

Injury prevention: Which measures are useful?

Prof. István Berkes MD., PhD



Priorities in Sports Medicine

- Antidoping
- Prevention of injuries

General considerations

- Increasing number of active athletes and sport events being performed by both sexes in different age groups at all levels
- Higher incidence of injuries with loss of time

General considerations

- Difficult, expensive and time consuming treatment of sports injuries
- Losses of athletes and clubs

General considerations

- Medical and socioeconomic grounds of prevention
- Differences in opportunities and circumstances of prevention between the professionals and amateur clubs and countries

General concepts of prevention must be nearly same in different clubs and countries

Responsibility

- Coaches
- Trainers
- Athletes
- Physicians
- Masseurs
- Referees
- Officials
- Parents

Prevention

- Primery
- Secondary
- Tertiary

Primary level of prevention

- Refers to the specific strategies used to prevent injury from occurring

Secondary level of prevention

- Refers to the early detection of injury, and the prevention of increasing the severity of injury, of developing any complications, and the prompt administration of appropriate therapy

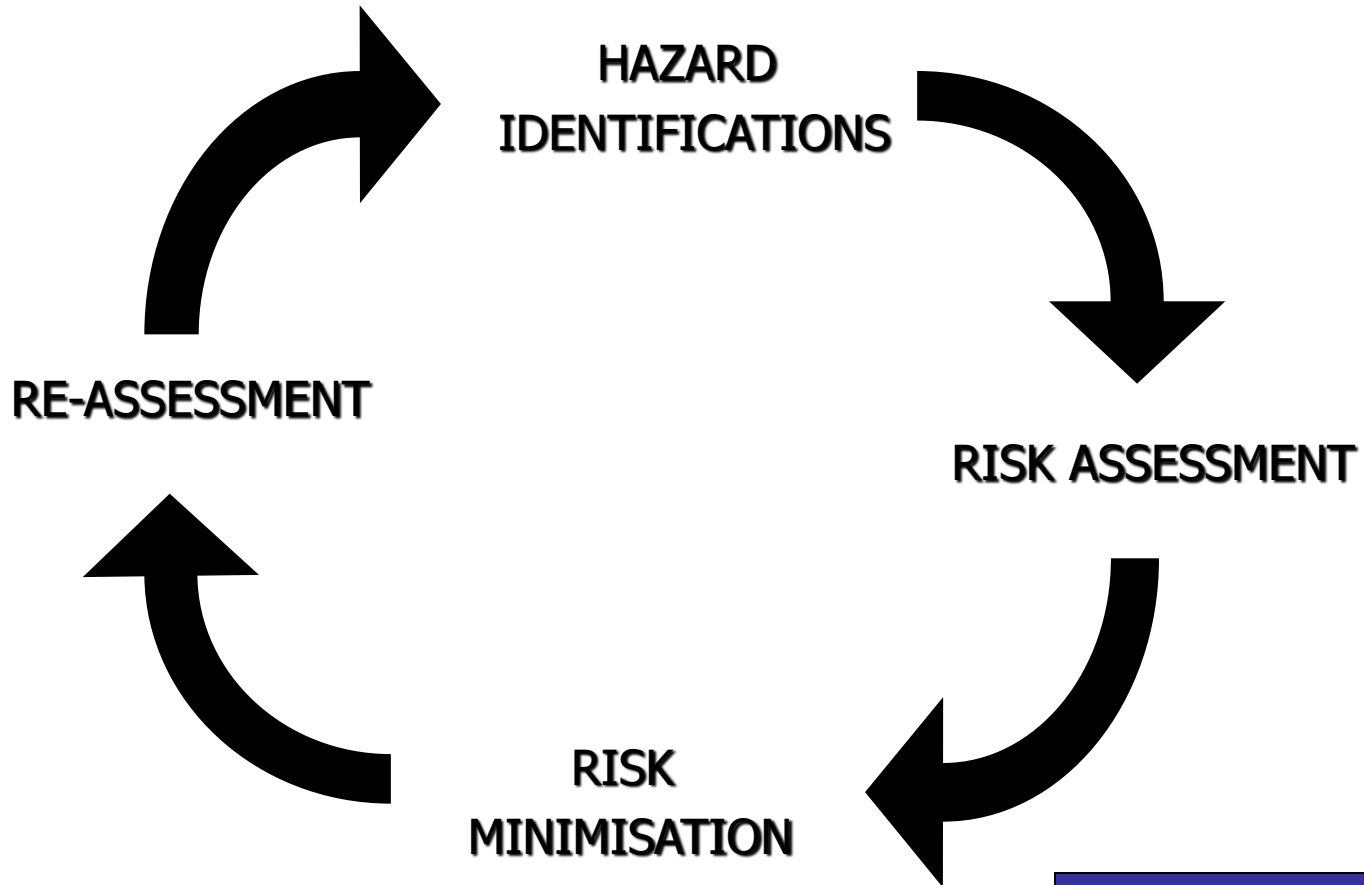
Tertiary level of prevention

- Refers to the restoration of function and the prevention of recurrence by the administration of an appropriate rehabilitation programme

