

Introductory Remarks

Acknowledge

- Jan Felshin, Ed.D.
- John Cooper, Ph.D.
- Walter Kroll, Ph.D.
- Jan Broekhoff, Ph.D.

Acknowledge

"Injuries to Runners"

James et al. , 1978

- Stan James, M.D.
- et: Barry Bates, Ph.D.
- al: Lou Osternig, Ph.D.

Contributors

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96: B. Caster

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79: G. McIntyre

80: B. Mason

81: P. Francis

99: J. Mc...

91: T. Derric...

93: H. Davis

82: P. Kinoshita

82: V. ...

89: S. Ingram

89: S. McCaw

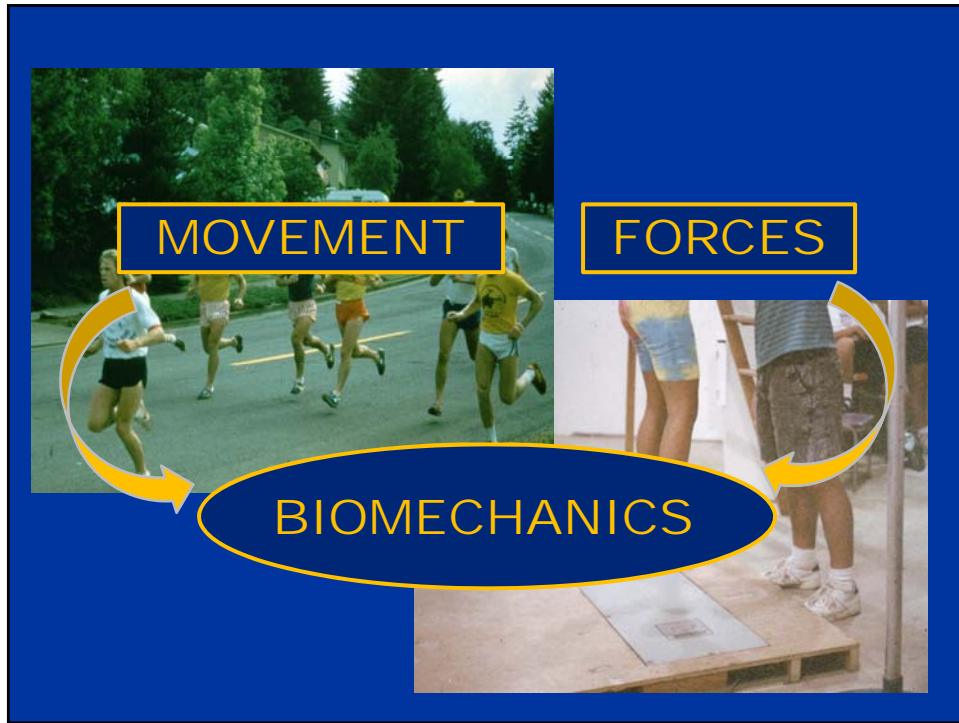
Recipients

- John Cooper, Ph.D.
- Barry Bates, Ph.D.
- Bruce Mason, Ph.D.
- Joe Hamill, Ph.D.

Accommodating Strategies for Preventing Chronic Lower Extremity Injuries

Barry T. Bates, Ph.D.





WHY ?

INJURY : PREVENT

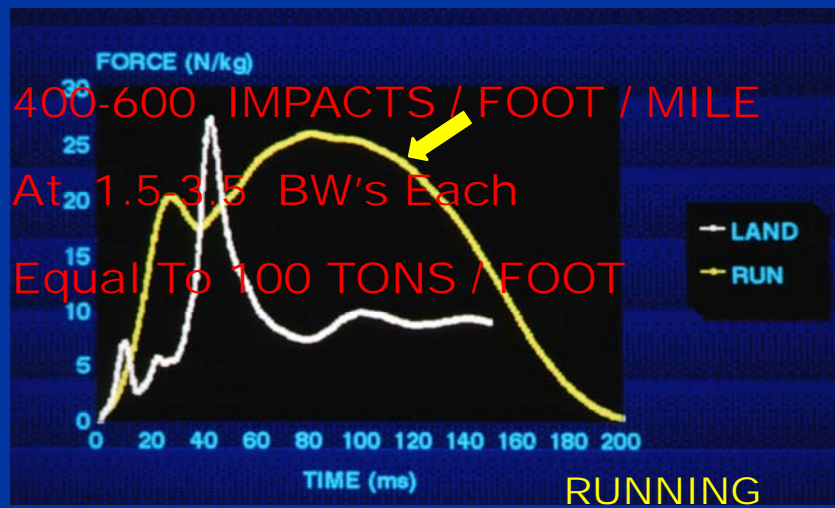
INJURY: REHABILITATION

PERFORMANCE: ENHANCE

RUNNING is "VIOLENT"



RUNNING is "VIOLENT"



Is There a Difference ?



Stride vs Injury



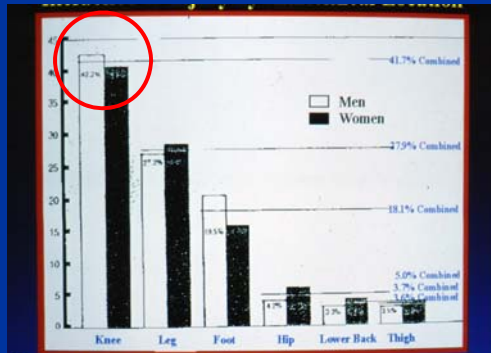
INJURY STATISTICS: RUNNING

| | |
|-----------------------|-----|
| KOPLAN et al, 1982 | 35% |
| LYSHOLM et al, 1987 | 65% |
| MARTI et al, 1988 | 46% |
| WALTER et al, 1989 | 48% |
| van MECHELEN, 1992 | 50% |
| ASPLUND, TANNER, 2004 | 50% |

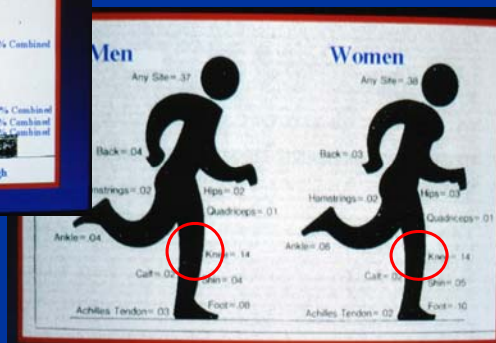
Ten Common Injuries (AOSSM, 2008; Others)

| | | |
|-------------------------------|---|-------|
| Plantar Fasclitis | } | Foot |
| Stress Fractures (Foot & Leg) | | |
| Achilles Tendonitis | } | Leg |
| Shin Splints | | |
| Iliotibial Band Syndrome | } | Knee |
| Patellofemoral Pain Syndrome | | |
| Ankle Sprains | } | Other |
| Muscle Pulls | | |
| Blisters | | |

Body Part Injured by Gender



(Clement, DB, et al. *Phys Spts Med*, 1981)



(Koplan, JP et al, *JAMA*, 1982)

