of Worldwide Pandemics…


ARTHRITIS FOUNDATION®
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What is Arthritis?

Cartilage Loss → **PAIN**

- Joint Space Narrowing
- Osteophytes
- Bone Cysts
- Subchondral Sclerosis

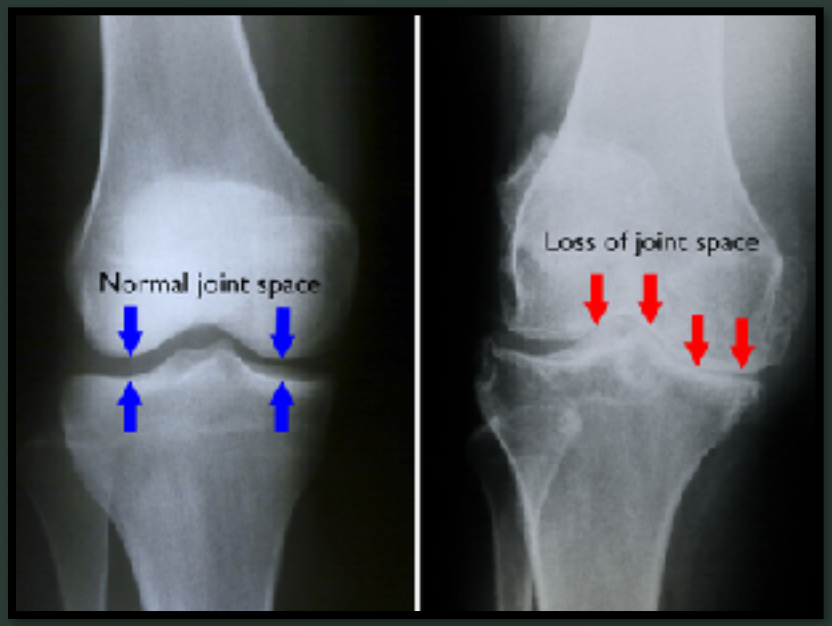
Phases

- Good days
- Bad days

Arthritis Epidemiology

2015: 54 million

- **50%** Knee Arthritis
  - 2/3 obese
- **25%** Hip Arthritis



2040: 78 Million

Limits ADL's and PRODUCTIVITY

www.cdc.gov/arthritis

Joint Replacement Incidence

2015

- 500,000 Total Knees
- 285,000 Total Hips

By 2030

- **3.5 Million Total Knees**
- **600,000 Total Hips**

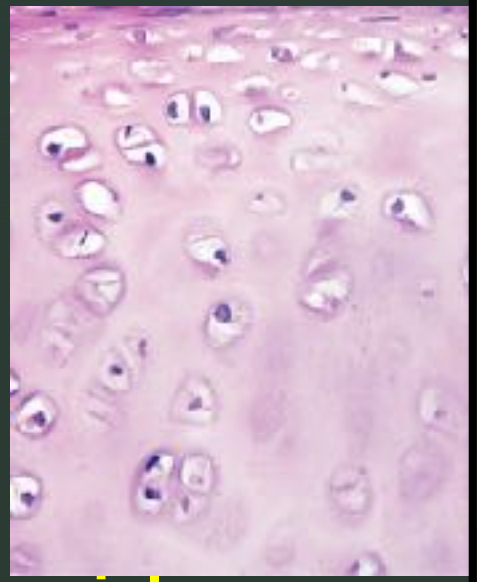
Risk Factors for Arthritis

- Genetics*
- Age
- Obesity
- Trauma
- Congenital
- Sex (**M**>F)
- Smoking
- Infection

“I Stand on Concrete Floors All Day”

THE HUMAN BODY IS DESIGNED FOR MOVEMENT

Articular Cartilage



- Avascular
- Scant Chondrocytes
- Derives Nutrition from **ingress/egress of synovial fluid**
  - Mechanical Stress
  - Alters Cellular Environment*

Cartilage Responds to Force

> PeerJ. 2020 Aug 5;8:e9676. doi: 10.7717/peerj.9676. eCollection 2020.

Medial knee cartilage is unlikely to withstand a lifetime of running without positive adaptation: a theoretical biomechanical model of failure phenomena

Ross H Miller [1 2], Rebecca L Krupenevich [3]

Review > Clin Sports Med. 2010 Jul;29(3):417-28. doi: 10.1016/j.csm.2010.03.006.