Injury definition

- Sustained in any sport-related activity which causes the athlete to be absent from full training or competition
 - Min. 1 day
 - Medical management
 - Negative financial and psychosocial effect

Four steps of prevention

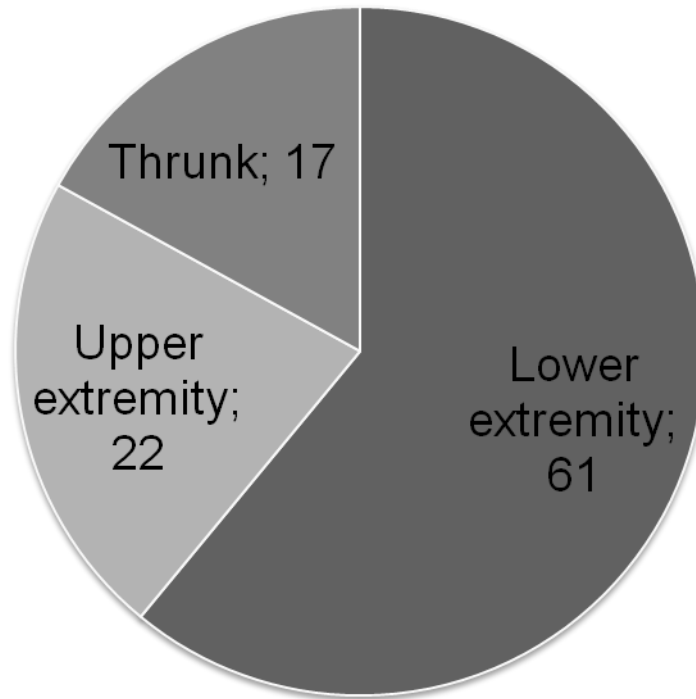


Van Mechelen et al, 1992

Step one

Hazard identifications

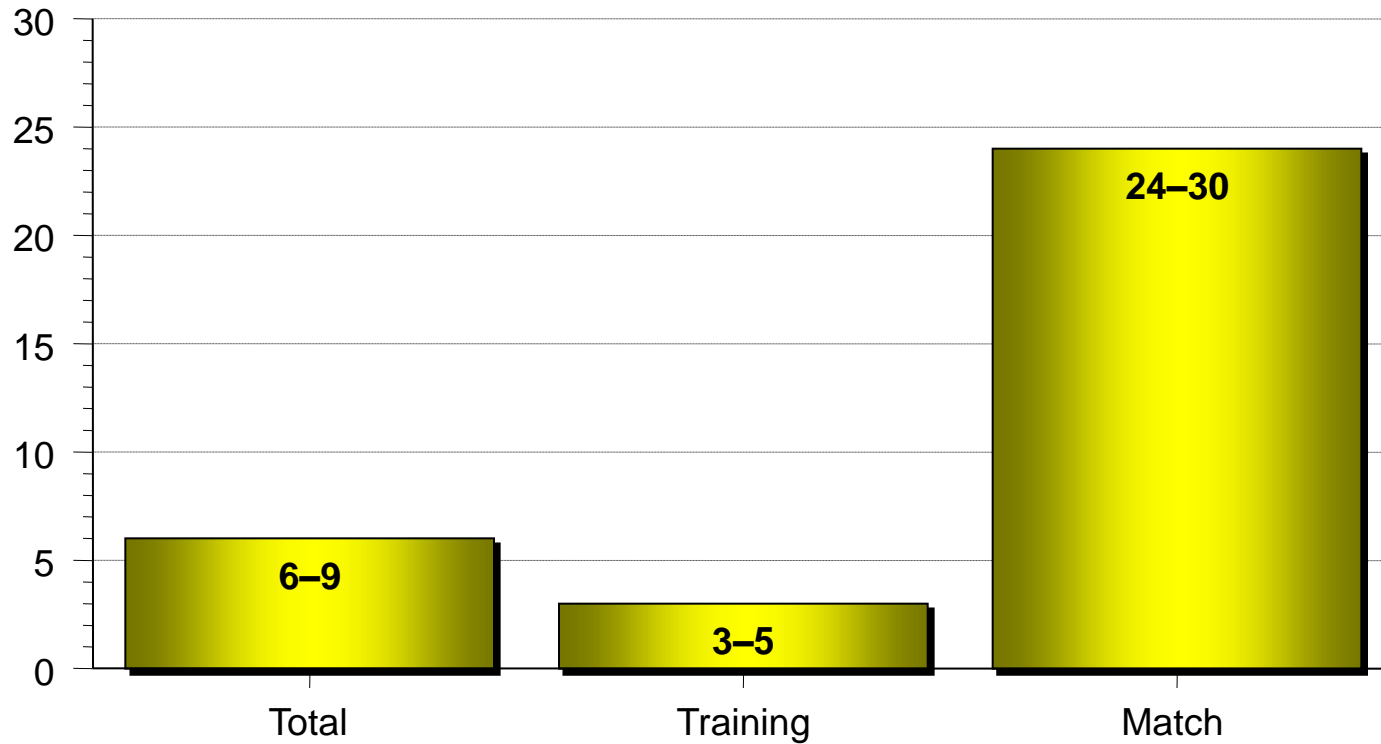
Sports injuries



National Institute for Sports Medicine 2010

Injuries in football

