CLERKING PATIENTS WITH RESPECT TO CLINICAL BIOMECHANICS

Andy Horwood

Podiatric Innovations Limited

Product Designer at Healthy Step Ltd

Visiting Fellow Staffordshire University

WHY DO WE CLERK OUR PATIENT?

- A DIAGNOSIS & A MECHANISM OF INJURY:

- PROCESSES & PATHWAYS: SOAPIER/ SIN / OLDCARTS
- ASSESSING BODY SYSTEMS: CRAG-CELS
- APPROACHING THE PATIENT: GETTING THE RIGHT ANSWERS
- BIOMECHANICAL PRINCIPLES OF CLERKING: STRESS-STRAIN RELATIONSHIP
- ASSESSING THE TISSUES MECHANICALLY FOR DIAGNOSIS

HealthyStep®

ACRONMY OR ANACRONISM?

- HELP OR HINDERANCE?

ARS SALUTARIS SCIENTIA

HealthyStep®

PROCESSES & PATHWAYS

ARS SALUTARIS SCIENTIA

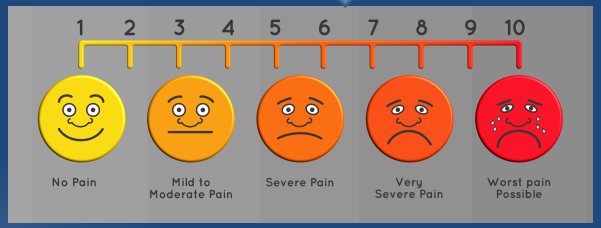
HealthyStep®

TREATMENT PATHWAYS OR RAMBLES

- DIAGNOSIS: an absolute datum point! BAD E.G.s
- MECHANISM OF INJURY: the route to treatment!
- STRUCTURED TREATMENT PLAN: Rx

SOAPIER (USEFUL FOR RECENTLY TRAINED)

- SUBJECTIVE…….What the patient reports.
- OBJECTIVE……..What we see, examine and record.
- ANALYSIS……..What we diagnose from the the above.
- PLAN……What we are going to do about it.
- Intervention…….The treatment we are going to apply.
- Evaluation…….Check what we have done seems effective.
- Re-evaluation….Did our intervention work!



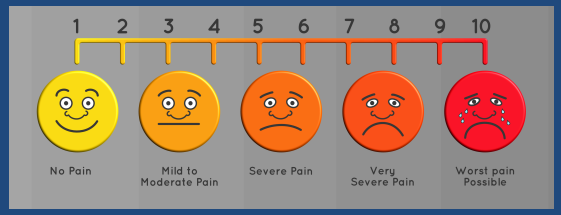
BIO-PSYCHO-SOCIAL MODEL OF CARE

HealthyStep®

SIN & OLDCART (S)

- Severity…….how bad is the symptom/problem
- Irritability……how easily is it set off.
- Nature…..everything else about the condition

1. Onset……problem history!
2. Location…..one finger test.
3. Duration…..symptom patterns.
4. Character…..burning, stabbing, throbbing, aching, radiating etc.
5. Aggravating/improving factors…….VERY USEFUL.
6. Radiating/referred……relative description of location (one finger test).
7. Temporal Patterns……..daily pain patterns, usually established on duration.
8. SEVERITY AGAIN!



ASSESSING THE BODY SYSTEMS

ARS SALUTARIS SCIENTIA

HealthyStep®

CLERKING SYSTEMS

- USE THE MEDICAL SYSTEMS (CRAG-CELS)

1. Cardiovascular; heart disease, vascular diseases, anemia
2. Respiratory; COPD, Asthma
3. Alimentary; IBS, Crohn's,
4. Genitourinary; Reiter's
5. Central Nervous System; Parkinson's
6. Endocrine; Diabetes
7. Locomotor; Osteoarthritis
8. Skin; psoriasis,

- Don't forget to consider age!

APPROACHING THE PATIENT

- TRY AND RECORD THE PATIENT NOT YOUR OWN VIEW

CLERKING TECHNIQUES: USING THE RIGHT QUESTIONS

1. CLOSED QUESTION; definite answer. "Where does it hurt"?
2. OPEN QUESTIONS; invites explanation. "When does it hurt"?
3. LEADING QUESTIONS; searching (not leading). "Is the heel pain present all the day"? "Does it hurt most when you first stand up?"
4. PROBING QUESTIONS; "Why do you think the pain is linked to your work"?

"I already diagnosed myself on the Internet. I'm only here for a second opinion."

