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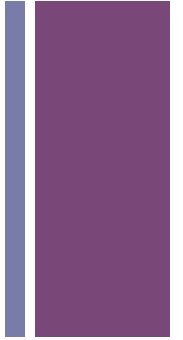
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Injury risk management in rugby – Applications of single team epidemiology

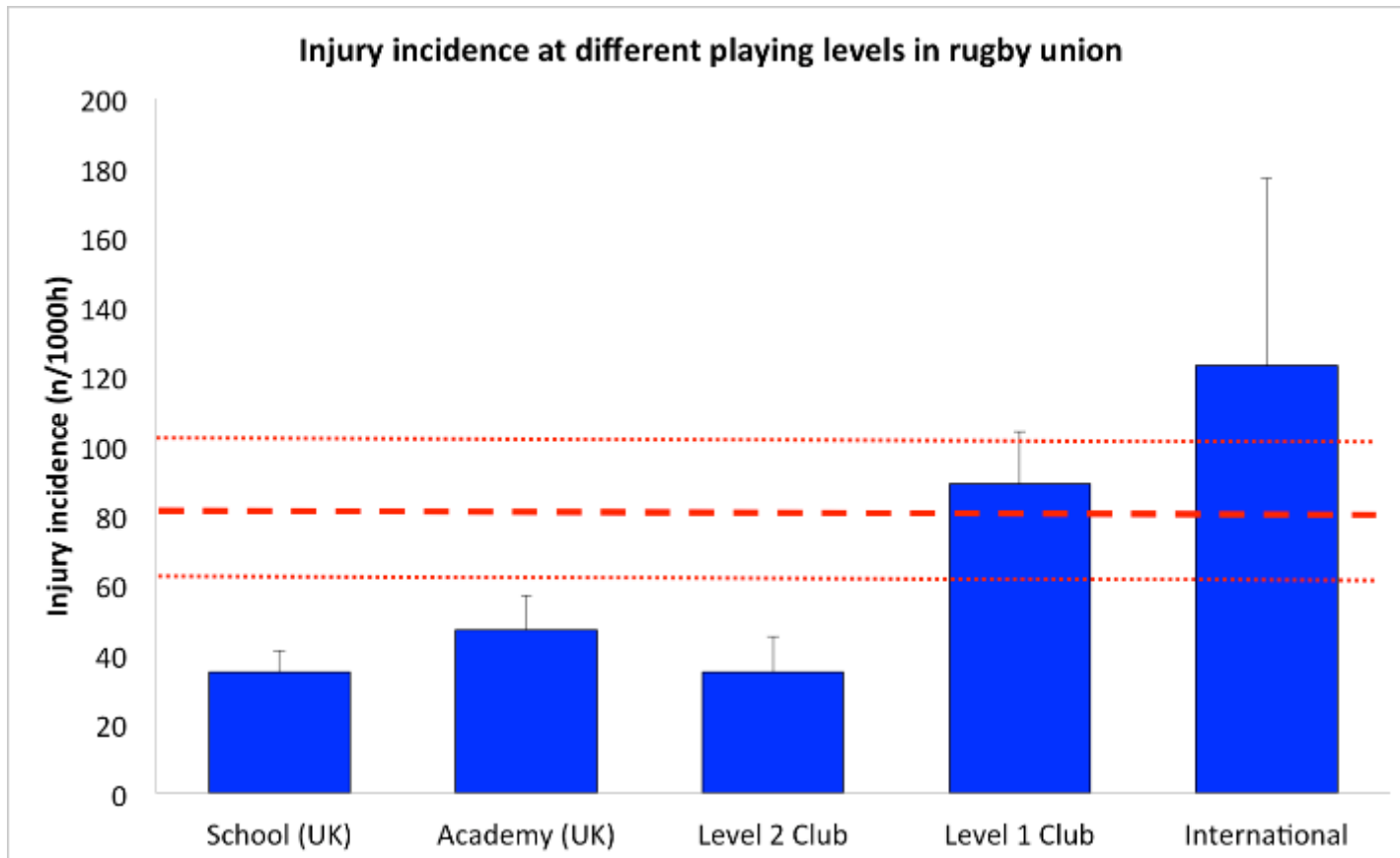
Dr. Jason Tee



epidemiology [ep''ĩ-de''me-ol'o-je]