Mean injury incidence / 1.000 hours exposure



Injuries in football

- Lower extremities
 - Most commonly affected (ankle, knee)
- Head injuries
 - Underestimated
- Female players
 - Twice more a serious injury than male athletes

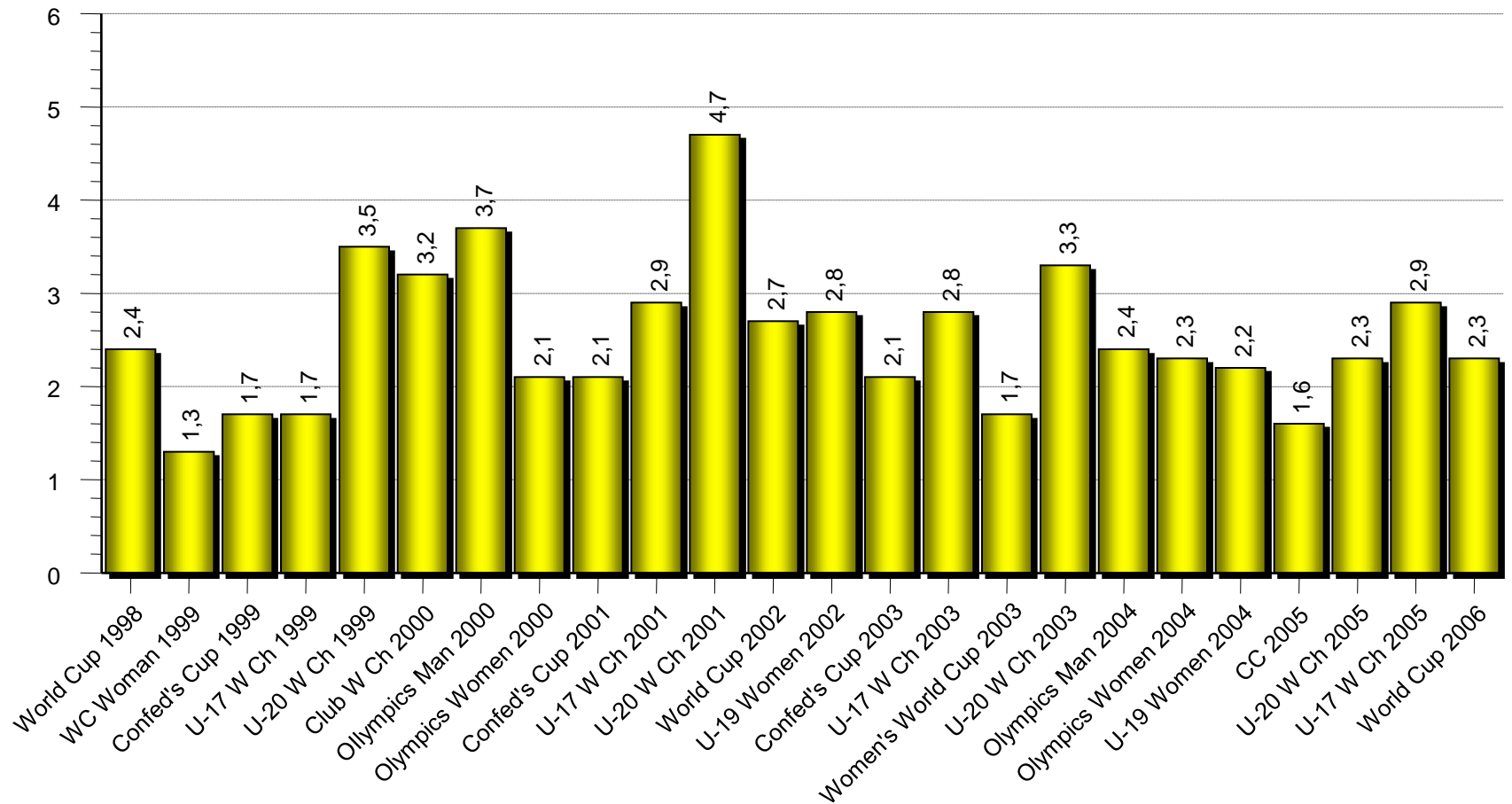
Injuries in football

- Different age groups, skill level and subgroups of football populations
 - Great differences
- Absence of players
 - 24 days/injury
 - 4 matches
- The average cost for medical treatment of football injuries ?