BEING A GOOD LISTENER

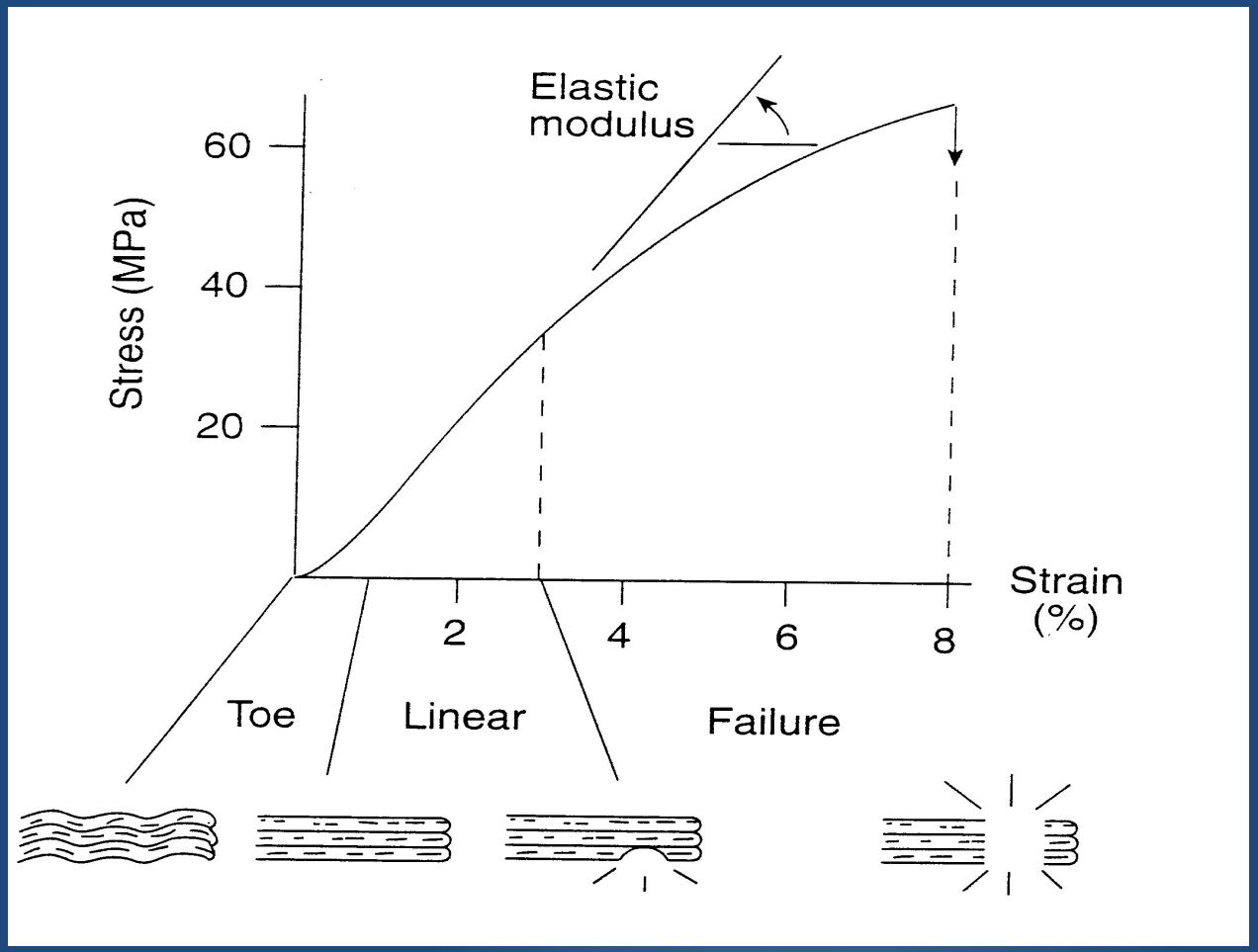
- The patient should tell you the most likely diagnosis which you only need to confirm.

"You have to learn about thousands of diseases, but I only have to focus on fixing what's wrong with ME! Now which one of us do you think is the expert?"

ARS SALUTARIS SCIENTIA

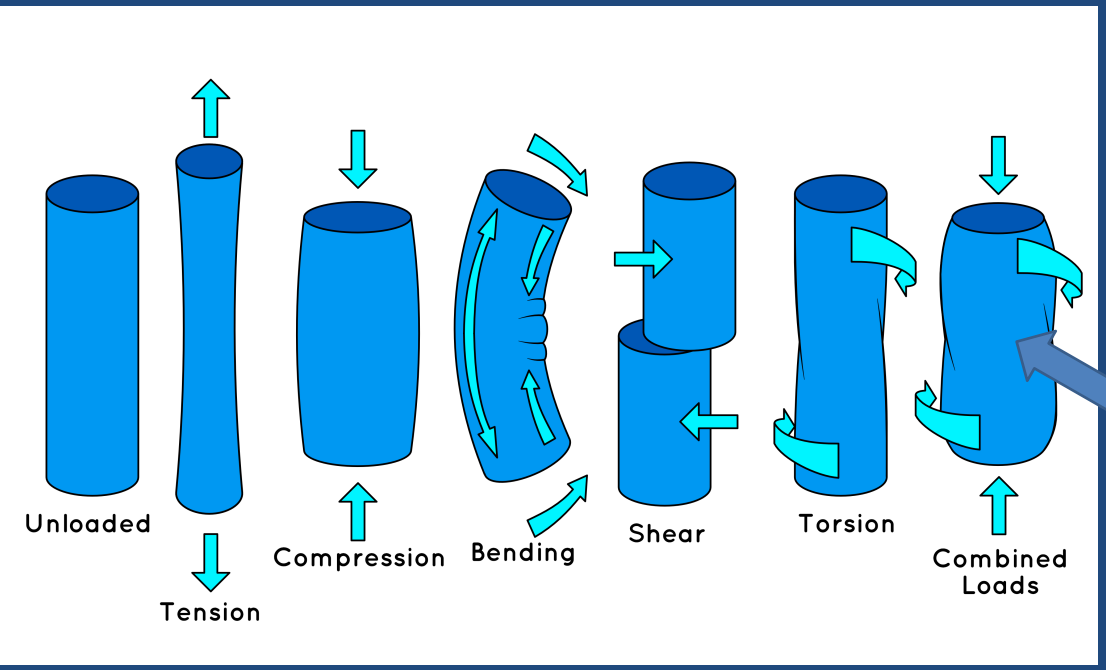
HealthyStep®

ASSESSING THE STRESS-STRAIN RELATIONSHIP



IS THE PATIENTS STRESS STRAIN RELATIONSHIP NORMAL?

