Evaluation and Management Common Running-Related Injuries

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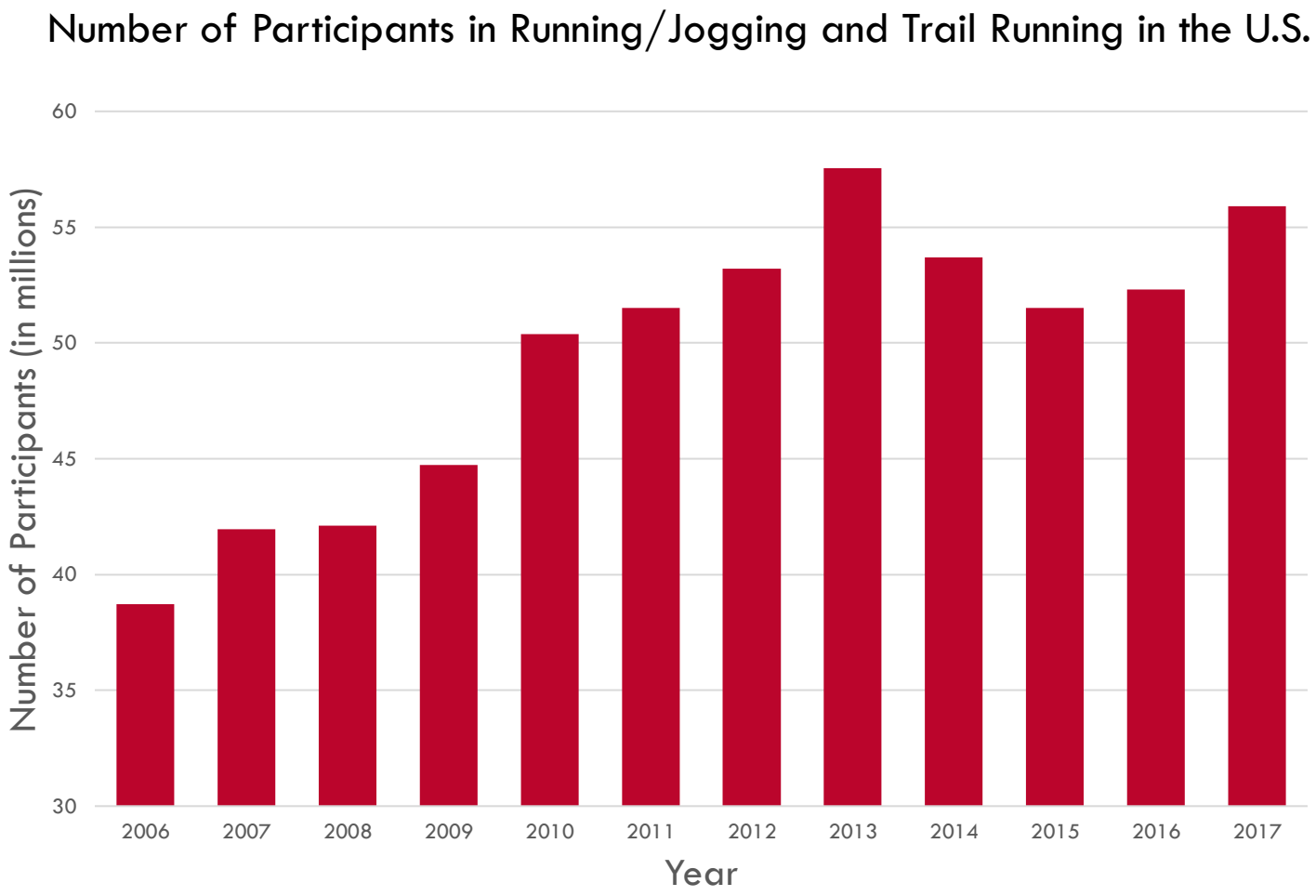
Objectives

- List at least 4 common running-related injuries
- Distinguish between intrinsic and extrinsic risk factors for running-related injuries
- Develop a systematic approach to identify risk factors for running-related injuries and in turn guide recommendations for injury management and prevention