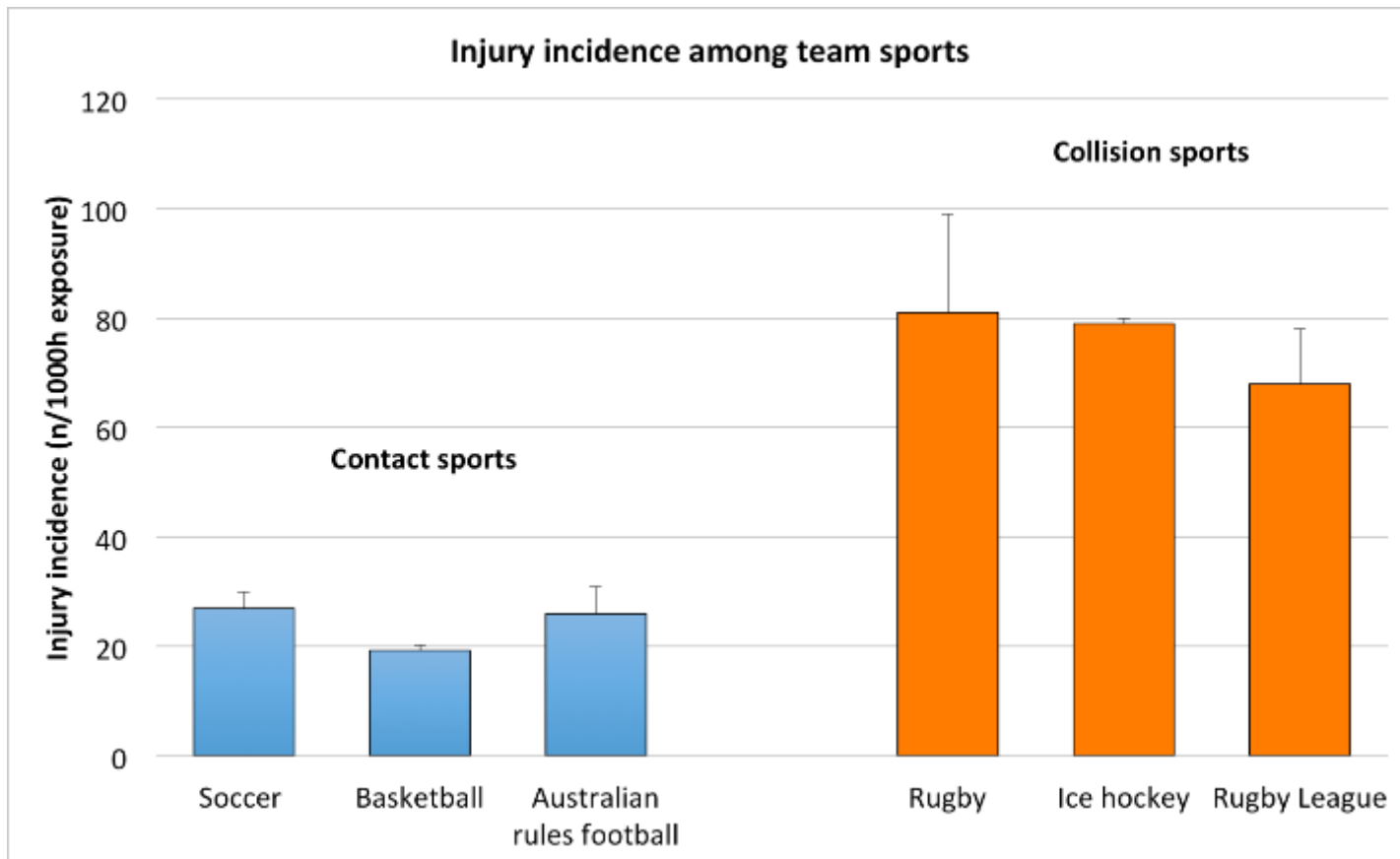
The science concerned with the study of factors determining and influencing the frequency and distribution of disease, **injury** and other health related events and their causes in a defined human population for the purpose of establishing programs to prevent and control their development and spread.