JAMES et al, 1978

Training Errors (60%)
Shoes and Surfaces
Anatomic Factors

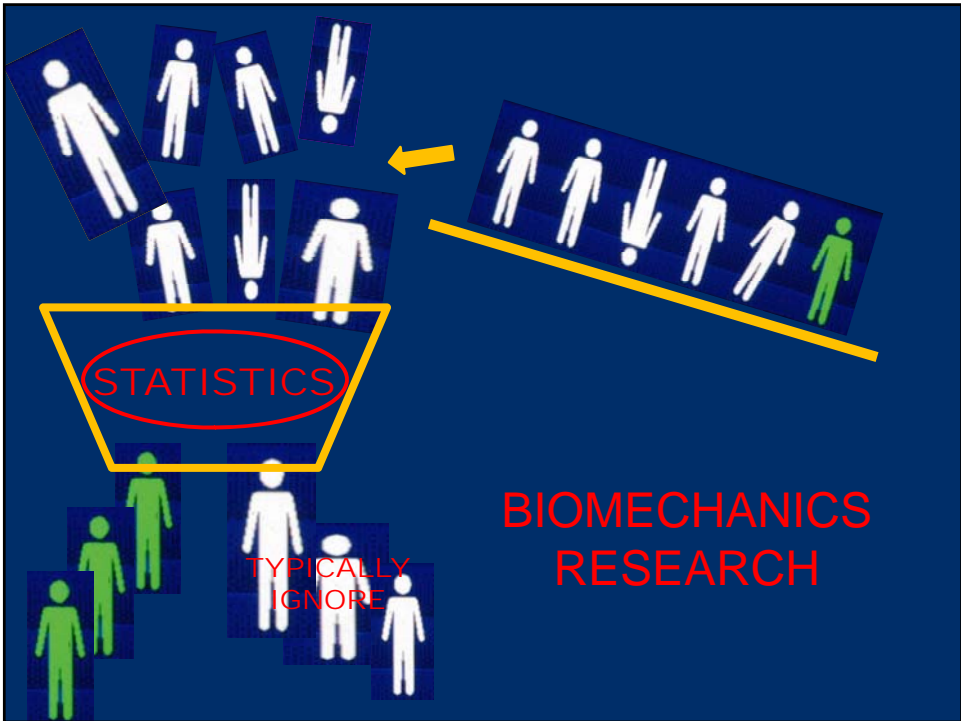
AOSSM, 2008

Training Errors
Shoes, Surfaces, Weather
Anatomic Abnormalities

Stop! → Detour

Why Is This The Case?

Why Haven't We Seen More Change Across Time?



"Average" Person



Individual

SHOE RESEARCH RESULTS

VS

SHOES CAUSE INJURIES ?

JAMES et al, 1978

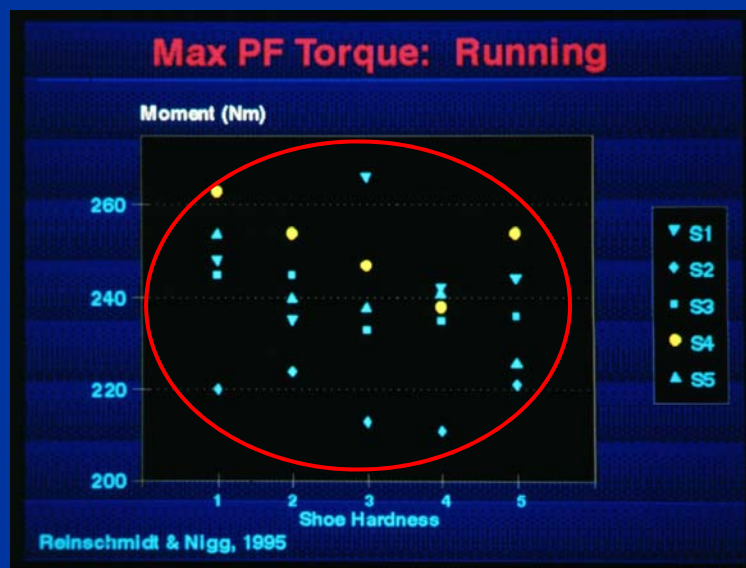
Training Errors (60%)

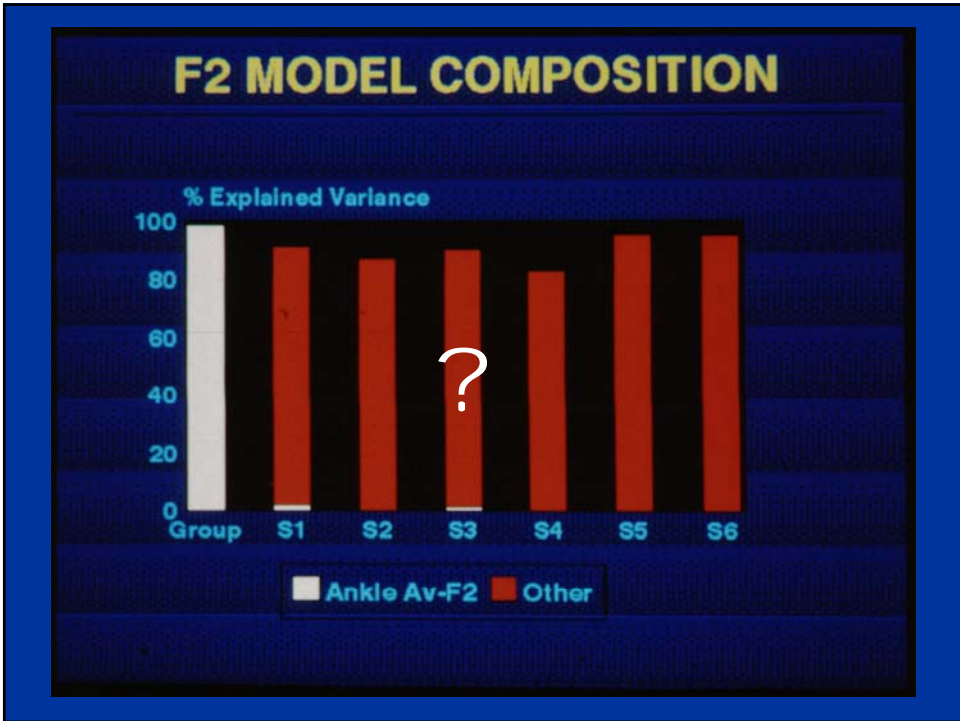
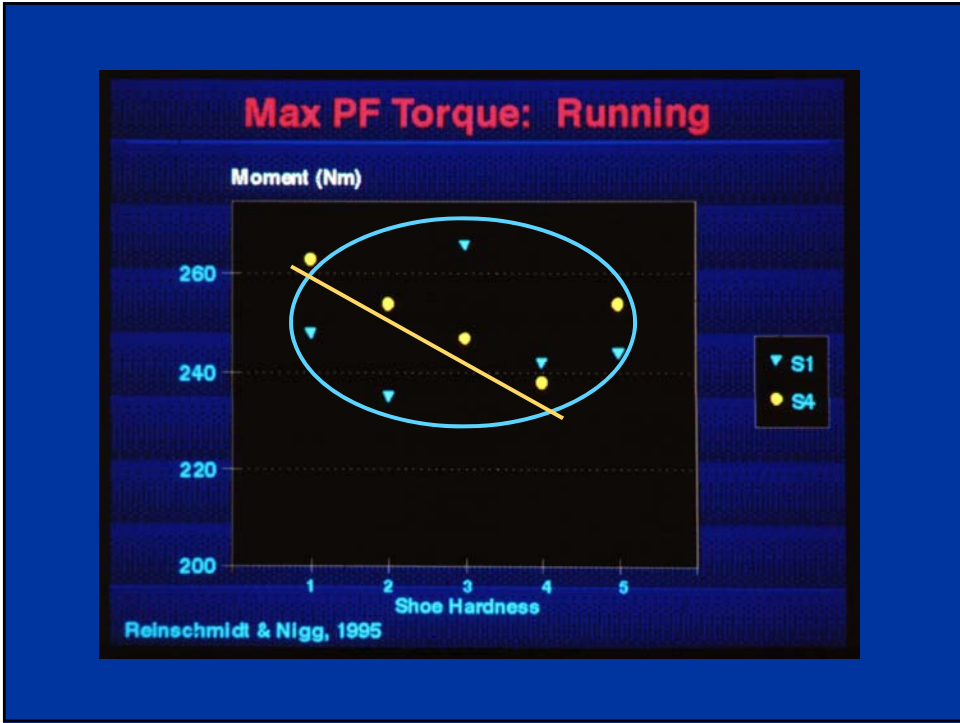
→ Shoes and Surfaces
Anatomic Factors