The popularity of running is generally rising



From: https://www.statista.com/statistics

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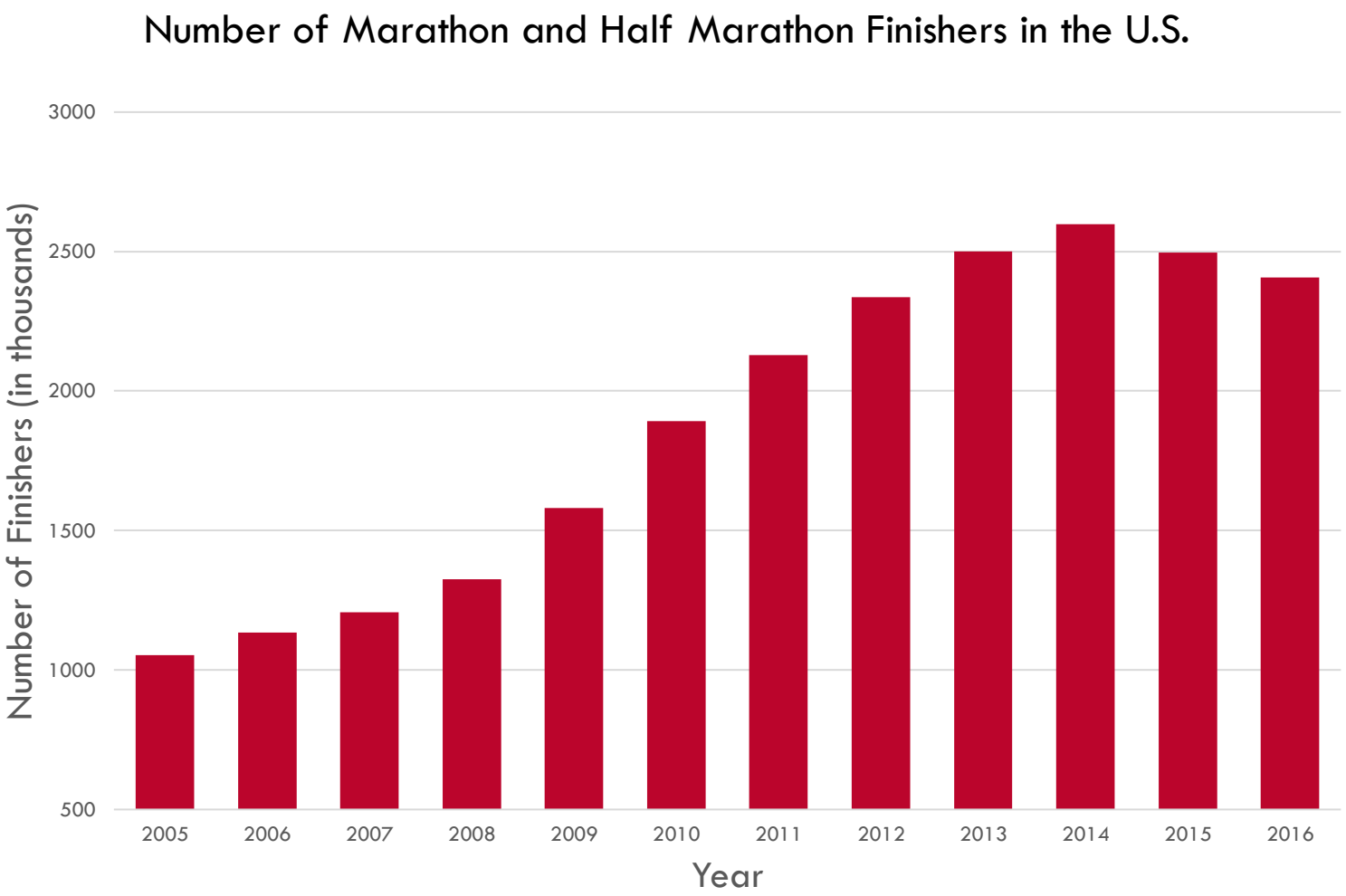

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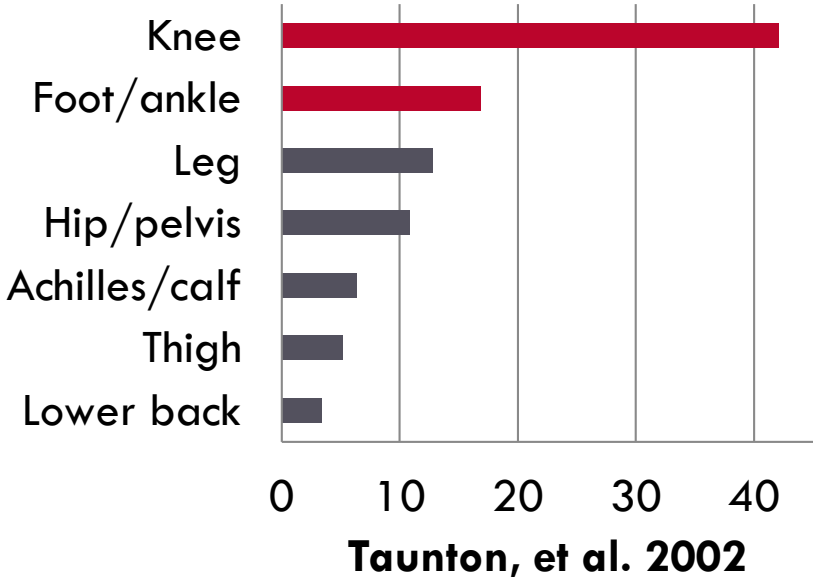
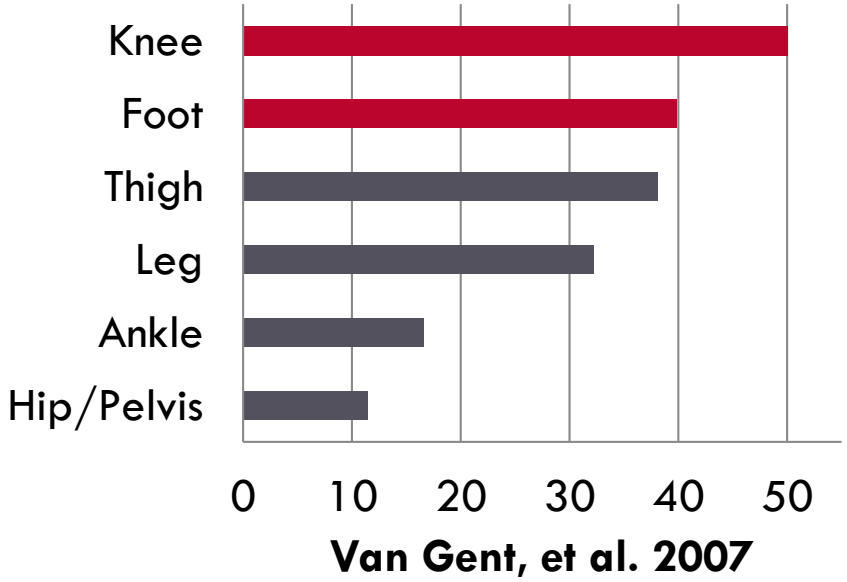
Running-related injuries (RRI) are common