STRESS & STRAIN

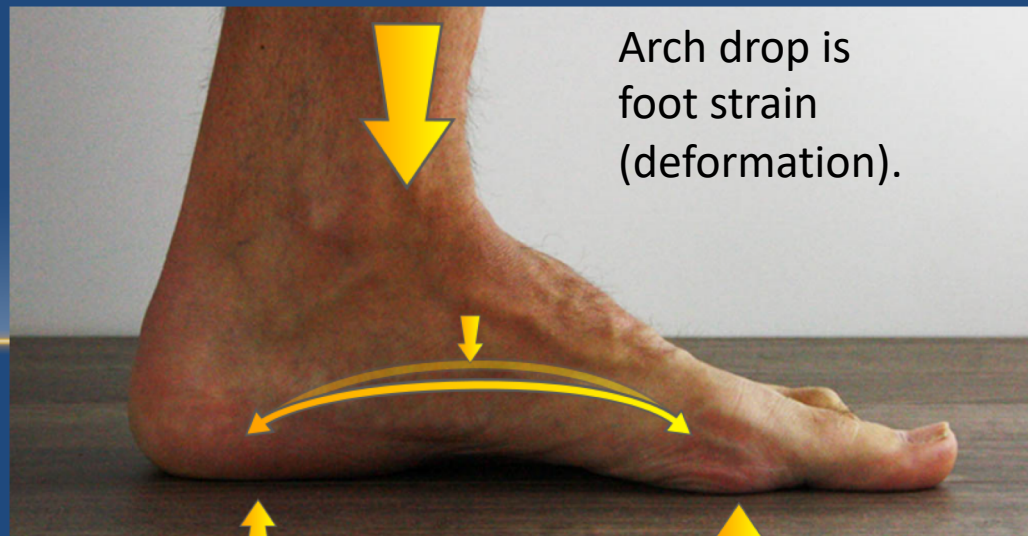


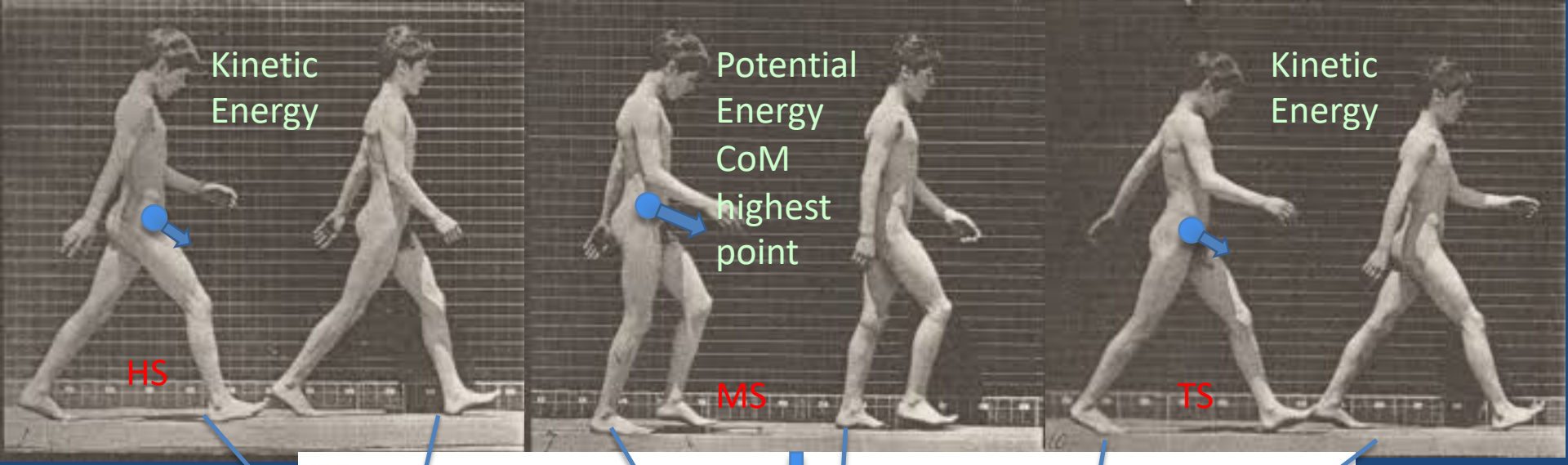
Stress is force in system.