FIFA Medical Assessment and Research Centre (F-Marc)

- 27 FIFA – Tournaments
- 25.932 players hours documented
- Men
 - World Cup 1988, 2002, 2006
 - U-20 World Championship 1999, 2001, 03, 05
 - U-17 World Championship 1999, 2001, 03, 05
 - Confederations Cup 1999, 2001, 03, 05
 - Club World Championship 2000, 2005
 - Olympic Games 2000, 2004
 - Futsal 2000, 2004
- Women
 - World Cup 1999, 2003
 - Olympic Games 2000, 2004
 - U-19 World Championship 2002, 2004

Injuries per match

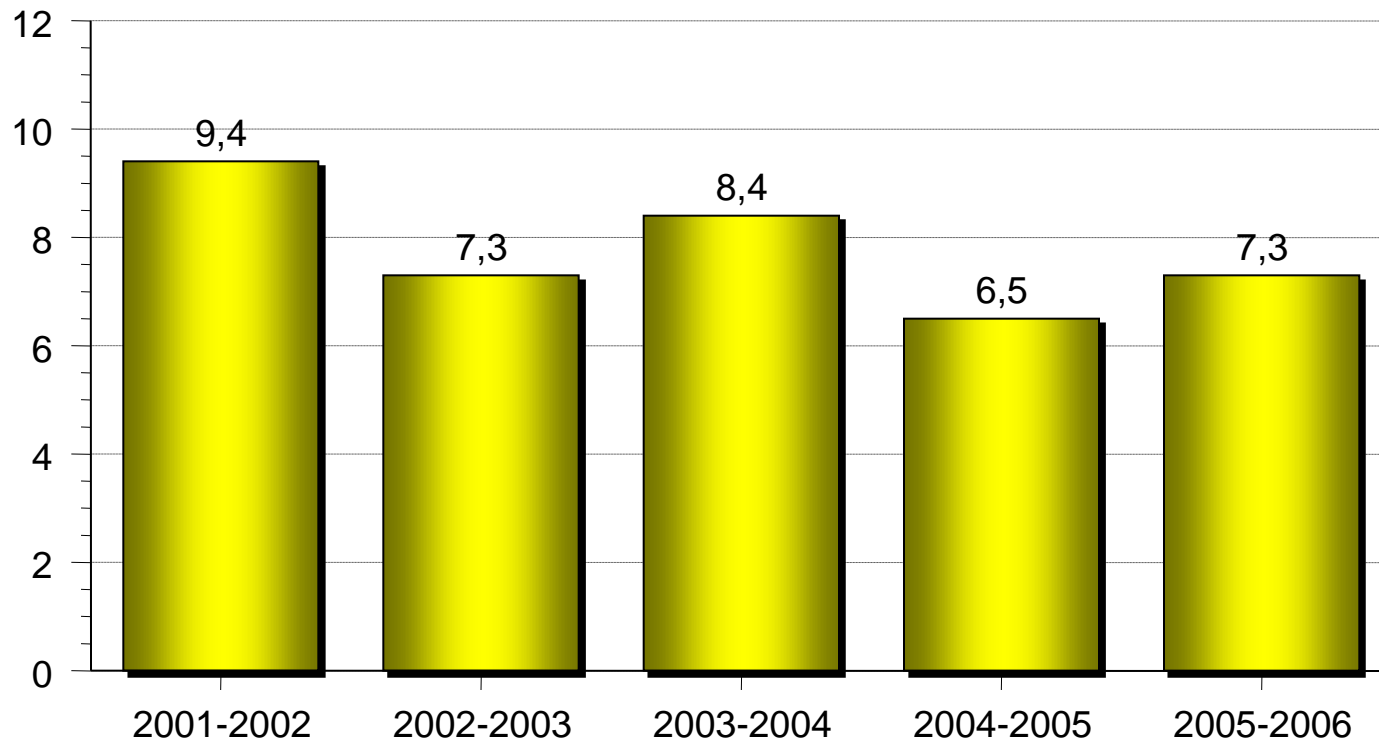


UEFA Injury Study

- UEFA Medical Committee
- 2001-2006
- 17 major clubs
- UEFA Champions League (UCL)