- Prevalence **~20-25%**
  - Up to 43.5% in some populations (Franke, 2019)
  - Incidence leading up to a marathon as high as 55%
- Common sites of RRI



Taunton, et al. 2002



Van Gent, et al. 2007

RRIs most commonly affect the lower limbs

- Most common RRIs
  - Patellofemoral pain
  - Iliotibial band syndrome
  - Lower extremity stress fracture
  - Medial tibial stress syndrome
  - Achilles tendinopathy
  - Plantar fasciitis
  - Patellar tendinopathy
  - Hamstring muscle injury/tendinopathy

Patellofemoral pain (PFP)

- Overuse injury characterized by **anterior knee pain**
  - Insidious onset
  - Worse with compressive forces to PF joint
    - Squatting, prolonged sitting, stair climbing
  - Other symptoms:
    - buckling, stiffness, swelling
  - Diagnosis is largely clinical and based on:
    - History and distribution of pain
    - Exclusion of alternative diagnoses
    - Identification of risk factors to further uphold diagnosis

Iliotibial band syndrome (ITBS)

- Overuse tendonitis of the ITB
  - Presents with **lateral knee pain**
    - Worse with exercise (repeated knee flexion/extension) or prolonged sitting
  - Physical examination
    - TTP lateral knee (ITB at lateral femoral condyle or GT)
    - Ober's test