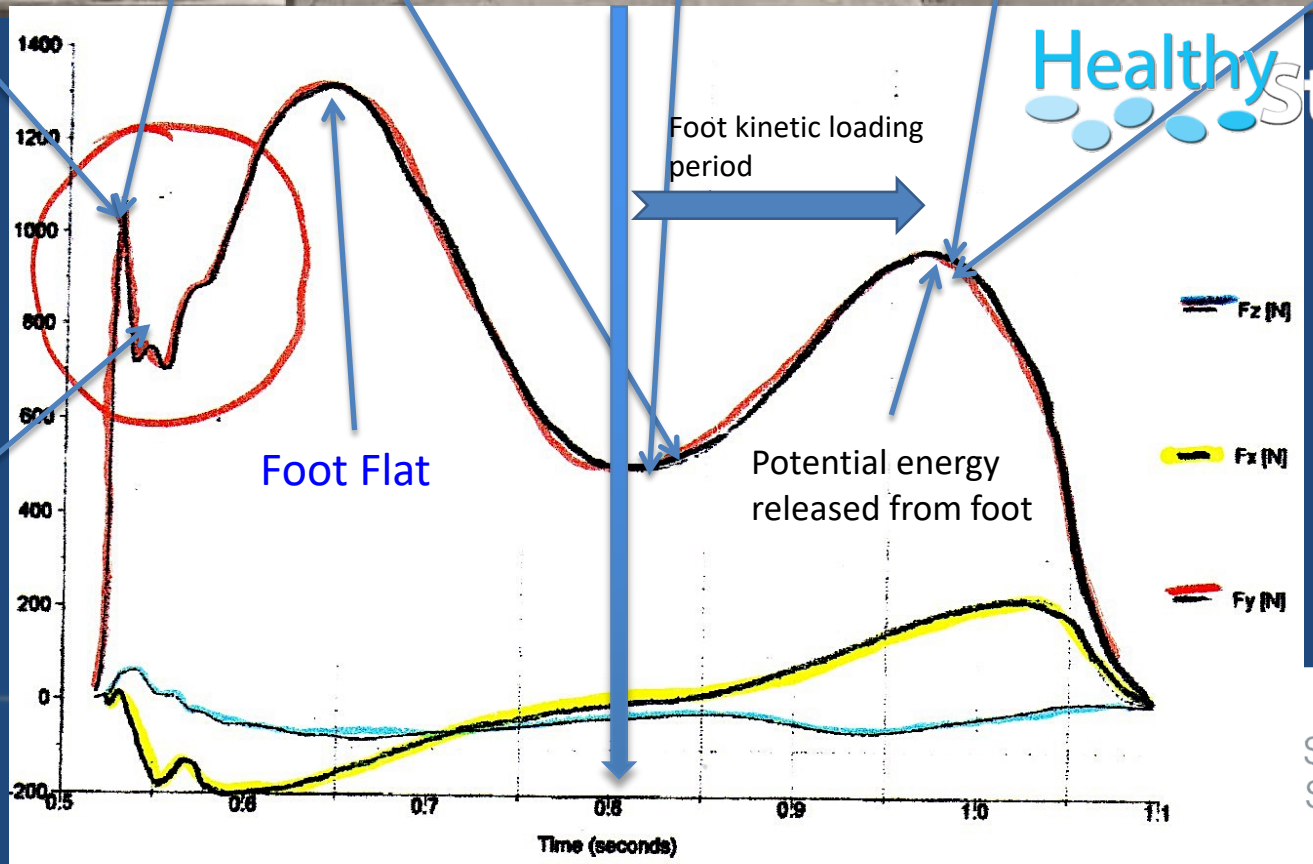
Strain is deformation.

All the types of strain bodies are put under.

The 2% (3%) strain in connective tissue (fascia) returned as potential energy!







Ankle Plantarflexion

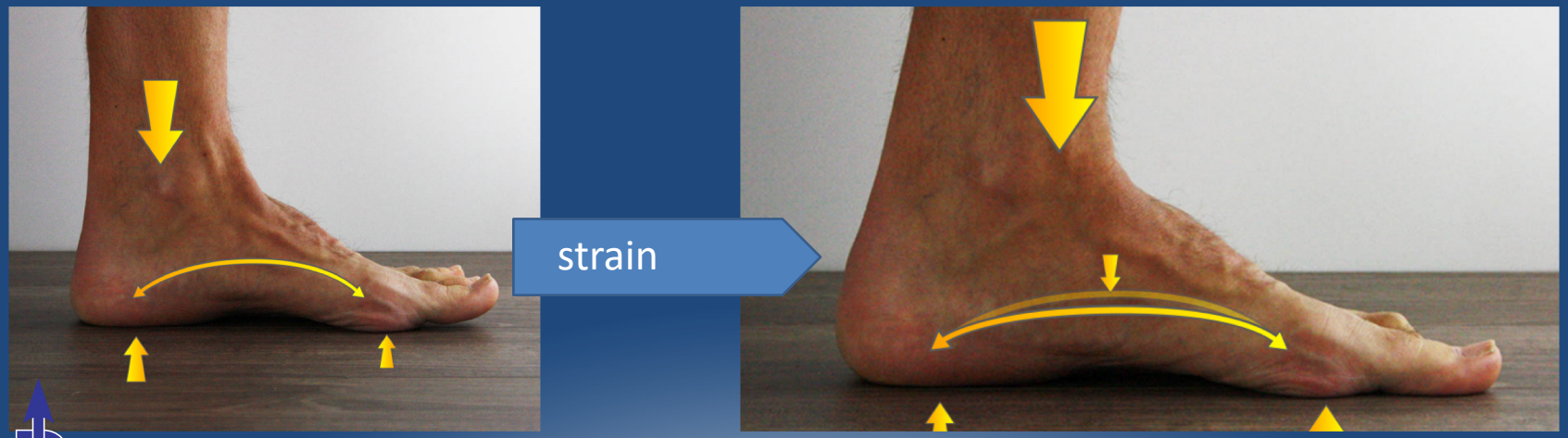
HealthyStep®

Ars Salutaris Scientia

STRAIN = DEFORMITY = WORK DONE

FOOT CONVERTS KINETIC ENERGY INTO POTENTIAL ENERGY

IF strain deformation too great = lost energy = poor energetics = HIGHER POTENTIAL INJURY RISK



ARS SALUTARIS SCIENTIA

HealthyStep®

WHICH FOOT IS THE LESS MECHANICALLY EFFICIENT?