AOSSM, 2008

Training Errors

→ Shoes, Surfaces, Weather
Anatomic Abnormalities





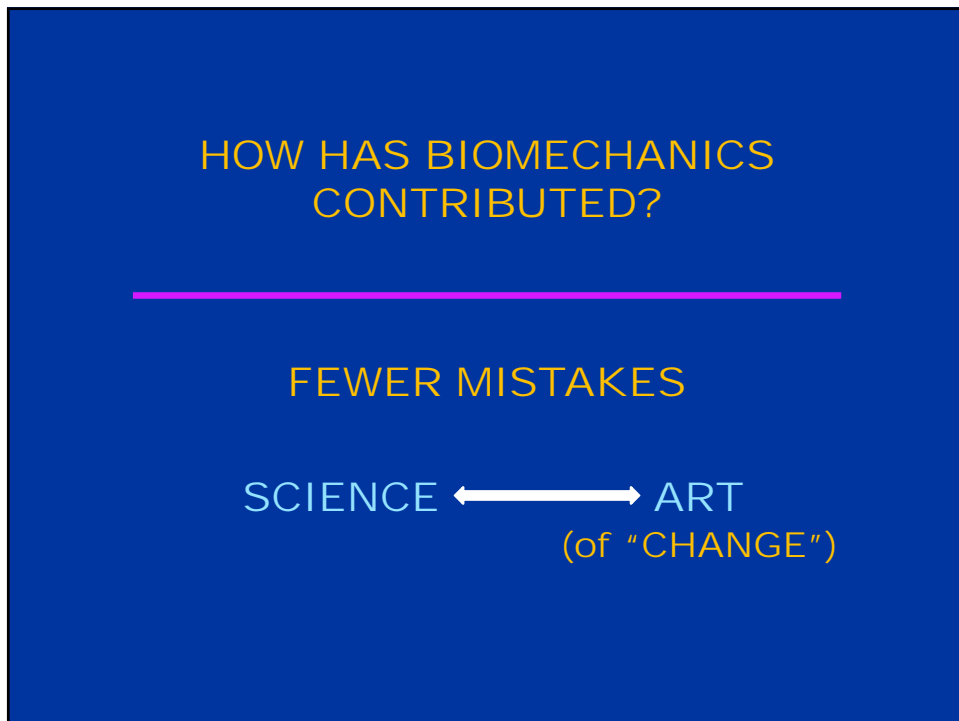
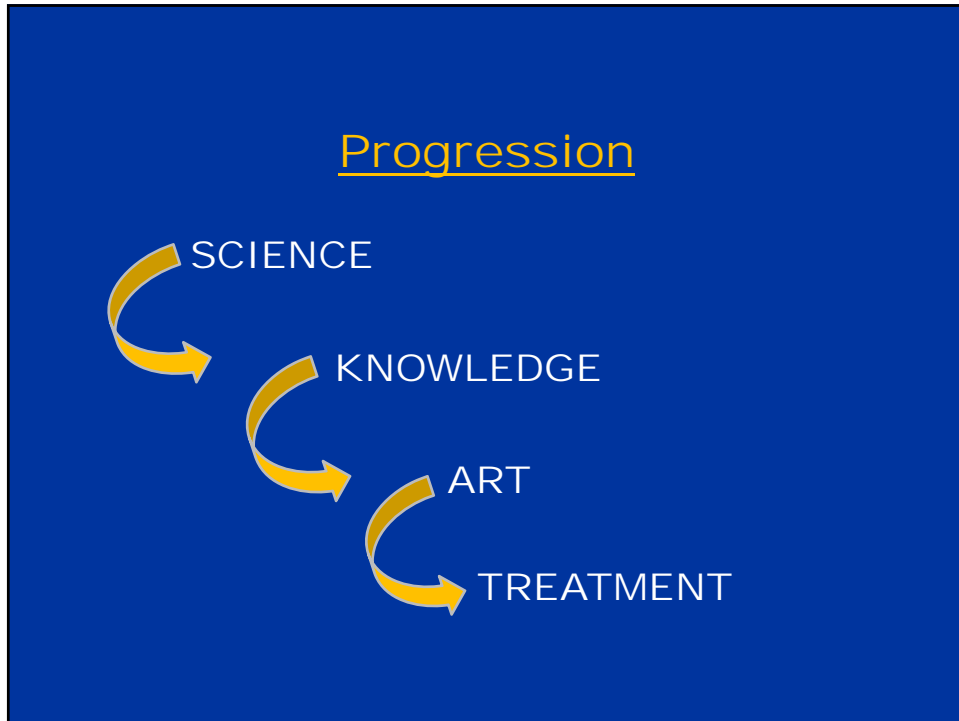
Final Comment

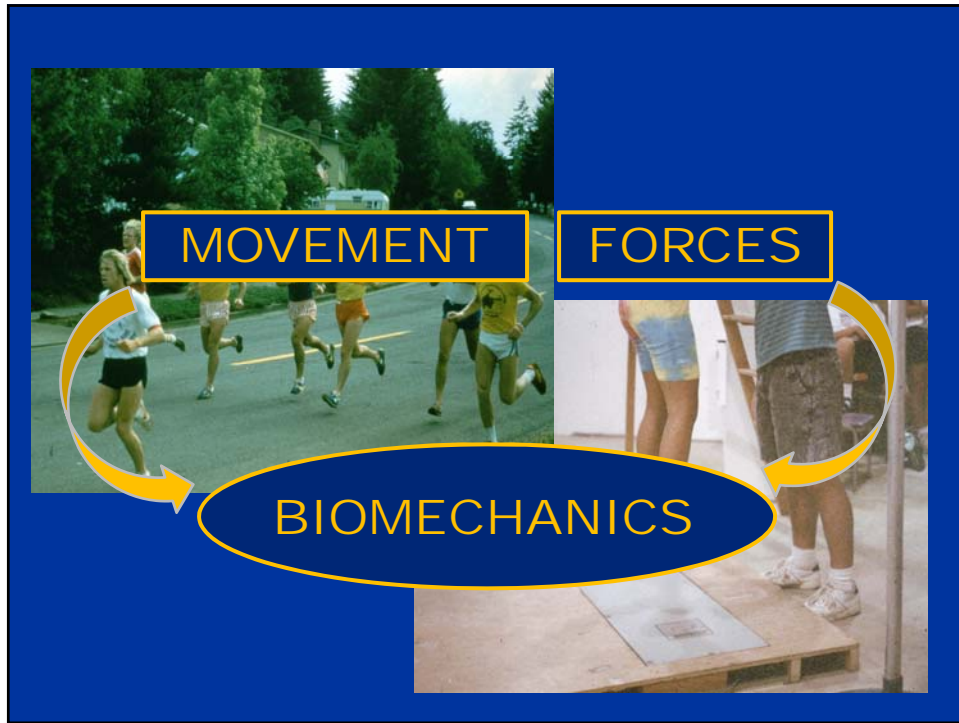
"... propositions about people cannot necessarily be derived from propositions about the mean of people ..."

Bouffard, 1993, p.371

HOW HAS BIOMECHANICS CONTRIBUTED?