Noble's compression test

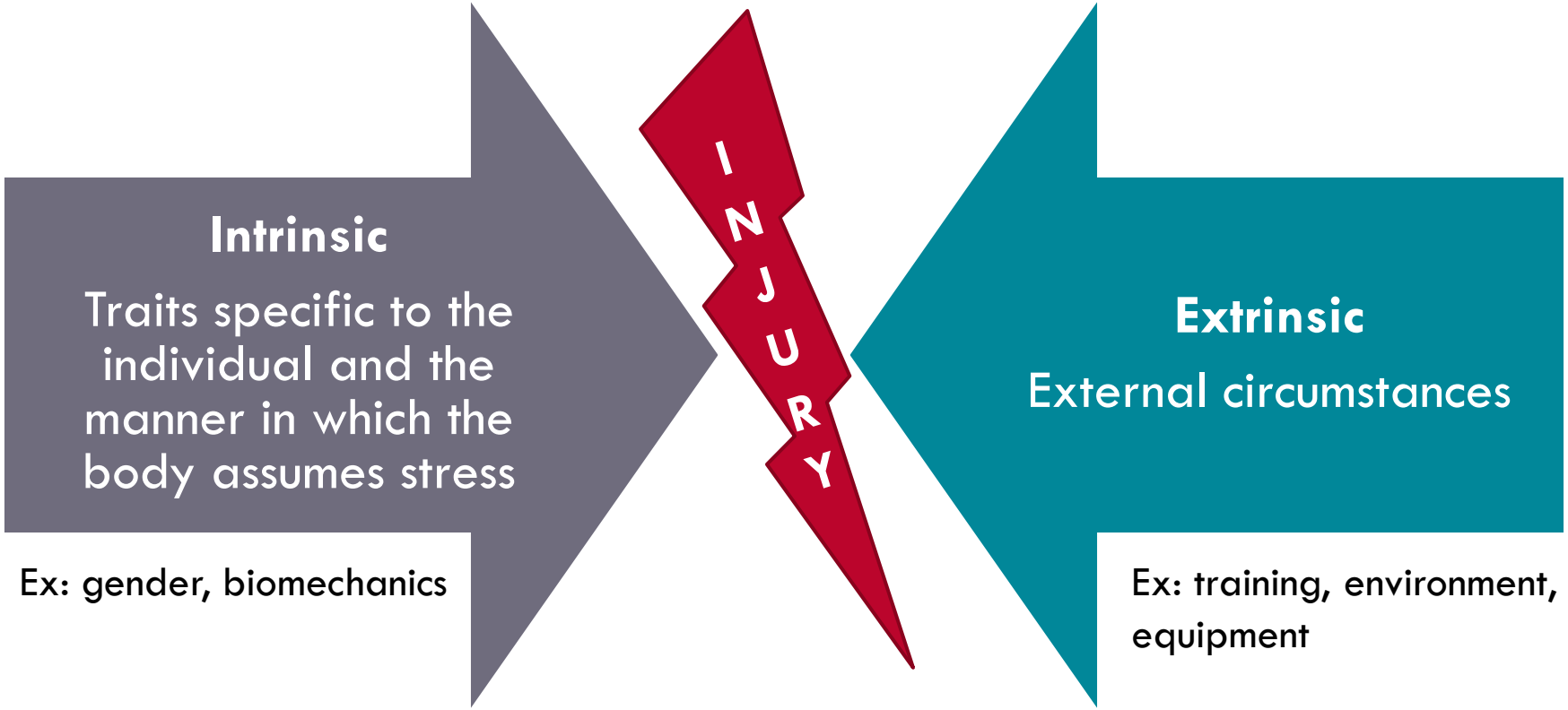
Stress fractures and Shin splints

- Lower extremity stress fracture
  - Overuse injury yielding discontinuity of cortical bone

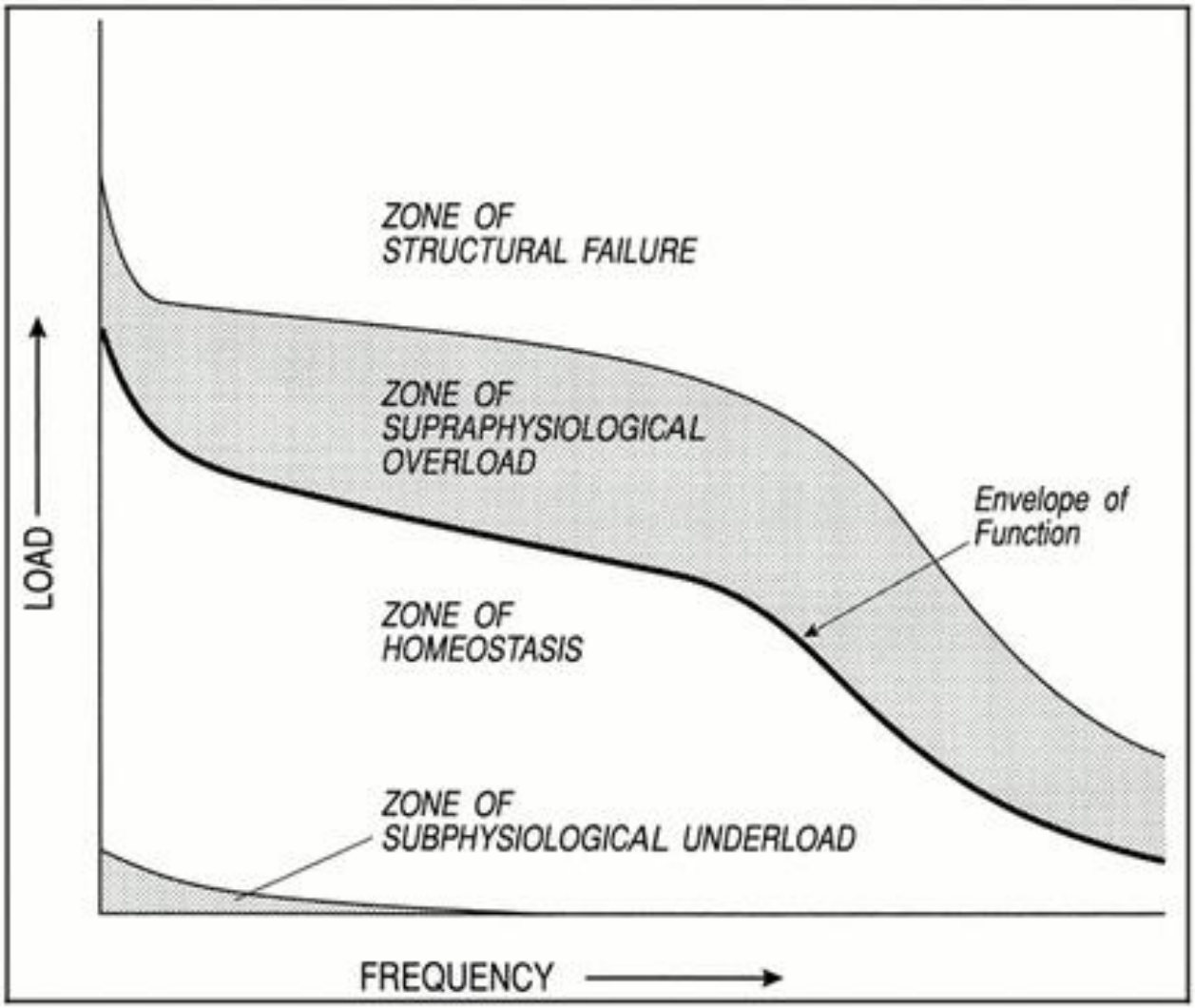
  - Presents as focal, mechanical pain
    - Point tenderness to palpation
    - Common sites: tibia, metatarsals, navicular, femur, pelvis
  - Medial tibial stress syndrome ("shin splints")
    - Overuse injury resulting from bony overload of the posteromedial tibia
    - Likely represents early spectrum bone stress injury