ARS SALUTARIS SCIENTIA

HealthyStep®

PRINCIPLES OF BIOMECHANICAL CLERKING PATIENTS

Associate or disassociate the information from the symptoms. Do we have:?

Normal Stresses on Normal Tissues.= Normal Strain.

The symptoms unlikely to have a biomechanical cause.

1. Abnormal Stresses on Normal Tissues.
2. Normal Stresses on Abnormal Tissue.
3. Abnormal Stresses on Abnormal Tissue.

PAIN IS A FUNNY OLD THING!
NORMAL STRESS ON NORMAL TISSUES

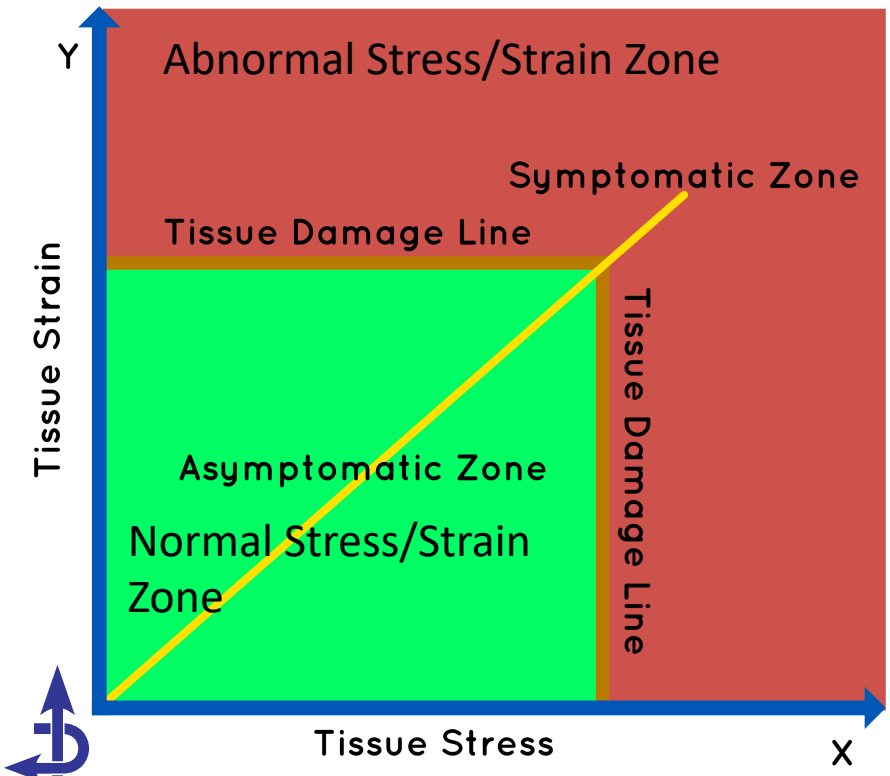
- Should not be related to mechanical causes.
- Can have biomechanical effects, but not cause.

1. Infections; verrucae, Reiter's, Lyme's Disease, etc.
2. Tumors; Fibromatosis, lipomas, osteomas, etc. (hopefully not sarcomas)
3. Inflammatory; Rheumatoid arthritis, psoriatic arthritis, Reiter's etc.
4. Foreign objects; glass, thorns, metal shards, hairs, spines etc.
5. Environmental mismatch. Vit D_3 deficiency, poor work posture/footwear, etc.
6. FATIGUE

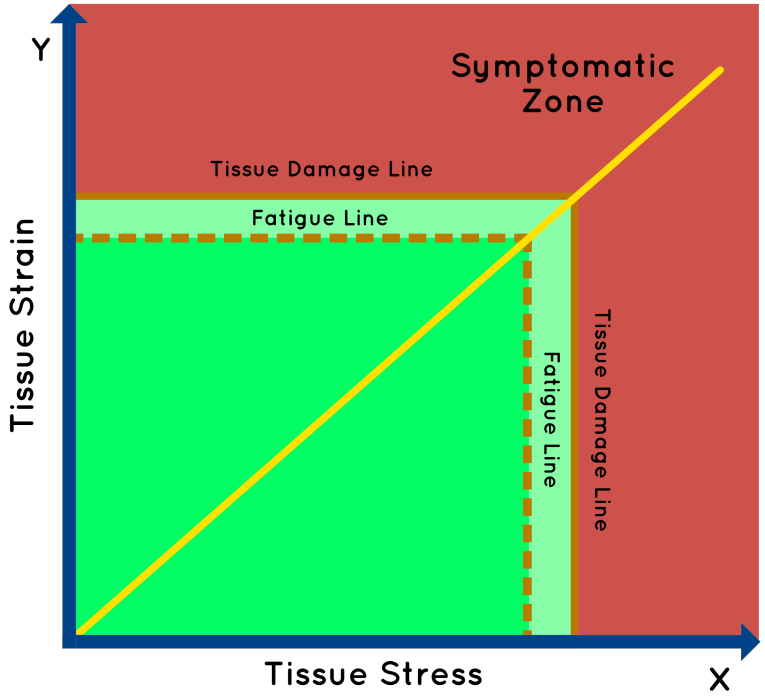
- Hypersensitivity (fibromyalgia, psychosocial conditions).