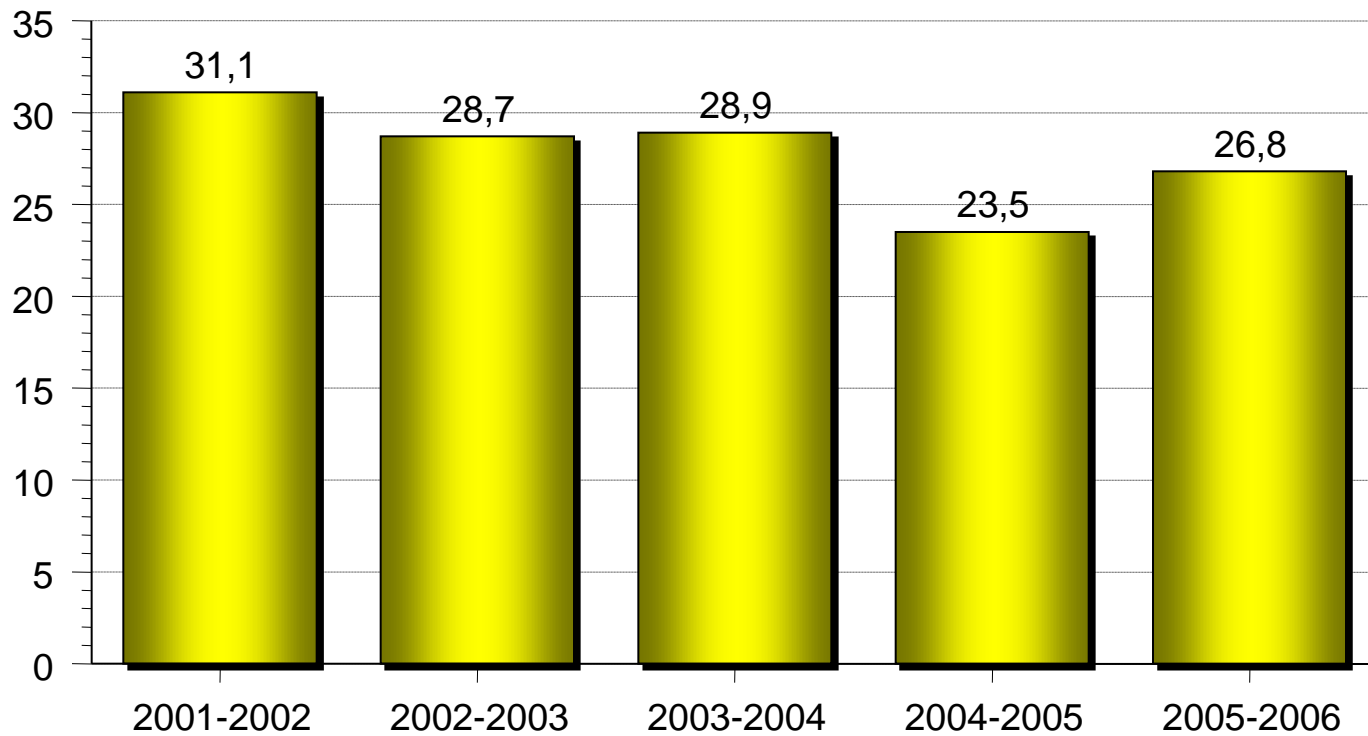
UCL Study

Injuries / 1.000 hours of exposure



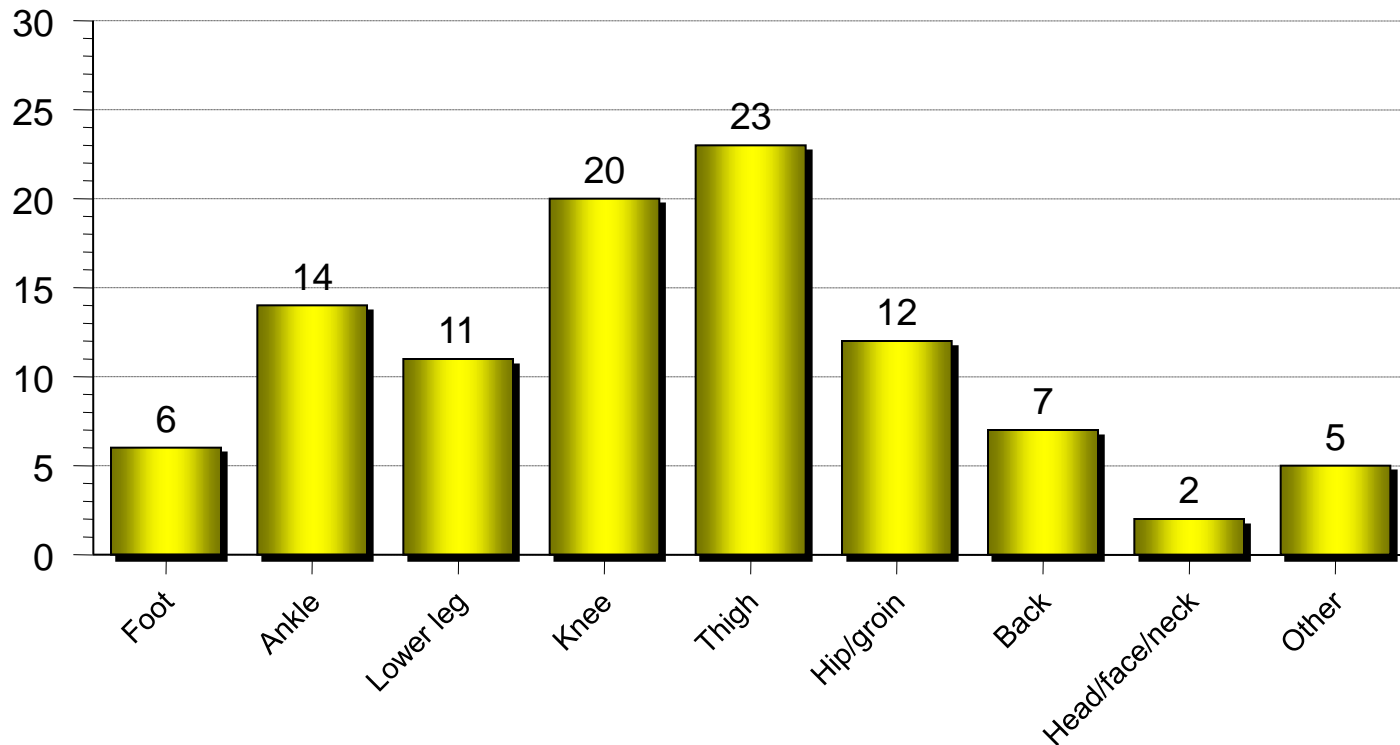