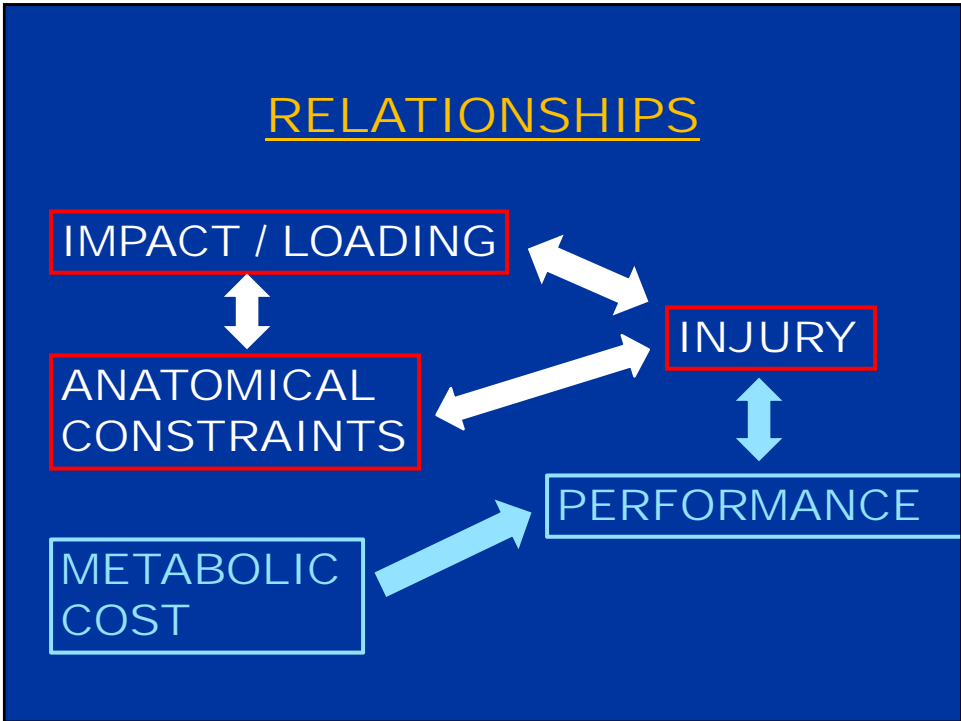
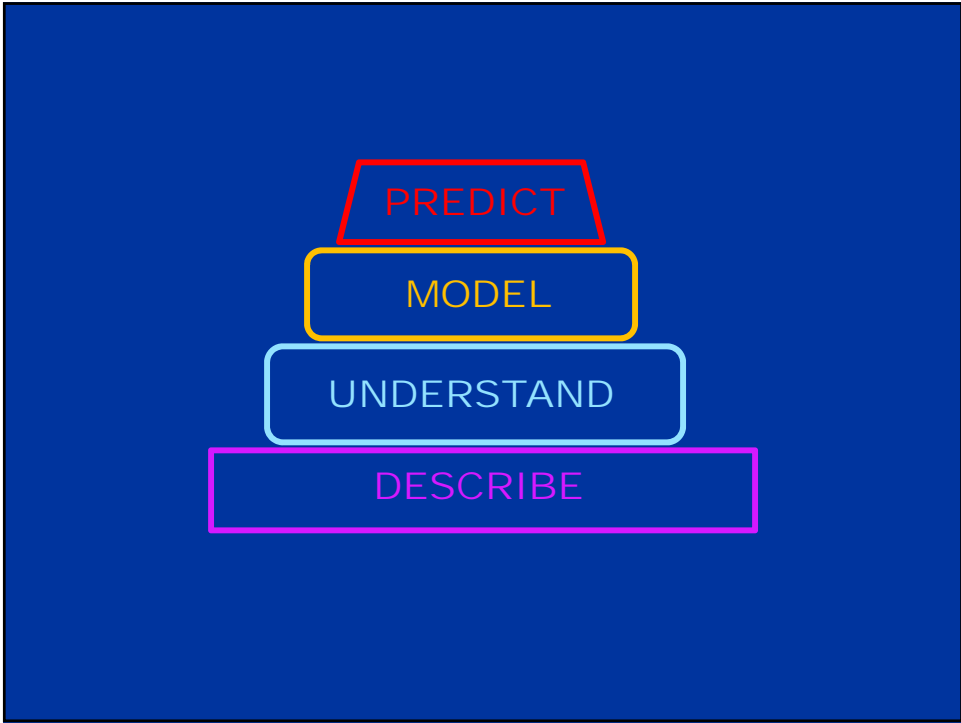






BIOMECHANICS

FIRST STEP TO GAINING
UNDERSTANDING / INSIGHT



INJURY

CAUSE: FORCE / STRESS

HOW: CHANGE

CURE: FORCE / STRESS
REDUCTION

HOW: CHANGE

INJURY

CAUSE: FORCE / STRESS

HOW: CHANGE

PREVENT: FORCE / STRESS

HOW: CHANGE FORCE

HOW: MAGNITUDE, DIRECTION

Insights on Injury

Injury = f (Change) { Too Much
Too Fast

Prevention } = f (Patience)
Rehabilitation

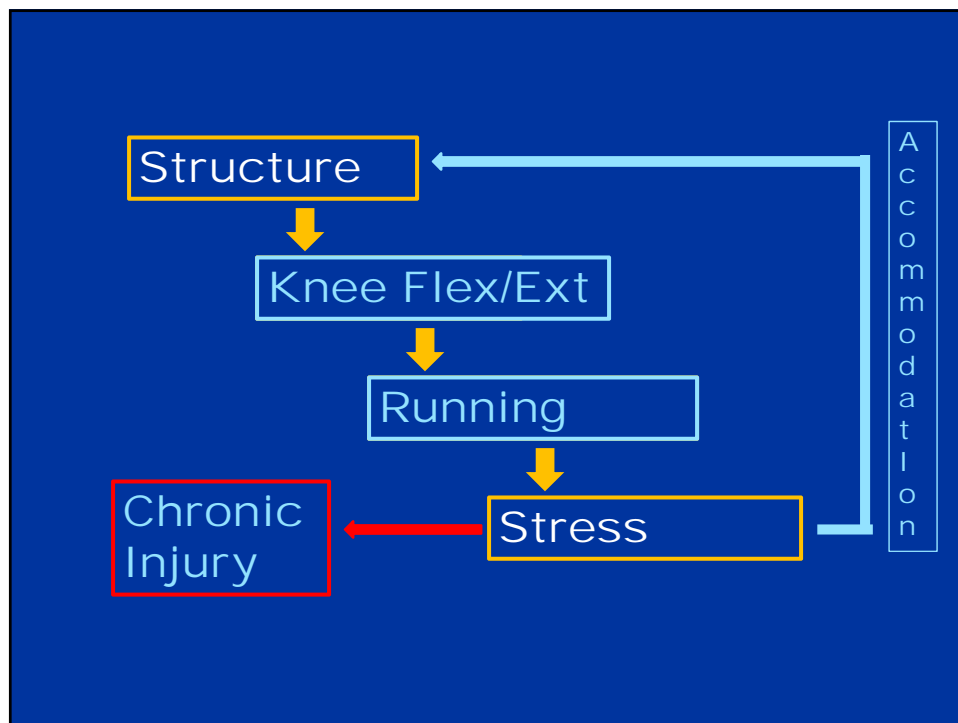
Patience = f (Controlled Change)

“The human system is functionally pliable in that changes (eg. volition, perception, learning, growth and development, etc.) are possible within the bounds of imposed constraints.”

James & Bates, 1996

How Individuals Differ

- Anatomical Structure
- Functional Capabilities
- Experiences
- Goals



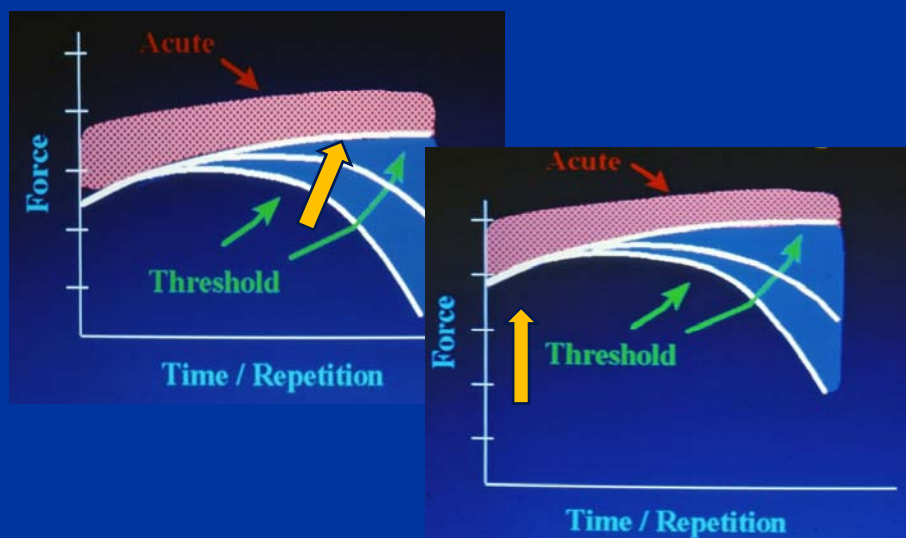
Stress "Modifies" Structures

Positively = "Accommodation"

or

Negatively = "Injury"