There is **no single cause** of RRIs

- RRIs are **multifactorial**
  - Combination of intrinsic and extrinsic factors



Envelope of Function



Risk Factors for RRI

Extrinsic Risk Factors Circumstances external to or independent of the individual	Intrinsic Risk Factors Traits specific to the individual and the way in which the body assumes stress
History of previous injuries	Lower extremity inflexibility
Training errors	**Leg length discrepancy**
Poor nutrition	**Pes planus or pes cavus**
Training surface (eg hard, irregular)	**Overpronation**
Lifestyle factors (eg smoking, EtOH)	**Genu valgus/increased Q-angle**
Medications (eg steroids, anitbiotics)	**Hip weakness**

Possible Protective Factors
Higher education level (college or university)
Running < 40 km per week on average
Training program (eg incorporation of interval training or resistance training)
Proper escalation and maintenance of training volume and intensity

History of prior injury is (most) frequently cited risk factor for RRI

van Gent, 2007
Hx/o prior injury
Long training distance

Malisoux, 2015
Increased BMI
Hx/o prior injury

Buist, 2010
Increased BMI
Hx/o prior injury
Sports w/o axial loading

van Poppel, 2018
Hx/o prior injury
Weekly training volume

van der Worp, 2015
Hx/o prior injury
Use of orthotics
Running on concrete
Age
Long running distance
Older running shoes

- Look for history of ***any*** musculoskeletal symptoms
  - Kluitenberg, 2015
    - 1,696 novice runners in "Start to Run" program
      - Previous MSK complaints (not necessarily related to sport) associated with development of injury

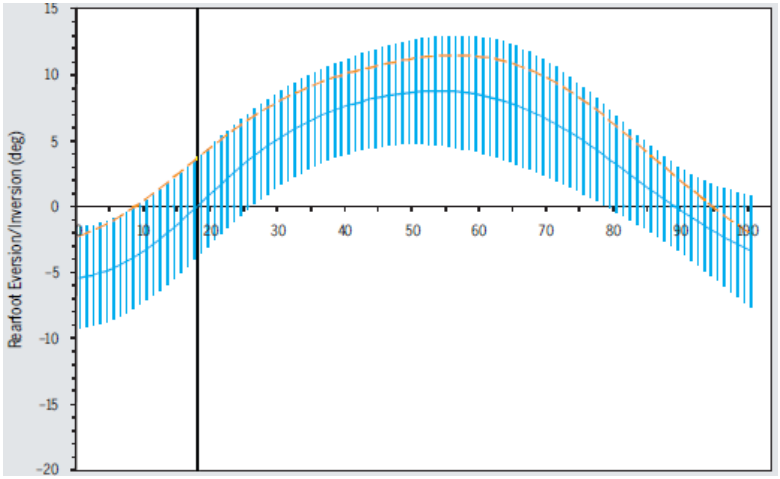
Training errors are a common extrinsic risk factor for RRI

- Common training errors
  - **Abrupt escalation in exercise (duration, frequency, intensity)**
  - Excessive hill work
  - ? foot wear and training surface
  - **Inadequate recovery time**
- Most runners should have at least 2 rest days/week
  - Ristolainen, 2014
    - Retrospective analysis of 446 elite endurance athletes
      - Evaluated training-related risk factors for injury development
    - Results
      - <2 rest days/week associated w/ 5.2-fold risk of injury
      - >700 training hours per year associated w/ 2.1-fold risk

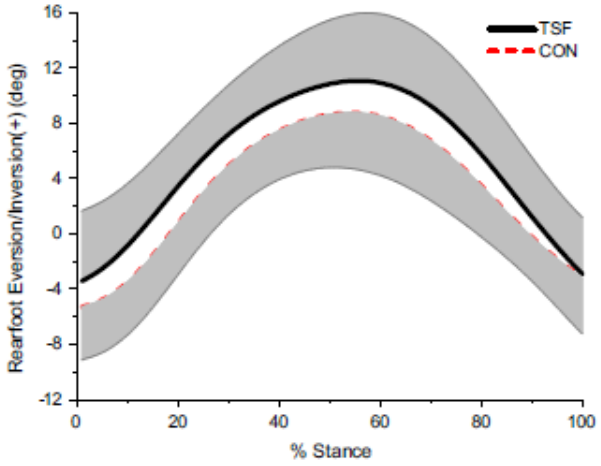
Rearfoot eversion associated with tibial stress fractures

- Rearfoot eversion ~ pronation
  - Retrospective comparisons of rearfoot eversion btw individuals with and without tibial stress fxs

Milner CE, et al. 2010



Pohl MB, et al. 2008



  - Stress fx groups had higher peak rearfoot eversion
    - Early muscular fatigue → abnormal tensile load medial tibia

