

### Risk factors for Sports Injuries

1. **Intrinsic** (inherent to the athlete)
   - Not modifiable (age, gender, ethnicity - genetics)
   - Modifiable (biomechanics, muscle strength, flexibility)

2. **Extrinsic** - factors not inherent to athlete (training, nutrition, equipment, environment and others)

### Primary vs. Secondary Prevention

**Primary prevention:** Prevention of first injury

**Secondary prevention:** Prevention of a recurrent injury

Which is more important? Primary or secondary prevention?

### What are the risk factors for injury in recreational athletes?

- Past injury
- Not weight lifting >2/week
- Not stretching >2/week
- Training >2/week (increased frequency of load)

### What are the risk factors for acute muscle injury in sport?

A past history of muscle injury is the single most important risk factor for a muscle injury (6-16 X greater risk)

### What is the best predictor of a hamstring strain or a groin strain in soccer rugby players?

Players with a past history of a hamstring or groin injury were respectively 11.6 and 7.3 times more likely to sustain a second injury
What is the best predictor of an acute hamstring strain in club rugby players?

Prospective cohort study

101 Club rugby players

Pre-season muscle strength (isokinetic), muscle flexibility, and history of past hamstring injury documented

Followed for 1 season and incidence of hamstring injuries was documented

Players with a past history of a hamstring injury are 8.23 times more likely to sustain a hamstring injury (despite normal muscle strength and flexibility)

Lombard R, Schwellnus M, 2004

In 2004, a past history of an injury (muscle, ligament) is the single most important risk factor for another injury

In injury prevention, secondary prevention is one of the most important challenges

Factors in the primary and secondary prevention of sports injuries

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Secondary prevention

Primary prevention

1. Warm up

• Increase muscle temperature by 1° C
• General vs. local
• Active vs. specific
• Decreased risk of injuries

Animal studies
Epidemiological studies
Effect on performance
Passive warm-up

Increases peak stretch but decreases peak force

Active warm-up

Increases peak stretch and peak force

Force (N)

Stretch (mm)

Does warm-up influence the mechanical properties of the muscle?

Does keeping the muscle warm by wearing “thermal pants” decrease the risk of recurrent hamstring muscle injuries?


Factors in the primary and secondary prevention of sports injuries

Warm-up

Stretching

Muscle strength/balance

Equipment

Training

Biomechanics

Strapping and bracing

Nutrition

Psychology

Lifestyle

Primary prevention

Secondary prevention

Some evidence

2. Stretching

Does stretching decrease the risk of injuries?

Flexibility and injury risk: The effects of the stretch protocol

Adapted from: Yeung et al, Br J Sports Med 2001 (35)


Does increased flexibility reduce the risk of muscle strain injuries? (Specific injuries)

Prospective randomized controlled trial

- 901 healthy military recruits randomly allocated to stretching (n=518) or no stretching (n=383) before and after each physical training session
- Stretches consisted of 30 sec hold (3 repetitions)
- Injury rates reported (overall, monthly) for specific injuries (bony, muscle/tendon, ligament, joint, spine)
Does decreased flexibility increase the risk of muscle strain injuries in soccer players with no previous injury? (Primary prevention)

- 146 male soccer players with no history of muscle injury in the lower extremities in the previous 2 years
- Flexibility of specific muscles (hamstring, quadriceps, adductor, calf) of the subjects was measured before the start of the season
- Players were monitored for specific muscle injuries (hamstring, quadriceps, adductor, calf).
- Pre-season ROM in the injured and non-injured groups


Summary: Stretching and sports injury prevention

1. Using the correct “dose” of stretching reduces the risk of specific injuries (muscle/tendon)
2. Data from studies on specific injuries (muscle and tendon) show reduction in injury risk with flexibility training
3. Flexibility and injury risk may be joint specific: possibly inherently stable joints - greater flexibility will reduce injury risk
4. Inflexibility may be a more important independent risk in primary, but not secondary prevention of injury

Factors in the primary and secondary prevention of sports injuries

Primary prevention
- Warm-up
- Stretching
- Muscle strength/balance
- Equipment
- Training
- Biomechanics
- Strapping and bracing
- Nutrition
- Psychology
- Lifestyle

Secondary prevention
- Good evidence
- Some evidence
- ?

3. Normal muscle strength and balance

- Muscle strength (Isokinetic dynamometry)
- Muscle imbalances
- Muscle activation or recruitment patterns

Does decreased pre-season hamstring muscle concentric and eccentric peak torque increase risk of hamstring injury? (Primary)


Du Randt J, Scales N (unpublished data), 1999

Does reduced hamstring eccentric / quadriceps concentric ratios reduce the risk of hamstring injury? (Primary)

Ratio

<0.9 (n=8)
>0.9 (n=28)
Does pre-season hamstring muscle strength predict recurrent hamstring injury risk (Secondary)

- Prospective cohort study
- 101 Club rugby players
- Pre-season muscle strength (isokinetic), muscle flexibility, and history of past hamstring injury documented
- Followed for 1 season and incidence of hamstring injuries was documented

Lombard R, Schwellnus M, 2004

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4. Correct Sports “equipment”

- Footwear
- Socks
- Shorts / Tops
- Underwear
- Racquets

Do “shock absorbing” insoles reduce the risk of injuries during training? (Primary)

Randomized controlled clinical trial
12 week training
Incidence of overuse injuries documented


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5. Adequate and correct training

- Frequency
- Duration
- Type (Strength, endurance)
- Intensity
- Progression
- Periodization

Does pre-season strength (S) and endurance (E) training reduce the risk of injury in Rugby? (Primary)

- Randomized trial of 2 provincial rugby teams over one season
- Pre-season strength (S) and endurance (E) training
- Calculate risk ratio of all injuries

Upton P, MSc thesis, Univ. of Cape Town 2001

Does pre-season training reduce the injury risk in soccer? (Primary)

300 female soccer players (ages 14-18 years) studied over a 1-year period
42 players (TR group) were randomly selected to participate in a 7-week training program before the season
Control, CON=248


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  - Training
  - Biomechanics
  - Strapping and bracing
  - Nutrition
  - Psychology
  - Lifestyle

- Secondary prevention
  - Same evidence
  - ?
  - Sport specific
  - ?

Secondary prevention

Does the pattern of knee movement in the down stroke of cycling increase the risk of knee injuries? (Primary)

- Linear (Normal)
- Oval
- Figure-of-eight


6. Correct biomechanics

- Pelvic control and stability
- Knee alignment
- Patellar anatomy
- Quadriceps angle
- Lower leg alignment
- Rearfoot
- Forefoot

Lifestyle
Psychology
Nutrition
Strapping and bracing
Biomechanics
Equipment
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7. Correct use of strapping and bracing

Do ankle orthoses reduce the risk of recurrent ankle sprains? (Secondary prevention)

There is stronger evidence that ankle orthoses decrease the incidence of secondary lateral ankle ligament sprains.

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Is there a genetic predisposition to chronic Achilles tendinopathy?

- 53 Caucasian subjects diagnosed with chronic Achilles tendinopathy

There appears to be a genetic predisposition to the development of chronic Achilles tendinopathy

- COL5A1 RFLP BstUI Allele


What does the future hold?

Is there a genetic risk for sports injuries?

Thank you for your attention