Accommodation vs Injury



Load sufficiently to get the physiological response / accommodation for specific activity (increase acute threshold)

Vary load enough to avoid cumulative stress / injury (increase chronic threshold)

Remember: Training Errors (60%)
(James et al., 1978)
Too fast a change in too short a period of time

Physiological Response (at any instant in time)

- ⇒ ● Age
- Gender
- Loading Rate
- Load Duration, Magnitude
- History {
 - Experience
 - Use
 - Disuse

“We are all creatures of
experience turning into
memory”

(mentally and physically)



Movement Constraints

- Morphological
- Environmental
- Bio/Mechanical
- ★ Task

Movement

A Tool for problem solving, i.e.
accomplishing a Task

(time, space & n-m-s system)

Constrained by:

Morphology

Environment

Bio/Mechanics

Strategy

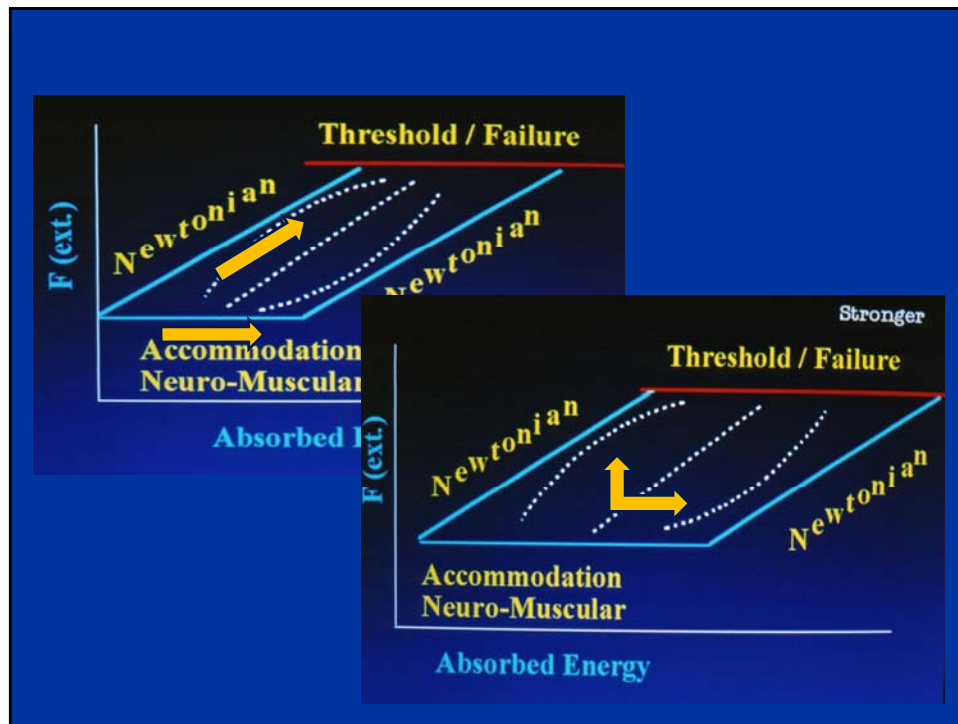
Selected
Neuro- Musculo -Skeletal
Solution
For the Performance of a
Motor Task

Response Strategies (to an Applied Load)

IGNORE → Newtonian

ACCOMMODATE → Neuro-muscular

ACKNOWLEDGE → Combination
(Biomechanical)



INJURY

CAUSE: FORCE / STRESS

HOW: CHANGE FORCE

PREVENT: FORCE / STRESS

HOW: CHANGE FORCE

HOW: MAGNITUDE, DIRECTION

How do we change the force factor (magnitude and/or direction)?

Variations within activity (changing shoes, terrain, footstrike, knee angle, etc.)

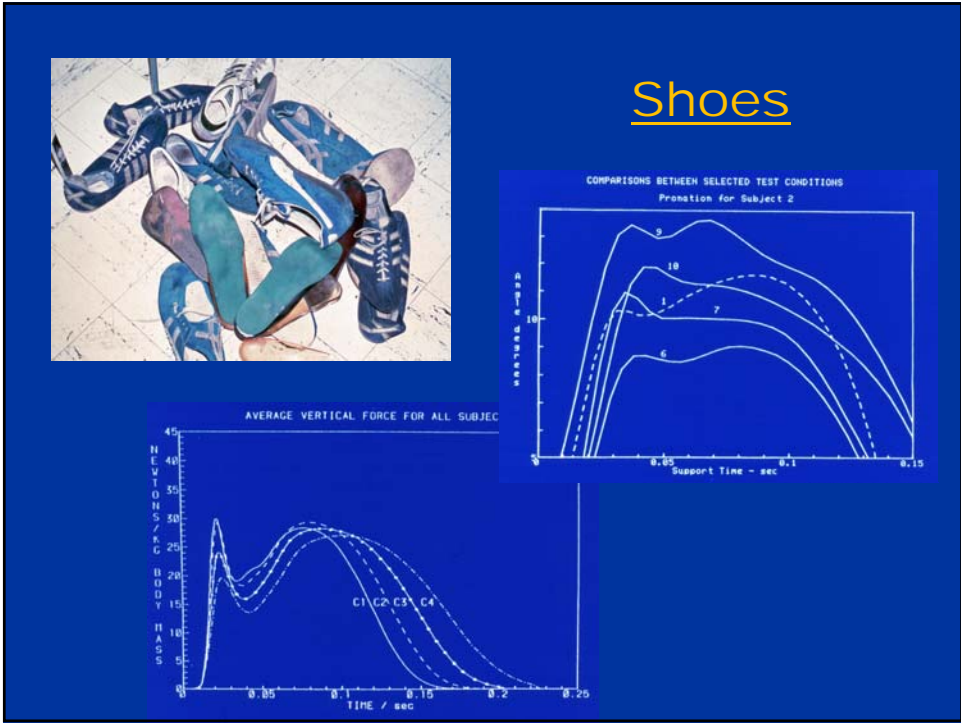
Variations by changing activity (cross training)

How do we change the force factor (magnitude and/or direction)?

➔ Change the environment, i.e. shoes, surface, terrain, etc.

Change performance characteristics, i.e. footstrike, knee angle, etc.

Change the activity, i.e. running, cycling, crosstraining, etc.



How do we change the force factor
(magnitude and/or direction)?

Change the environment, i.e. shoes,
surface, terrain, etc.

→ Change performance characteristics,
i.e. footstrike, knee angle, etc.

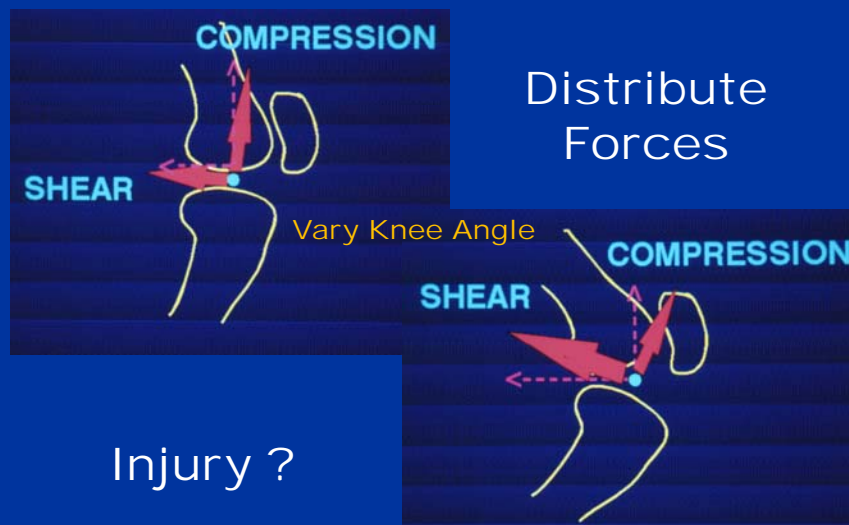
Change the activity, i.e. running,
cycling, crosstraining, etc.