NORMAL TISSUE STRESS & STRAIN RELATIONSHIP

NORMAL HEALTHY TISSUE



FATIGUE REDUCES TISSUE STRENGTH



ARS SALUTARIS SCIENTIA

Healthy Step®

ABNORMAL (NEW) STRESS/ NORMAL TISSUES

- Normal healthy individual exposed to an abnormal stress;
- Tissues either adapt or injure to new stress.

1. STRESS TOO HIGH FOR TISSUES = INJURY
2. STRESS NEAR MAXIMAL TOLLERENCE REPEATED FOR TOO LONG (tissue fatigue). (Runners, dancers, etc. and obesity),

TISSUE CONDITIONING

INCREASES PROTECTION

In gradual onset symptoms look for abnormal alignment/motions in gait that might focus stresses into the relevant tissue.

ARS SALUTARIS SCIENTIA

HealthyStep®

NORMAL STRESS / ABNORMAL TISSUES

- Normal motion in gait, but the tissues are incapable of dealing with normal activity stresses.

- Diabetics. (glycosylation)
- Connective tissue disorders.
- Cardiovascular/alimentary diseases/respiratory. (tissue nutrition)
- Previously-injured tissues. (poorly healed tissues)
- THE ELDARLY. (weakness/atrophy/hormonal changes)

Kinematics, kinetics and alignment may appear normal:

but the tissues can't tolerate normal.

ARS SALUTARIS SCIENTIA

HealthyStep®

ABNORMAL STRESS / ABNORMAL TISSUES

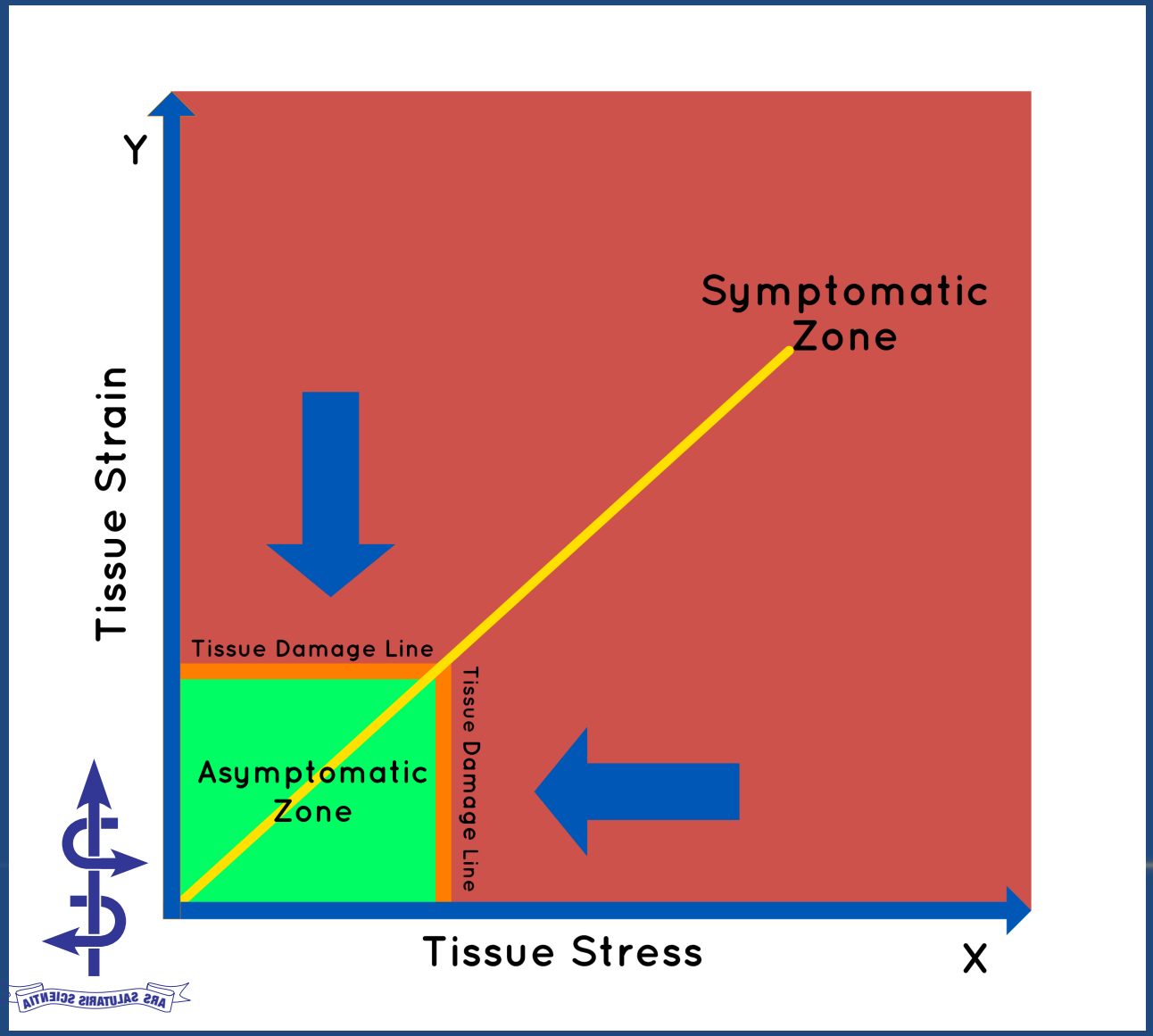
- The tissues are abnormal and do not stress normally under normal stress, but are now subjected to abnormal stress.