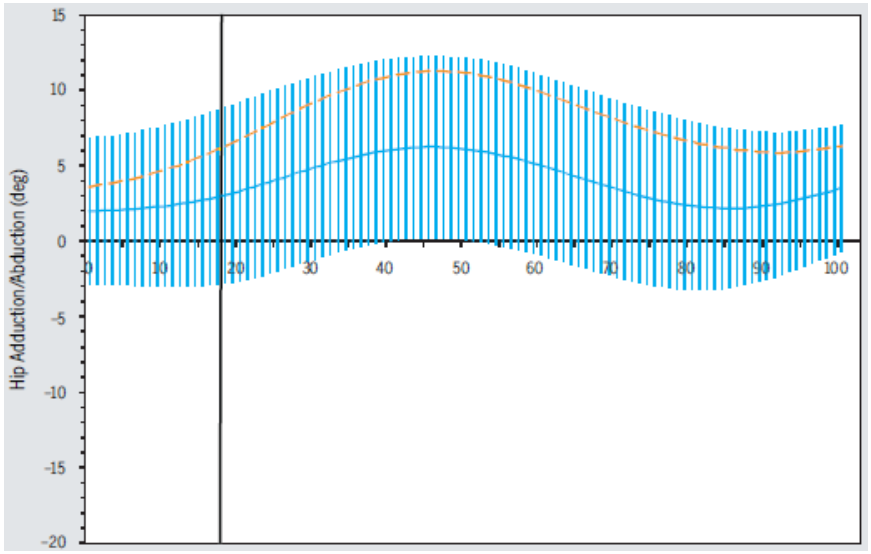
Excessive rearfoot eversion implicated in other RRIs

- Rearfoot eversion ~ pronation
  - Excessive rearfoot eversion may be associated with PFP
    - Differences in foot position appear to be subtle (1-2°)
  - Excessive rearfoot eversion may predict response to foot orthosis (Barton, 2012)
    - 26 individuals with PFP treated with prefab orthosis
    - Greater peak rearfoot eversion was only predictor of significant response to orthosis
  - Compensatory internal rotation of the femur

Hip adduction associated with tibial stress fractures

- Hip kinematics
  - Retrospective comparisons of peak hip adduction between individuals with and without tibial stress fx

Milner CE, et al. 2010



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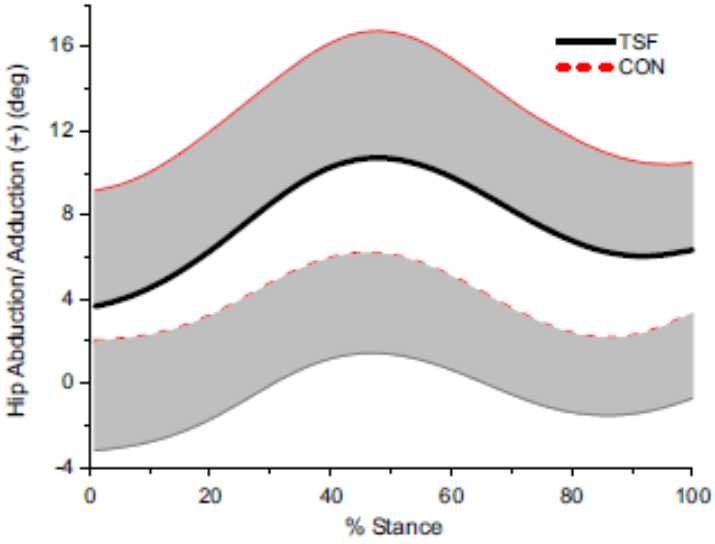
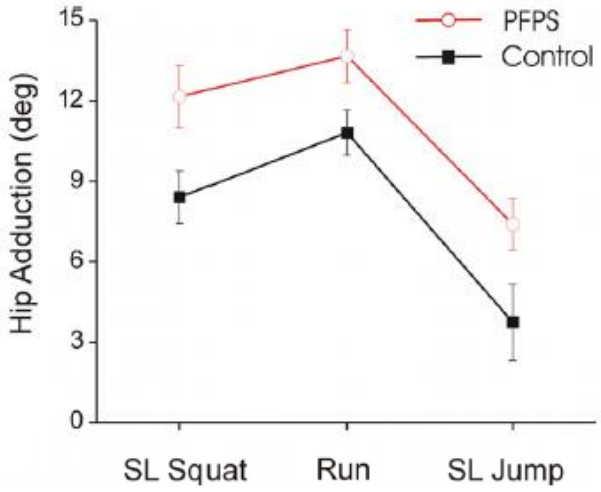
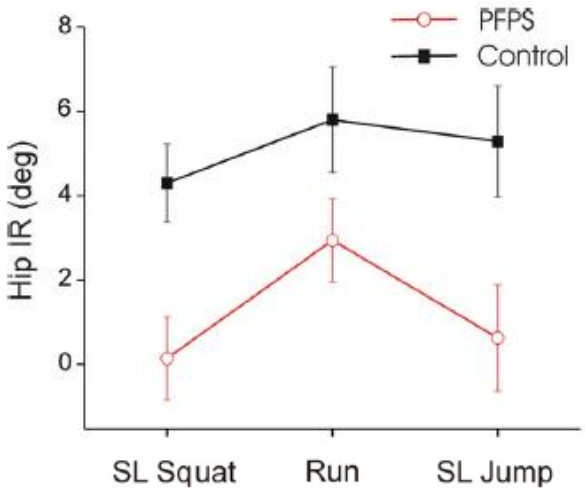