Running and osteoarthritis

Stuart E Willick [1], Pamela A Hansen

Meta-Analysis > Phys Ther Sport. 2021 Jan;47:147-155. doi: 10.1016/j.ptsp.2020.11.030. Epub 2020 Nov 24.

The effect of running on knee joint cartilage: A systematic review and meta-analysis

Xueping Dong [1], Canfeng Li [1], Jiyi Liu [1], Pengzhou Huang [1], Guanwei Jiang [1], Mengdi Zhang [1], Wentao Zhang [1], Xintao Zhang [2]

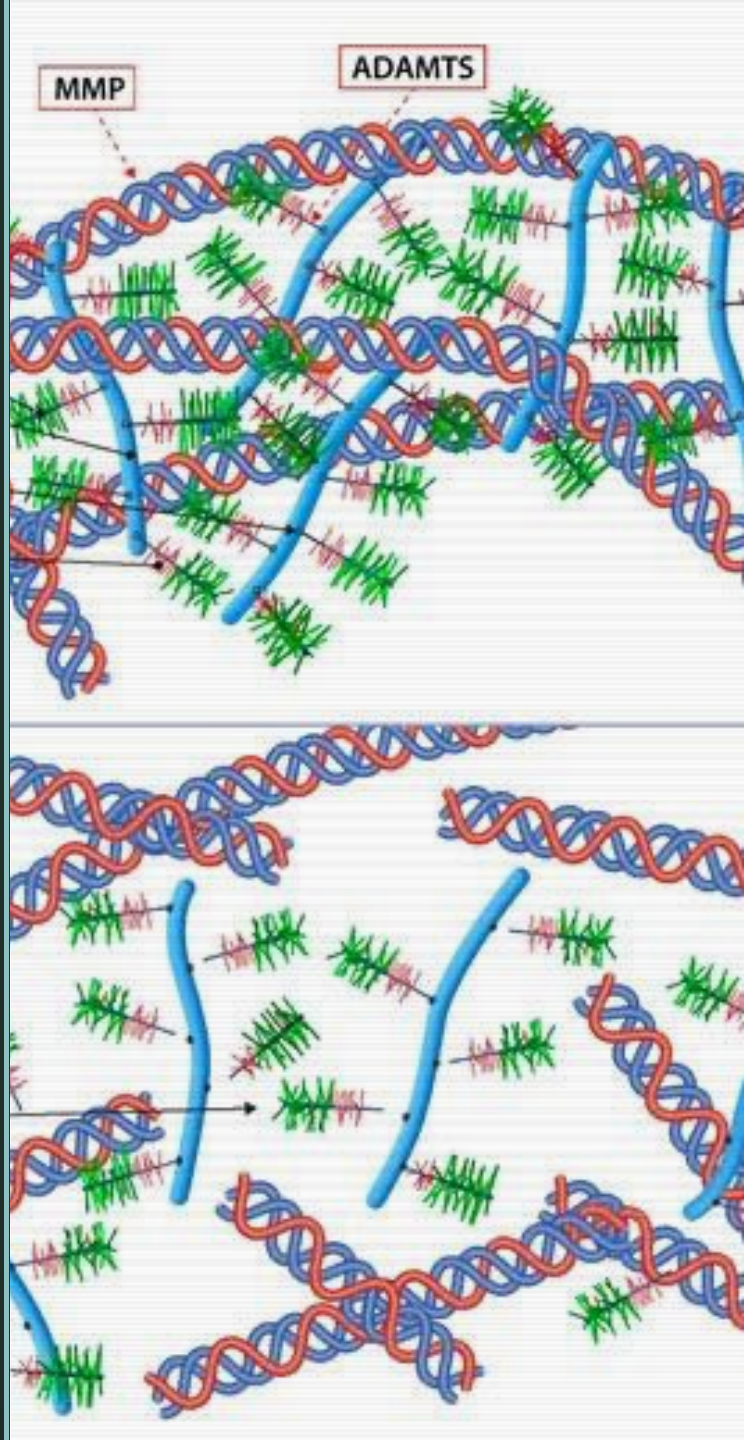
Review > Exerc Sport Sci Rev. 2017 Apr;45(2):87-95. doi: 10.1249/JES.0000000000000105.