Footstrike Pattern



Performance Characteristics

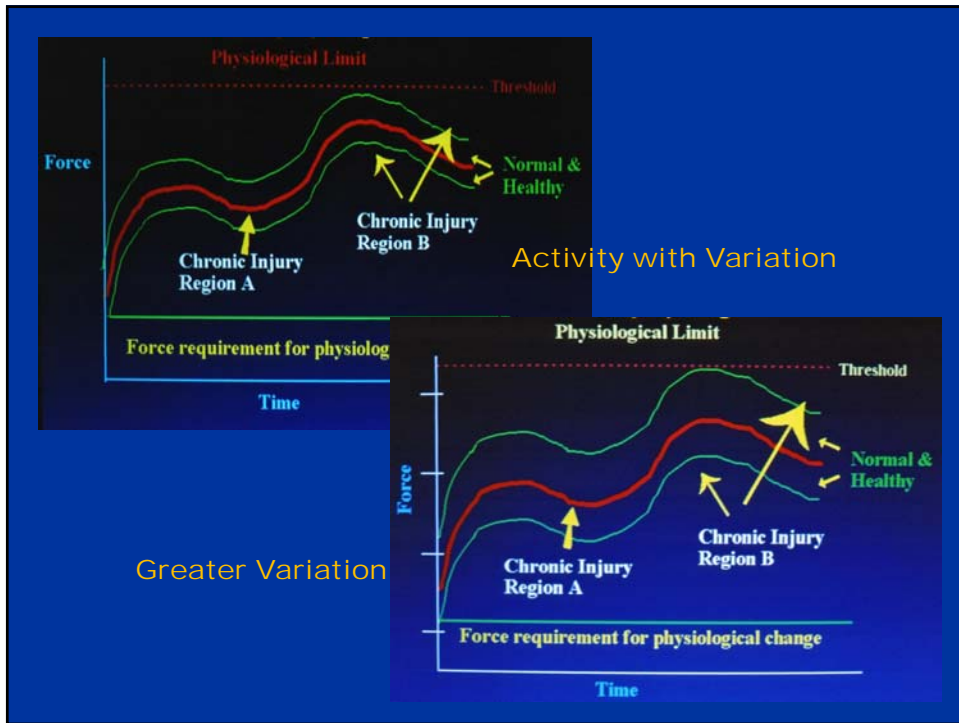
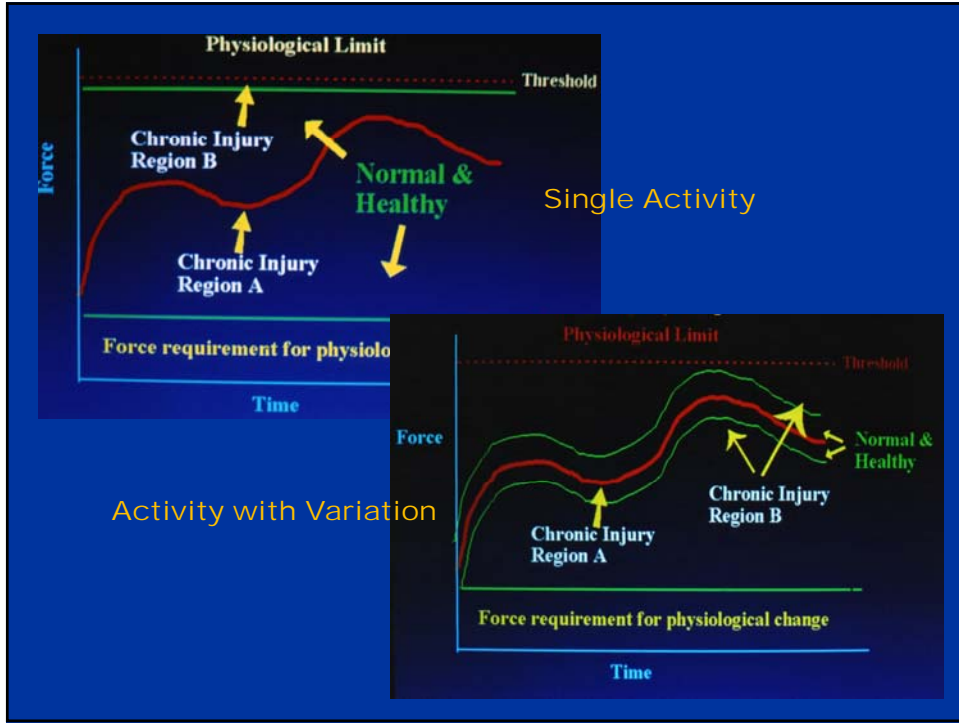