UCL Study

Injuries / 1.000 match hours



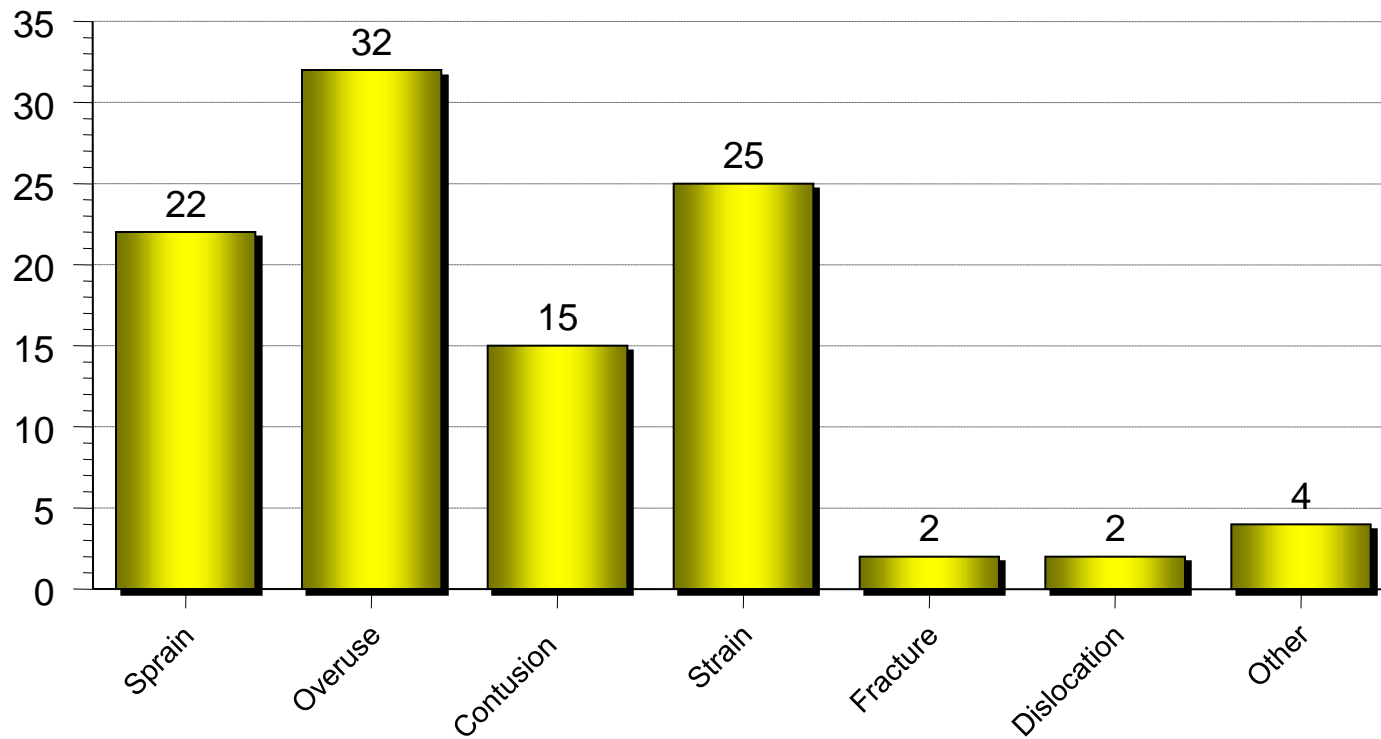
UCL Study

Location of injuries (%)