Joint Loading in Runners Does Not Initiate Knee Osteoarthritis

Ross H Miller [1]

Aging Cartilage

- "Disorganized" Structure
- Decreased ability to attract **Water Molecules**
  - Loss of **Hyaluronic acid Backbone**
  - Degradation of **Chondroitin & Keratin Sulfate** Chains



Boric et al: *Genes* 2020

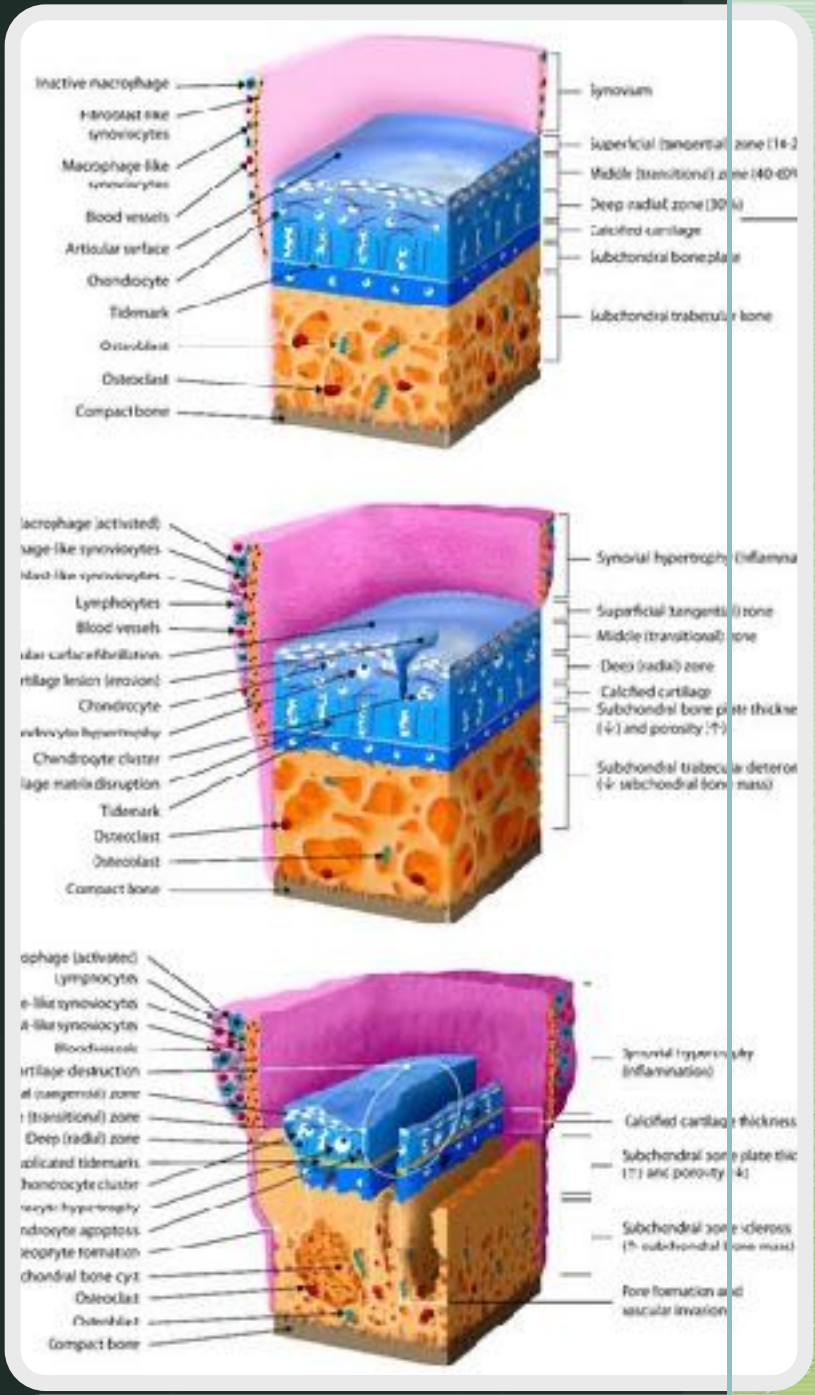
Cartilage Destruction

EARLY: Disruption of Extracellular Matrix

- Secondary chondrocyte hypertrophy
- Reduction in subchondral bone mass, synovial thickening, & inflammatory cells migration

LATE: Full-thickness Cartilage Erosions & Chondrocyte Apoptosis

- Further synovial thickening with immune cells infiltration, increased vascularization, & subchondral bone sclerosis



Boric et al: *Genes* 2020

Concrete

- Romans ~300 BC
- **Gravel + Sand + Cement + Water**
- Non-forgiving surface???