- Any injured tissue repeated subjected to abnormal stress.
- Any tissue carrying pathology subjected to abnormal stress.
- Any degenerated tissue subjected to abnormal stress.
- Any aged tissue subjected to abnormal stress.

Abnormal kinematics/kinetics and alignments in gait and stance expected.

INJURY SEVERITY INFLUENCES EXAMINATION

INJURED TISSUE DOES NOT BEHAVE LIKE NORMAL TISSUE



ASSESSING THE TISSUES MECHANICALLY FOR DIAGNOSIS

Healthy Step®

ARS SALUTARIS SCIENTIA

ESSENTIAL FOR ESTABLISHING THE DIAGNOSIS

	PROS	CONS
• DIAGNOSTIC IMAGING.	Sensitivity V.Good.	Selectivity variable
• CLINICAL EXAMINATION.	Sensitivity OK.	Selectivity Pretty Good
1. Palpation.	Sensitivity Good.	Selectivity Poor
2. Cyriax.	Sensitivity Good.	Selectivity Good

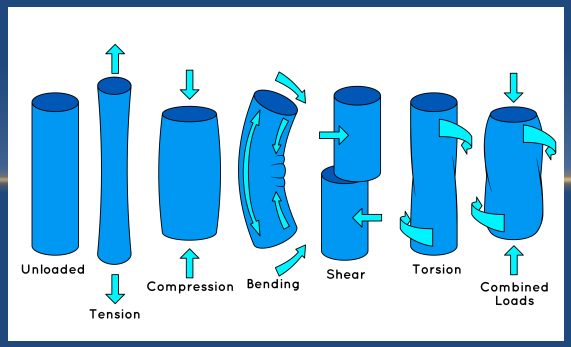
Confirms diagnosis (Pellechia et al,19966; Greenwood et al, 1998) effective in lower limb (Howard, 2000)

CYRIAX APPROACH

- Different tissues do different things.
- Different structures tend to be injured by specific stress/strain relationships. Most tissues are anisotropic.

EXAMPLES:

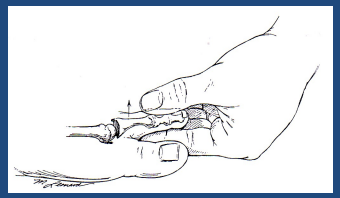
- Joint surfaces = compression / shear under compression
- Tendons, fascia (aponeuroses) = tension / torque under tension
- Bone = torque / torque under tension.
- Muscles = under isometric or concentric contraction
- Nerves = under compression / compression under tension.



CYRIAX APPROACH TO EXAMINATION

1. Distinguish deltoid ligament strain from a tibialis posterior grade I tendinopathy in medial ankle pain after an eversion ankle sprain?

2. Distinguish a flexor plate mechanism dysfunction from a pre-stress (fatigue) fracture in 2nd metatarsal head metatarsalgia?