  - Stress fx groups had higher peak hip adduction

Excessive hip adduction implicated in PFP

- Hip kinematics
  - Willson, 2008
    - Comparison of hip kinematics between PFP and controls
    - During single leg squat, running, and single leg jumps

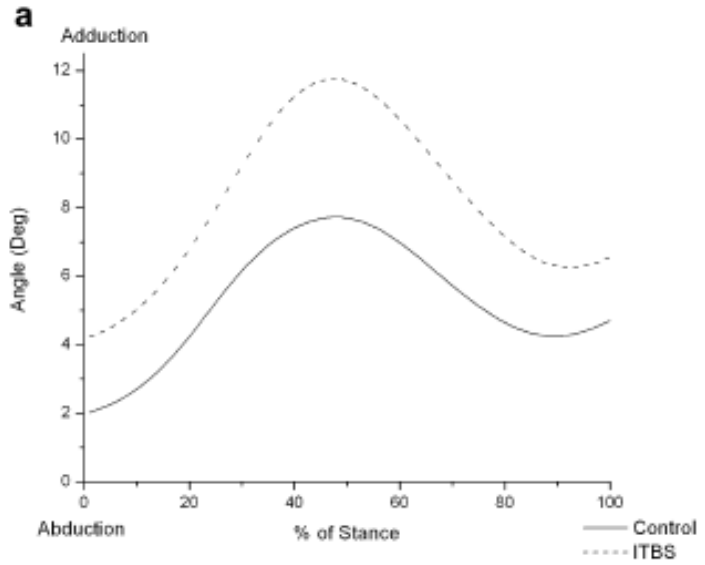




  - PFP group had increased hip adduction

Excessive hip adduction implicated in ITBS

- Hip kinematics
  - Noehren, 2007
    - Comparison of hip kinematics in ITBS and controls
    - Prospective analysis



  - Increased hip adduction associated with development of ITBS

Summary

- Common risk factors for RRIs
  - Extrinsic factors
    - History of prior injuries
    - Training errors
  - Intrinsic factors
    - Overpronation
    - Hip abductor weakness

- Identification of risk factors is necessary for successful treatment and prevention of RRI

Approach to Prevention

- History
  - ***Inquire regarding prior injuries***
  - Evaluate training habits (volume/intensity, recovery, running surface, hills)
- Intervention
  - Education
    - ≤ 10-15% increase in volume or intensity per week
    - Damsted, 2019
      - 261 runners training for a half marathon (14 wks)
      - 56 (21.5%) developed a RRI
        - In the first 21 days:

        Significantly more runners were injured when they increased their weekly distances by >20% (c/t those who increased by < 20%)

Approach to Prevention

- History
  - ***Inquire regarding prior injuries***
  - Evaluate training habits (volume/intensity, recovery, running surface, hills)
- Intervention
  - Education
    - ≤ 10-15% increase in volume or intensity per week
    - Ensure adequate rest (at least 2 rest days/wk)
    - Consider training on even, more compliant surfaces
    - Replace shoes ~every 300-400 miles
      - What about *shoe type*?

Approach to Prevention

- Shoe type and RRI
  - Pollard, 2018
    - Compared loading rate and impact forces in neutral and maximalist shoes
    - Before and after 5-K run
      - Higher loading rates and impact forces in maximalist shoe (both pre- and post-)

  - Helton, 2019
    - Prospective analysis of 1025 cadets
    - Shoe stiffness and lower extremity injury
      - Moderate lateral torsional stiffness associated with (49%) lower likelihood of injury
      - Similar risk for minimal and extreme stiffness

Approach to Prevention

- Physical examination
  - Observation (leg length)

    - Consider scanogram/leg-length x-ray
- Intervention = orthoses (shoe inset/lift)
  - Treat leg length discrepancies of >0.5 inch

Approach to Prevention

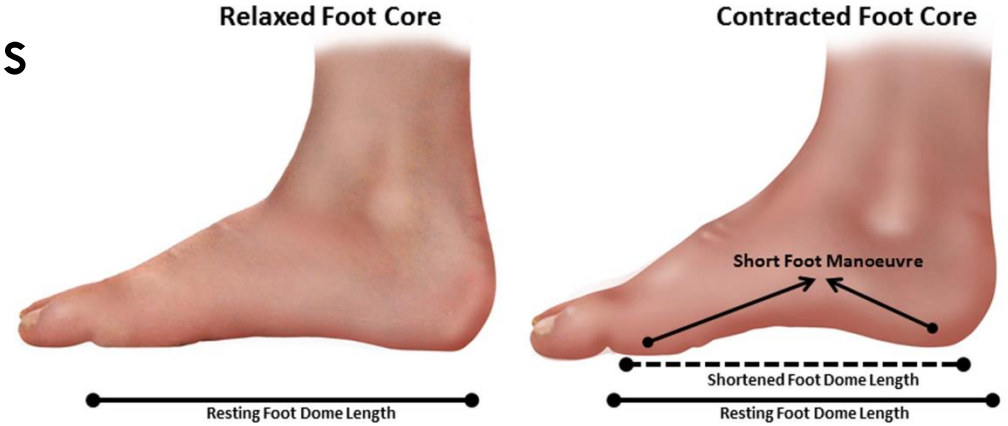
- Physical examination
  - Foot position
    - Pes planus