UCL Study

Distribution of injuries by type (%)



UCL Study

- Injury risk is not increasing
 - In matches has dropped by 14%
- Reason is unknown
- Contributory factors
 - Increased knowledge about injuries
 - Improved communication between club medical teams

Budapest Sports Medicine Experiences

- 2006-2007
- Prospective study
- Hungarian Football Academy
- 35 players
- Age: avr. 16.4
- Registration by medical staff
- Investigation, documentation by chief physician

Budapest Sports Medicine Experiences

- 6 injuries/1.000 hrs exposure
- Injury rate: 3/player/season
- Injury incidence varied throughout the season (peaking in November)
- Thigh 53 %
- Ankle 19 %
- Knee 13 %
- Offensive players 39.5 %

Female football

- Tegnander et al: Injuries in Norwegian female elite soccer: a prospective one-season cohort study KSSTA, 2008
- 181 female soccer players
- Age: avr. 23 years
- 189 injuries
- Overuse 10 %
- Games 47 %, trainings 53 %

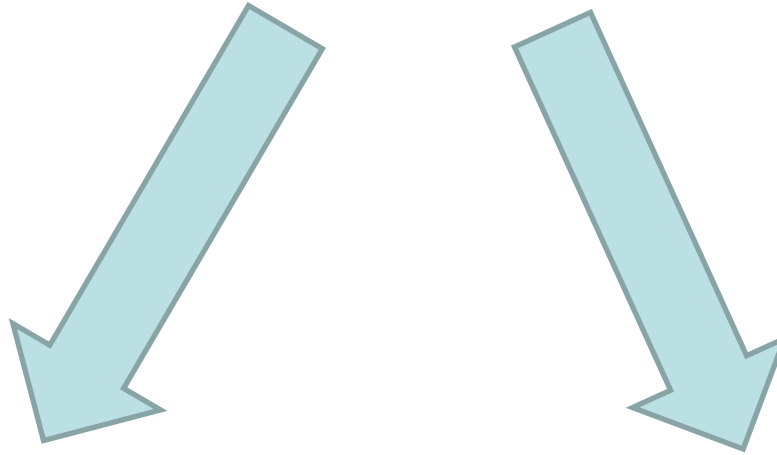
Female football

- Tegnander et al: Injuries in Norwegian female elite soccer: a prospective one-season cohort study KSSTA, 2008
- Incidence of acute injuries
 - 23.6/1.000 game hours
 - 3.1/1.000 training hours
- Lower extremities 81 %
- Head injuries 6.3 %
- Ankle sprain 17.2 %
- Minor injuries 50 %
- ACL/PCL injuries
 - 0.6/1.000 game hours

Step two

Risk assessment

Risk factors



Intrinsic

Extrinsic

Risk factors

Intrinsic

- Physical
 - Gender
 - Age (maturational stage)
 - Somatotype
 - Previous injuries
 - Fitness level
 - Flexibility
 - Strength
 - Joint stability
 - Biomechanics
- Psychological/psychosocial

Extrinsic

- Sport played (contact/non- contact)
- Level of play (recreational/elite)
- Position played
- Goal/aim of sport
- Rules
- Playing, training time
- Playing surface (type/condition)
- Time of season/time of day
- Equipment (protective/footwear)
- Weather
- Nutrition

Intrinsic risk factors

Non-modifiable

- Age (maturational stage)
- Gender
- Somatotype
- Previous injury

Potentially-modifiable

- Fitness level
- Pre-participation sport specific training
- Flexibility
- Strength
- Joint stability
- Biomechanics
- Balance/proprioception
- Warm-up activity

- Psychological/psychosocial factors

Step three

Risk minimisation

Previous controlled studies on the prevention a football injuries

Study authors	Population (gender, age)	Sample size	Country	Type of injury	Type of intervention	Result
Ekstrand et al [2]	males, 17-37 yrs	12 teams	Sweden	All injuries	Multi-modal intervention programme	Significantly less injuries vs. control group by 75%
Heidt et al [3]	females, 14-18 yrs	300 players	US	All injuries	Frappier Acceleration Training Program	Significantly less injuries vs. control group
Junge et al [4]	males, 14-19	194 players	Switzerland	All injuries	Multi-modal intervention programme	Significantly less injuries vs. control group
Tropp et al [5]	males, seniors	296 players	Sweden	Ankle sprains	Use of orthosis or ankle disk training	Less injuries in players with previous history of ankle sprains using either technique
Surve et al [6]	males, seniors	504 players	South Africa	Ankle sprains	Instruction to wear a semi-rigid orthosis	Significant reduction of recurrent ankle sprains in players with previous history of ankle sprains
Caraffa et al [7]	-	60 teams	Italy	ACL-injuries	Proprioceptive training	Significant reduction of ACL injuries
Hewett et al [8]	females, 14-19 yrs	200 players	US	Serious knee injuries	Pre-season neuromuscular training programme	A trend of less injuries in the trained vs. control group
Söderman et al [9]	females, 21 yrs	140 players	Sweden	Severe knee injuries and ankle sprains	Balance board training	No preventive effect
Askling et al [10]	males, 25 yrs	30 players	Sweden	Hamstring strains	Training with eccentric overload	Significantly less injuries vs. control group
Mandelbaum et al [11]	females, 14-18	5703 players	US	Non-contact ACL-injuries	Multi-modal intervention programme	Significant reduction of ACL injuries