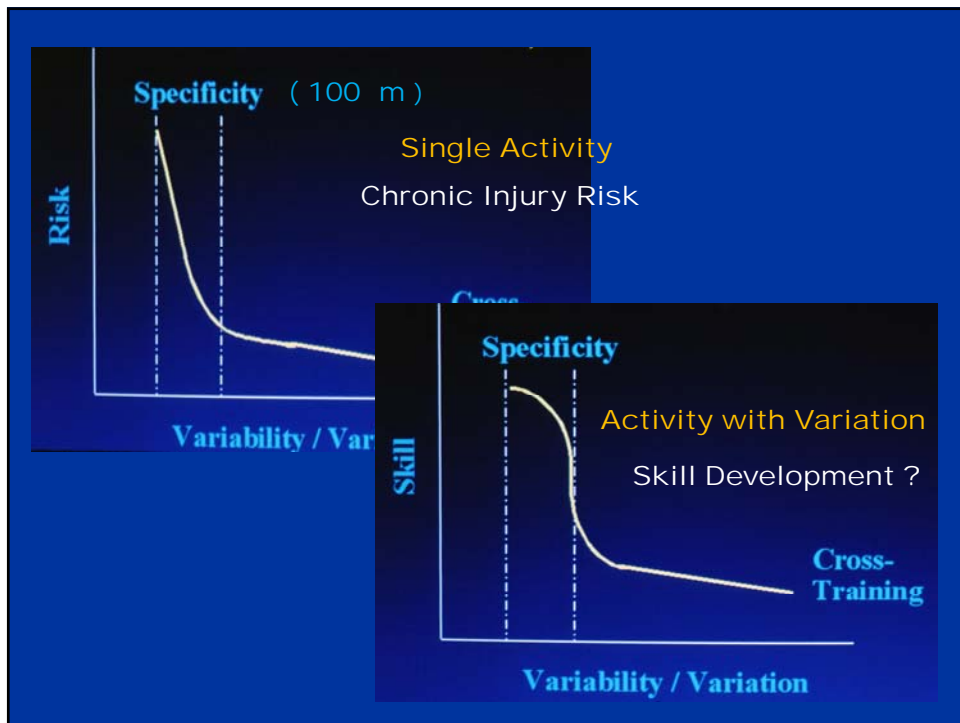
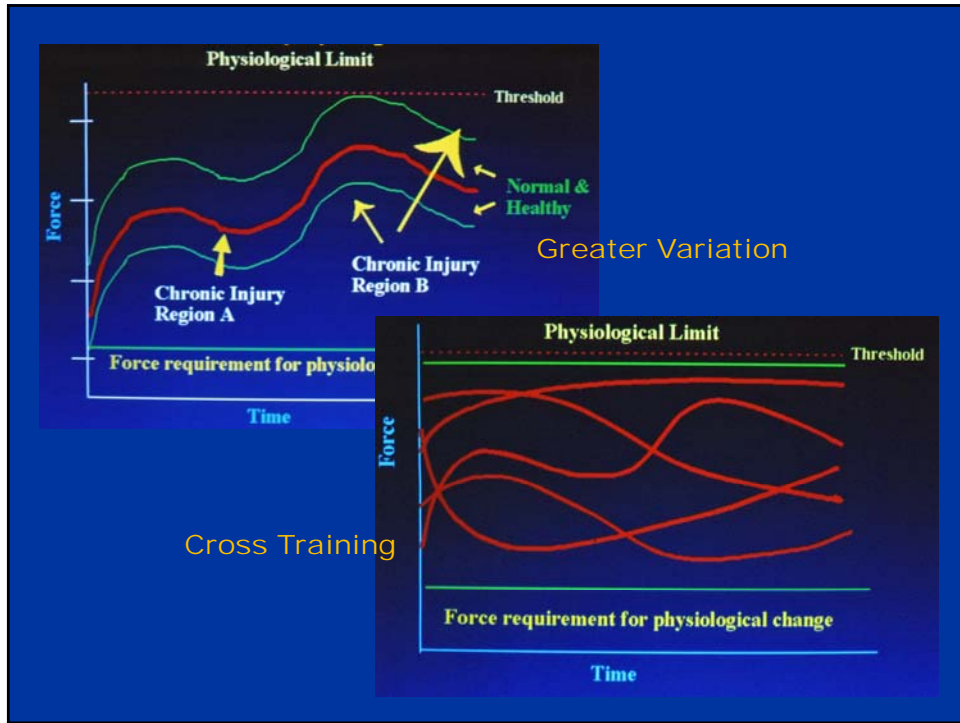
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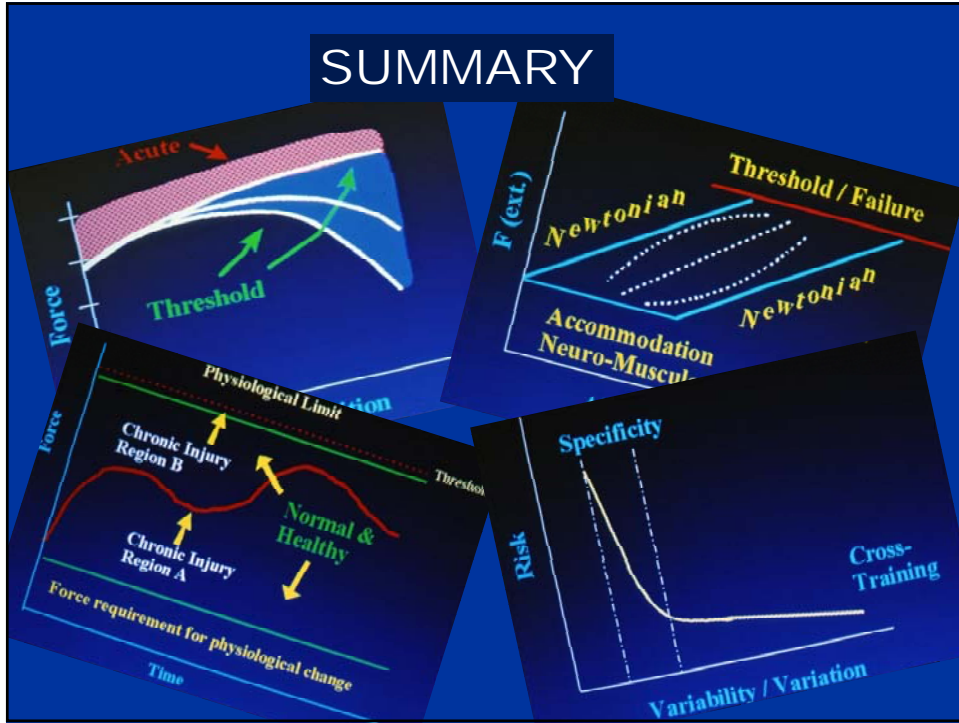
Change performance characteristics,
i.e. footstrike, knee angle, etc.

→ Change the activity, i.e. running,
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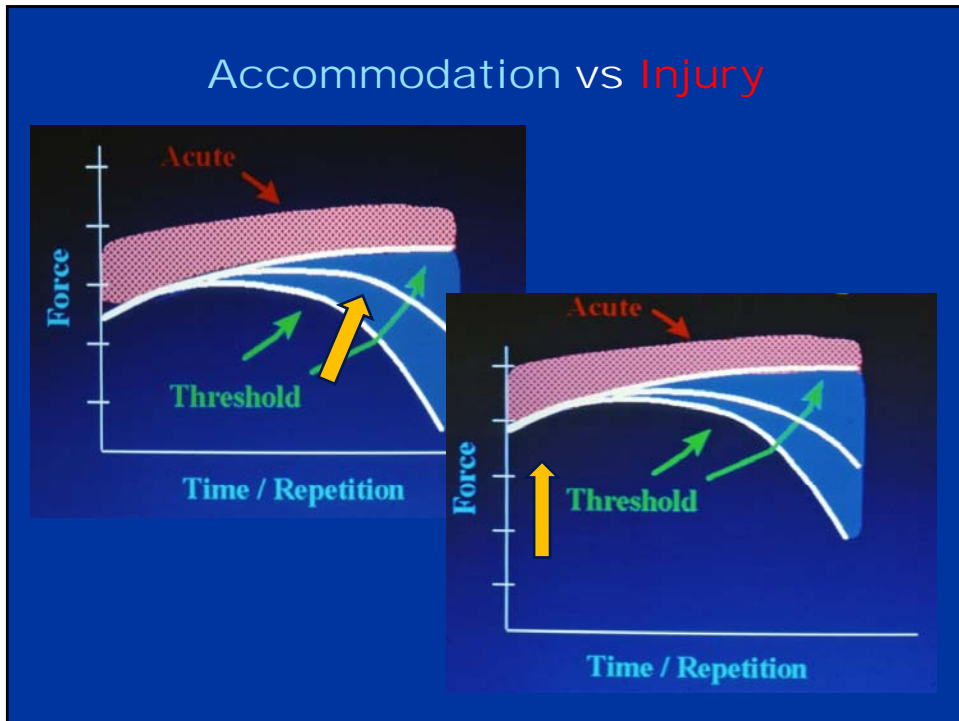