Compressive Strength

Stiffness of Material (Young's Modulus)

MATERIAL	STRENGTH (MPa)
Steel	200,000
Concrete	**14,000 – 41,000**
Asphalt	5,000 – 10,000
Wood	7,000 – 14,000
Soil	35 – 100
Bone	**10 – 40**
Rubber	7
Cartilage	**0.45 – 0.80**

http://www.pavementinteractive.org/elastic-modulus/

Daily Battle Against Gravity

Static Position

- Cartilage Deformation
- Muscle Fatigue
- Decreased Blood Flow
- Mental Weariness

Promote Movement

Proper Footwear

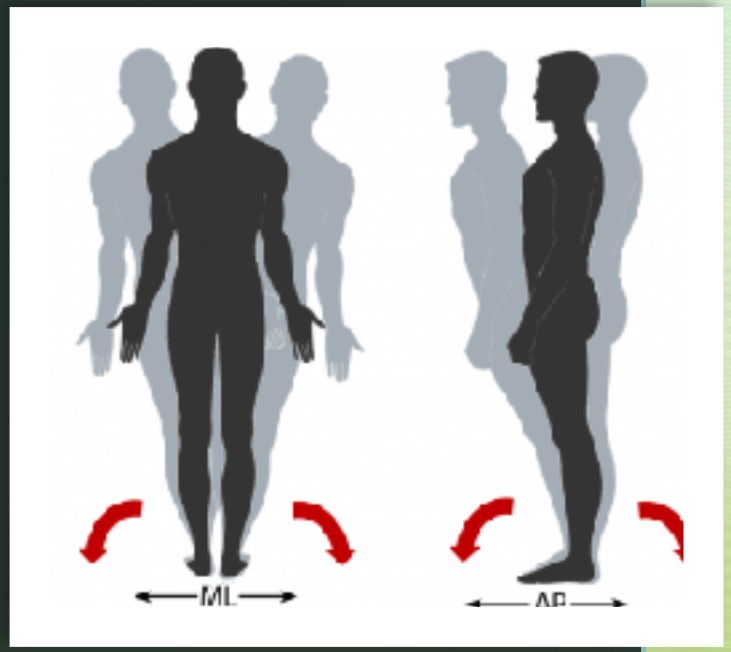
Change Positions

Stretch Breaks

Workplace Ergonomics

Anti-Fatigue Mats

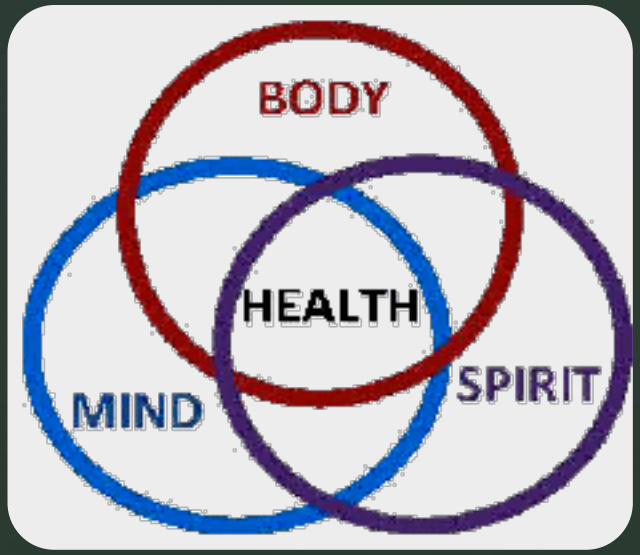
- Challenges body's center of gravity ➔**Sway**
- Generates **MOVEMENT** for joints