3. Distinguish a medial collateral ligament strain from a medial compartment DJD in the knee causing medial knee pain?

TIBIALIS POSTERIOR ACTIVE INVERSION

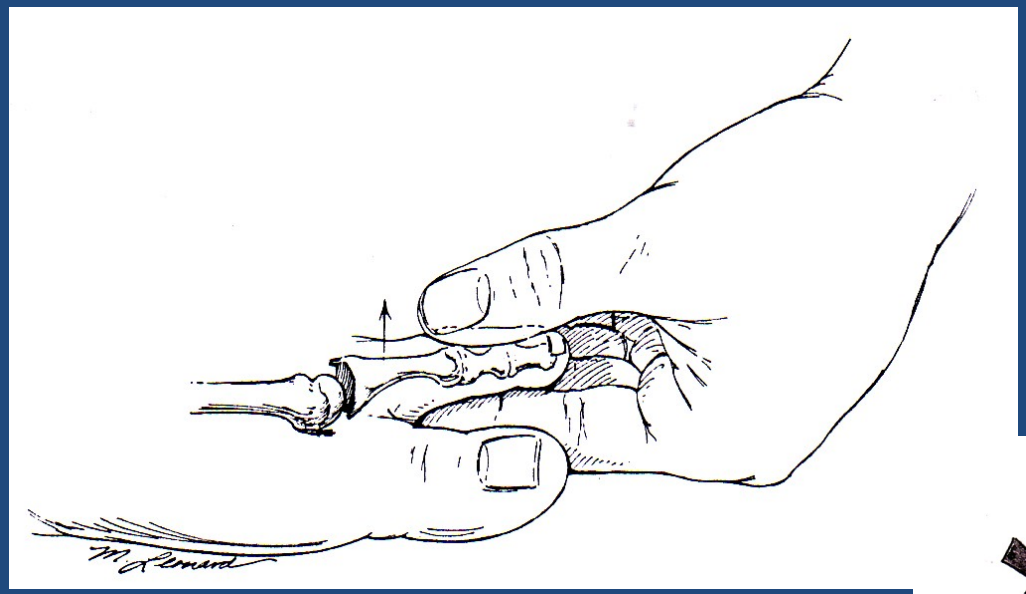
DELTOID PASSIVE EVERSION

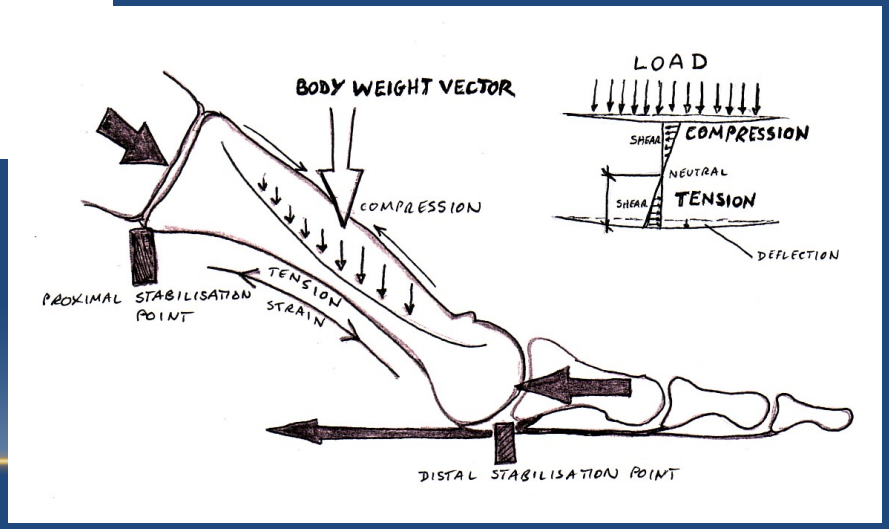
ARS SALUTARIS SCIENTIA

HealthyStep®

REALLY WEAK/PAINFUL TIBIALIS POSTERIOR

FLEXOR PLATE INJURY OR METATARSAL PRE-STRESS FRACTURE?

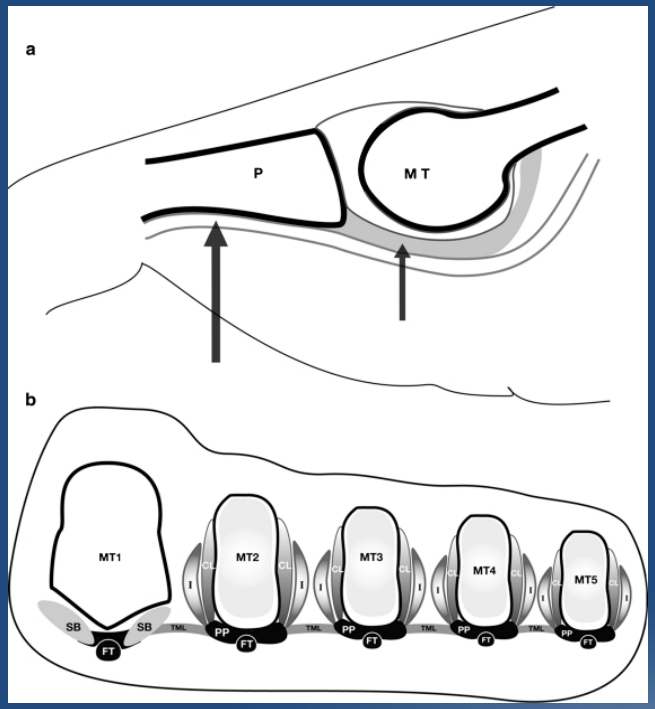




TESTING FLEXOR PLATE INTEGRITY

- DORSAL STRESS TEST (draw test)

Yanks = vertical stress test



- Grade 0 stable (no pain)
- Grade 0 stable (with pain)
- Grade 1 subluxation
- Grade 2 dislocation
- Grade 3 fixed dislocation

High Sensitivity 98% positive for pain. Klein et al, (2013)

KNEE COMPRESSION / LIGAMENT TENSION STRESS TESTS

Varus medial compression/lateral tension

Valgus lateral compression/medial tension

HealthyStep®

FAILURE IN CLERKING AND EXAMINATION LEADS TO MANAGED NEGLECT

ARS SALUTARIS SCIENTIA

HealthyStep®

ADVERT

University Accredited Continuing Professional Development (CPD)

Biomechanics, Gait Analysis Podopaediatrics

Please visit:
http://blogs.staffs.ac.uk/staffsbiomech/post-graduate-and-continuing-professional-development/

Or contact:
Dr Helen Branthwaite
h.r.branthwaite@staffs.ac.uk

For more information on all our postgraduate modules and MSc in Clinical Biomechanics

STAFFORDSHIRE UNIVERSITY

THANK YOU

- References:
- Greenwood MJ, Erhard RE, Jones DL (1998). Differential diagnosis of the hip Vs lumber spine: five case reports. *Journal of Orthopaedic and Sports Physical Therapy.* 27(4): 308-315.
- Howard PD (2000). Differential diagnosis of calf pain and weakness: flexor hallucis longus strain. *Journal of Orthopaedic and Sports Physical Therapy*. 30(2): 78-84.
- Klein EE, Weil L, Weil LS, Coughlin MJ, Knight J. (2013) Clinical examination of plantar plate abnormality. *Foot & Ankle International. 34(6): 800-804.*
- Pellechia GL, Paolino J, Connell J (1996). Intertester reliability of the Cyriax evaluation in assessing patients with shoulder pain. J*ournal of Orthopaedic and Sports Physical Therapy*. 23(1): 34-38.