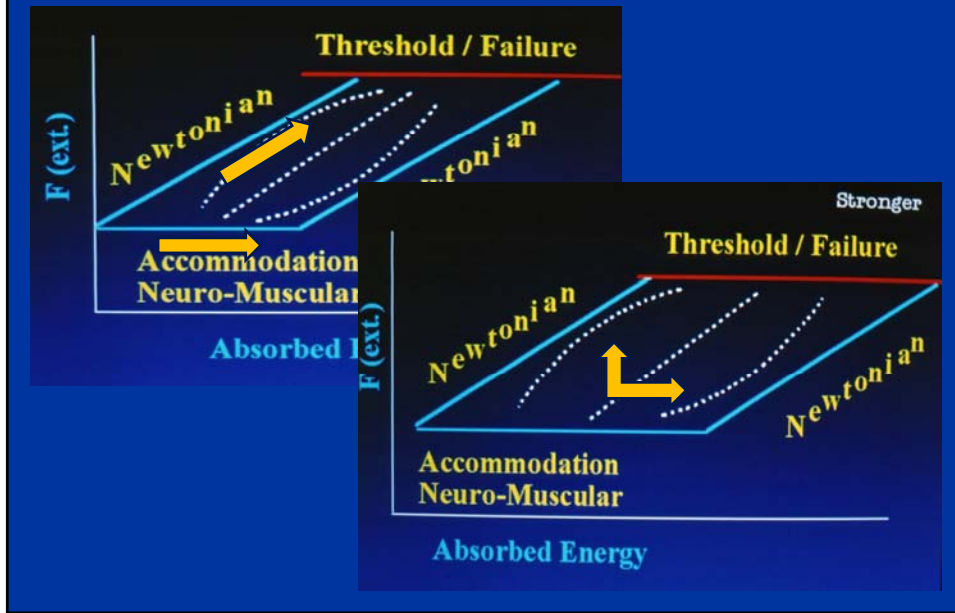
SUMMARY



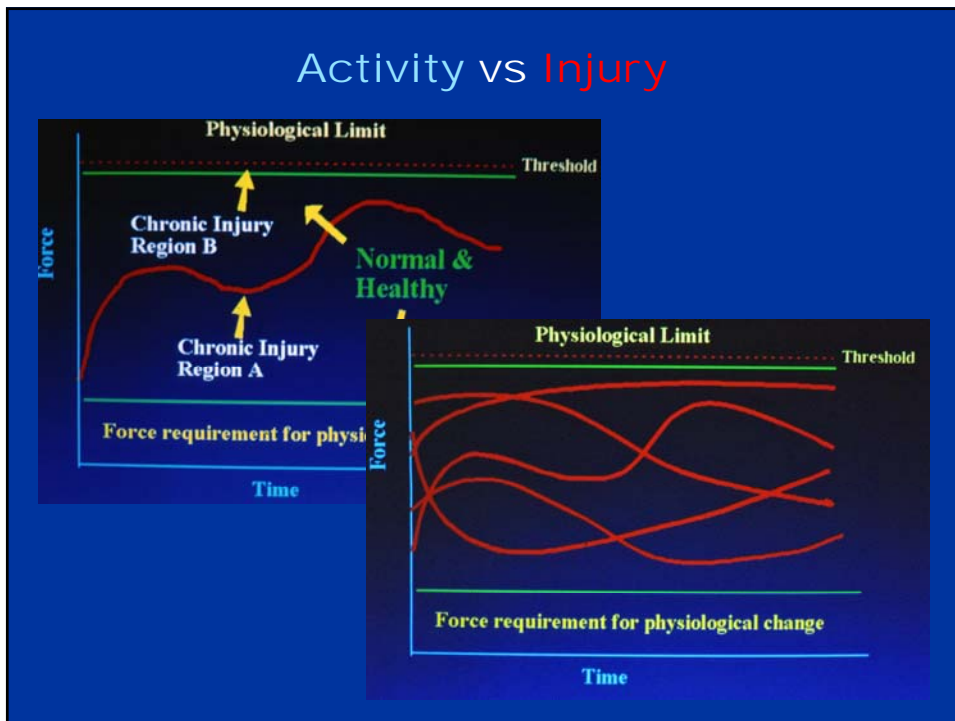
Accommodation vs Injury

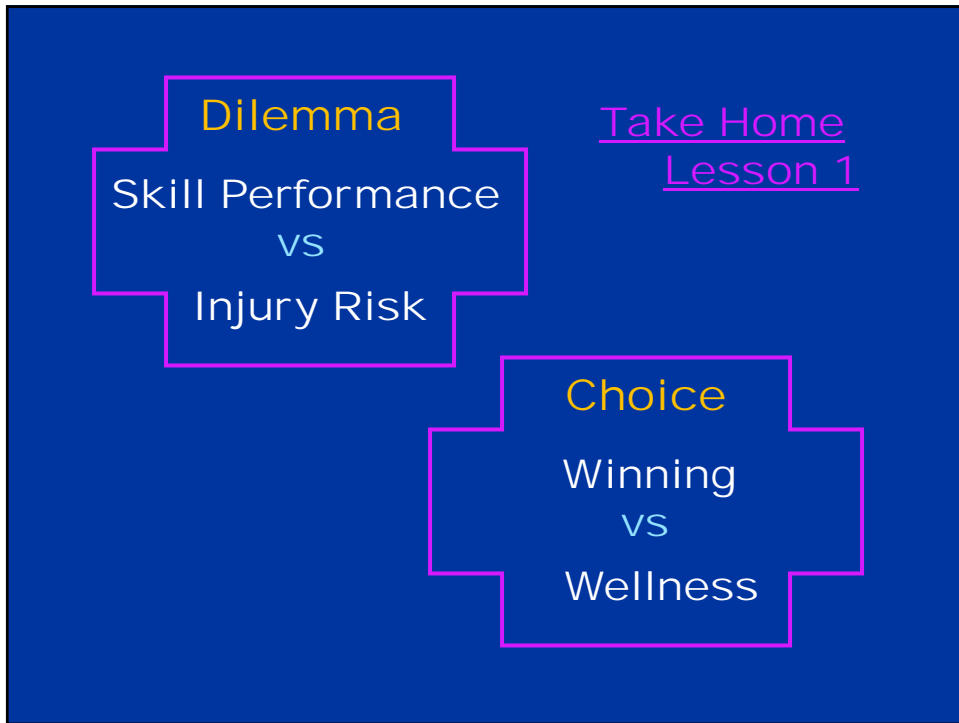
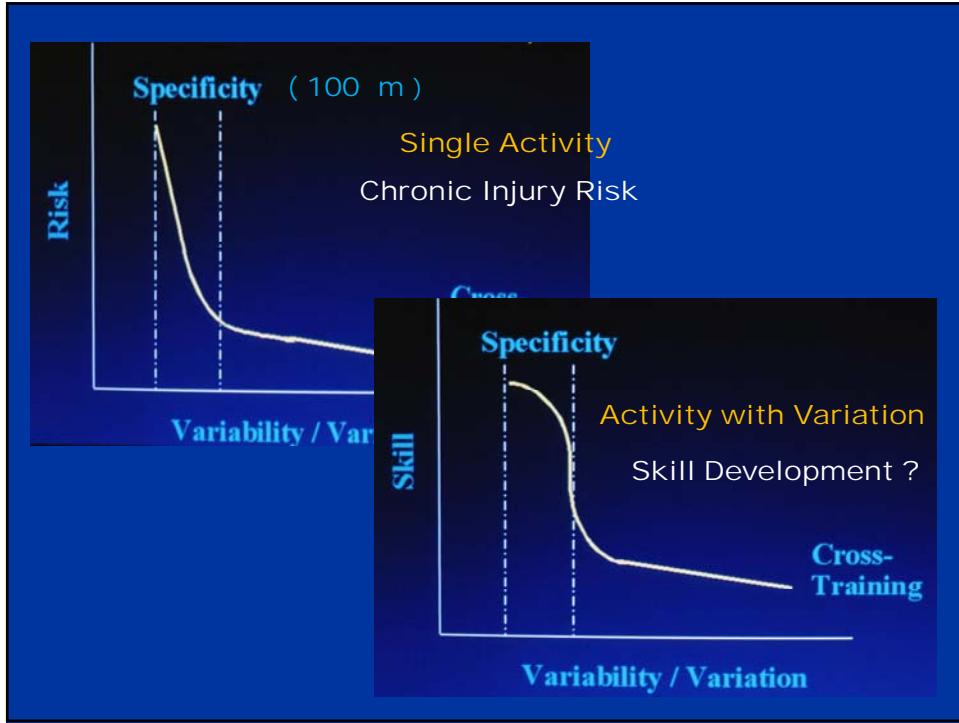


Strategies vs Injury



Activity vs Injury





Take Home Lesson 2

Injury = f (Change) { Too Much
Too Fast

Prevention } = f (Patience)
Rehabilitation

Patience = f (Controlled Change)

Some Final Suggestions

- Have Appropriate Goals
- Train/Exercise Smart
- Get Adequate Rest
- Don't Ignore Pain
- Think Prevention
- Have Fun

It's Your Choice! **Choose Wisely**

Wellness **Injury Risk**

Injury Risk **Goals**

Age *Winning*



Thank You !

The image features a blue background with white text at the top: "It's Your Choice!" and "Choose Wisely". Below this is a dark blue rectangular area containing several terms: "Wellness" in cyan, "Injury Risk" in yellow, "Injury Risk" in purple, "Goals" in white, "Age" in green, and "Winning" in white script. To the right of this area is a white line-art cartoon of a person from behind, holding a sign that says "THE END". Below the cartoon, the words "Thank You !" are written in pink.