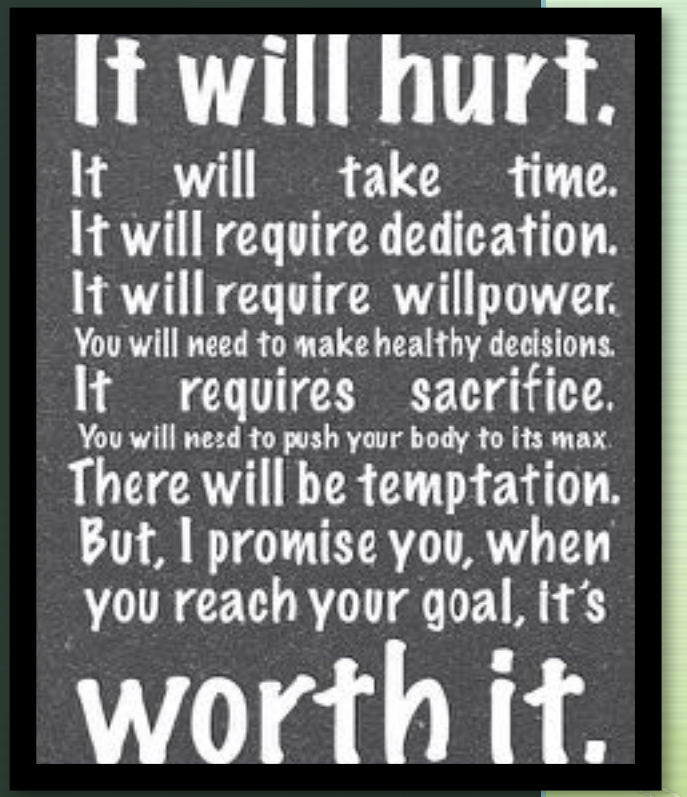


https://media.lanecc.edu/users/howardc/PTA204L/

GOAL:
Keep Patient Productive

- Contribute to Society
- Quality of Life





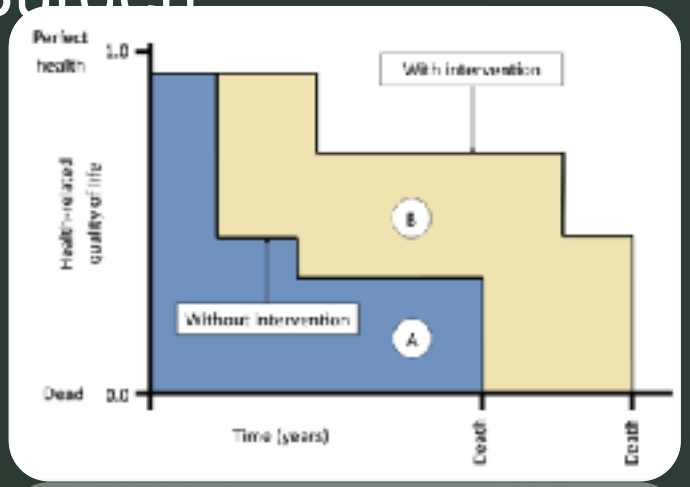
Conservative Management

AAOS Recommendations

- Activity Modification
- NSAIDS
- Physical Therapy
  - **Low-impact Exercises**
  - **Weight Loss**
- Bracing
- Injections
  - Steroid
  - Viscosupplementation

Quality-Adjusted Life Years (QALY)

- Measure of Disease Burden
  - Quality of Life
  - Quantity of Life



- Value ($) of Medical Interventions
- Cost-effective Analysis

(Cost of intervention – Cost of no intervention) / (Effect of intervention – Effect of no intervention)

Is Joint Replacement Worth It?

- Threshold **$50,000**
  - **TKA = $43,107** per QALY
  - **THA - $39,453** per QALY

- Conclusion: **TJA is COST EFFECTIVE**

Elmallah et al JOA 2017
McLawhorn JBJS 2018

Joint Replacement & Employment

Lyall et al

(Ann R Coll Surg Engl 2009)

97% working pre-TKA returned to work within **6 months**

Unemployed before TKA → **still unemployed after TKA**

Mobasheri et al

(Ann R Coll Surg Engl 2006)

96% working pre-THA returned to work

50% unemployed before THA returned to work

Worse if unemployed >1 year

Return to Work after TJA

Early Return

- Younger patients
- Few co-morbidities
- Sedentary work
- Self-Employed
- **Motivated***
- **Support System**

Later Return

- **Workers Comp***
- Heavy Manual Labor

Malviya et al. *Occ Med* 2014

Recovery after Joint Replacement

Therapy is a **NECESSITY**

- **3 MONTHS**
  - Range-of-Motion
  - Strengthening
  - Endurance
  - Balance

Driving:

2-3 weeks hips

4-6 weeks knees

Return To Work

- Sedentary jobs: **6-8 weeks**
- Labor Intensive: **3 months**
- KEY: **Patient Expectations**

Work Hardening/ Conditioning

- Psychological Counseling
- Physical Strengthening
- Functional Specific Training

Conclusions

- Arthritis is **Common**
- Cartilage Responds to **Stress**
- Joint Replacement Is Beneficial ($$$)
- Reasonable Return to Work **Expectations**
- Improved **Quality of Life**

Questions?