  - Shoe wear pattern

- Intervention
  - Physical therapy
  - Consider shoe modification or orthoses

Approach to Prevention

- Foot core exercises



- Short-foot exercise
  - Mulligan, 2013: 21 healthy subjects
    - 4-wk short-foot exercise program
    - Found reduced arch collapse (ND, AHI)
  - Lynn, 2012: 24 healthy subjects
    - Compared 4-wk program of short-foot exercise to towel curl exercise
    - SFE had improved dynamic balance

Approach to Prevention

- Physical examination
  - Static hip strength

  - Dynamic hip strength

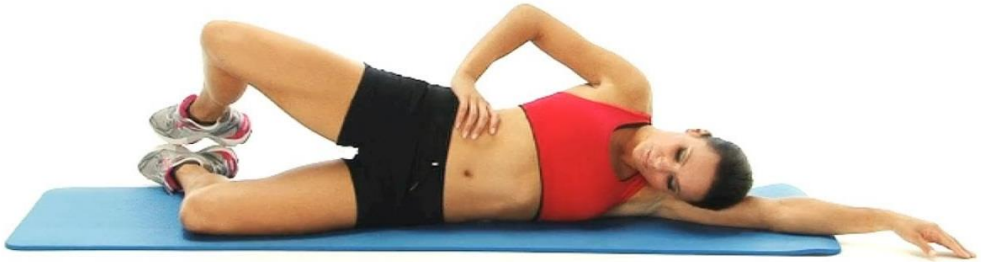
Good

Bad

- Intervention
  - Physical therapy

Approach to Prevention

- Hip strengthening exercises



Approach to Prevention

- Hip strengthening exercises

Approach to Prevention

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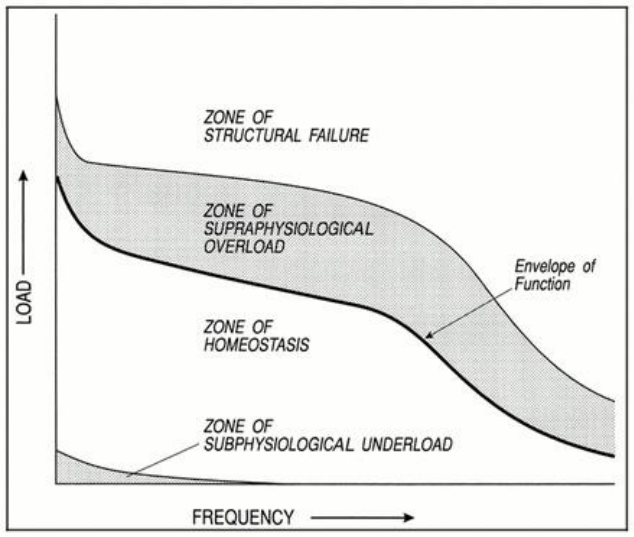
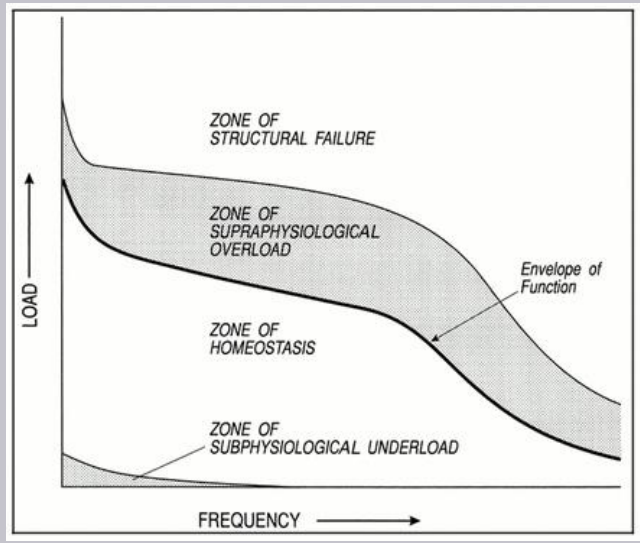
Conclusion



- RRI development
  - Is multifactorial
  - Is often predictable
  - May be preventable

- Management and prevention
  - Correction of training errors
  - Address overpronation
  - Focus on hip strength

Conclusion



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  - Is multifactorial
  - Is often predictable
  - May be preventable

- Further research is necessary to evaluate screening protocols that promote prevention to **keep on running!**

References

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