Preventive measurements of different perspectives and competences

Trainers' perspective	Medical perspective	Players' perspective	Others (officials, governing bodies)
Risk conscious education of players	Supervision of injury prevention, implementation and control of preventive measurements, routine taping of ankle joints	Cooperation with coaches, medical personnel and management in realising the concept of injury prevention	Injury awareness of clubs and governing bodies
Structured, complex pre- and in-season training regimen (including proper complex muscle management and stamina training, proprioceptive training)	Risk conscious attitude towards players	Injury conscious playing attitude – hard, but fair	Ensure safe pitch conditions
Appropriate warming-up, and cool-down	Education all staff members	Fair play	
Reduction of physical overload; appropriate game / training relationship	Load-control – assistance to trainings Pre-season and pre-signing examinations Sufficient regard for complaints, ensuring sufficient recovery time and adequate rehabilitation	Good equipment, especially football boots Using protective gears (shin guards, ankle taping and bracing) Improvement of performance (flexibility, skills, endurance) Improvement of reaction, improvement of lifestyle habits	Observance of the existing rules Improvement of rules of the game Reduction of foul play Documenting

Features of a multi-modal preventive strategy for the prevention of football injuries

Preventive measurement	Addressed risk factor / effect
Cardiovascular stamina training	Better oxygen-supply Less fatigue – Improved stamina
Proprioceptive training including <ul style="list-style-type: none"> ▪ sports specific agility drills ▪ core proprioception ▪ lower extremity proprioception 	Better neuromuscular coordination: less injuries associated with landing and pivoting drills More muscular support to joints Fewer ACL- and ankle injuries
Stretching	Increase muscle flexibility Muscles will become more resistant to passive forces Less muscle injuries
Muscle strengthening – thigh muscles	Better hamstring-to-quadriceps power ratio (at least 2:3), better muscular balance Fewer injuries to the thigh muscles
Muscle strengthening – lumbar spine and back muscles	Better muscular balance, stronger deep back muscles Less low-back pain Less groin injuries

Return to sport activity

- Full and pain-free range of motion of affected joint
- 80-90 % „normal” muscle strength (in comparison with uninjured limb or pre-injury strength assessment)
- Adequate proprioceptive function (ie. as assessed by balance ability)
- Ability for sports-specific movement
- Psychological recovery
- Graduated return to pre-injury sporting activity (ie. increasing time and intensity of performance) pain-free

Step four

Re-assessment

Conclusions

- Problem with comparisons between different studies of football injuries
- Inconsistent manner in which injury is defined and information collected and recorded
- Need for a consensus about study design

Conclusion

- It is important in the future that all studies follow the consensus statement of Fuller et al. on injury definitions and data collection procedures

Fuller et al, Br J Sports Med, 2006: Consensus statement on injury definitions and data collection procedures in studies of football (soccer) injuries

Take home message

- Collaborative effort will continue to reduce injuries during sports by understanding the scientific data, taking action accordingly

Thank you

Take home message

- What do you feel are ways to decrease the number of serious injuries in football?
- Collaborative effort will continue to reduce injuries during football matches by understanding the scientific data, taking action accordingly

Risk factors

- Intrinsic
- Extrinsic

Risk factors

Intrinsic	Extrinsic
Age	Level of play
Joint stability	Exercise load
Muscle strength asymmetry	Amount and standard of training
Previous injuries	Position played
Adequacy of rehabilitation	Equipment used
Psychosocial stress	Field conditions
Insufficient endurance	Rules
Sex	Foul play
Ethnic origin	Age of beginning football
Fatigue	Lack of professional education

Risk factors for injury in sport

Extrinsic factors	Intrinsic factors	
	Non-modifiable	Potentially modifiable
Sport played (contact/non- contact)	Previous injury	Fitness level
Rules	Age (maturational stage)	Pre-participation sport specific training
Goal/aim of sport	Gender	Flexibility
Playing time	Somatotype	Strength
Level of play (recreational/elite)		Joint stability
Position played		Biomechanics
Playing surface (type/condition)		Balance/proprioception
Weather		Warm-up activity
Time of sason/time of day		Psychological/psychosocial factors
Equipment (protective/footwear)		