+ Epidemiology of rugby



Williams et al., Sports Med 2013

+ Epidemiology of rugby





Importance for state of the game

Law modifications

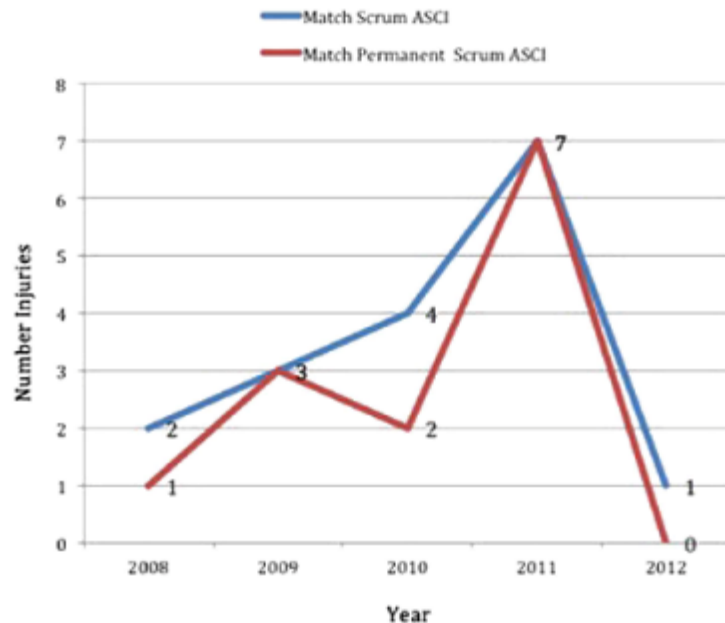


Figure 2 Pattern of match-related scrum acute spinal cord injuries (ASCI) between 2008 and 2012 in South Africa, including permanent injury trends.

Hendricks et al., BJSM, 2014

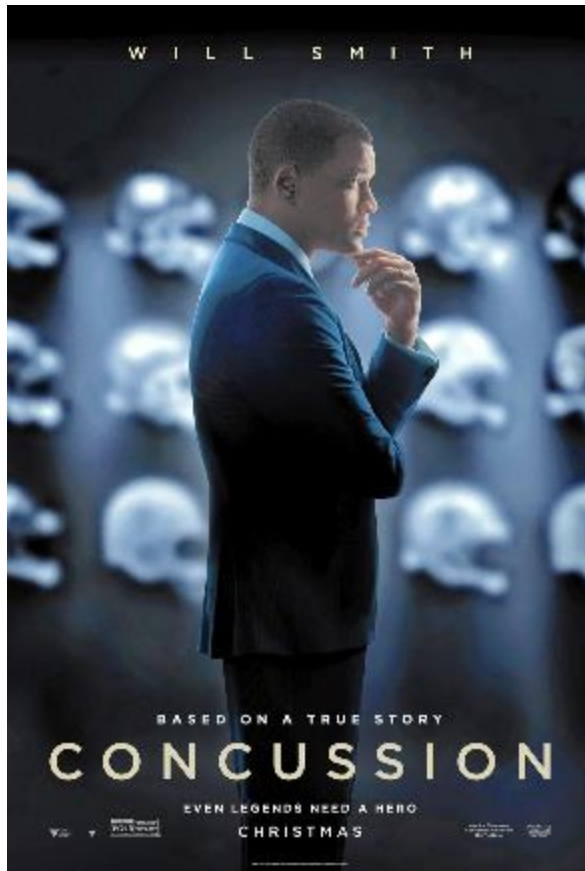
Education programs



Fig. 2. Average absolute number of injuries per year pre-BokSmart (2008–2009) and post-BokSmart (2010–2013) in junior and senior players including incidence rate ratio (IRR)
*Indicates that IRR is significantly different.

Brown et al., Scand J Med Sci Sports, 2016

+ Current challenges



Sport Collision Injury Collective
www.SportCIC.com

1st March 2016

cc:

Anne Longfield OBE, Children's Commissioner for England
Professor Sally Holland, Children's Commissioner for Wales
Tam Baillie, Children's Commissioner for Scotland
Koulla Wosouma, Children's Commissioner for Northern Ireland
Dr. Niall Muldoon, Ombudsman for Children for Northern Ireland

Professor Dame Sally Davies, Chief Medical Officer for England
Dr Ruth Hussey OBE, Chief Medical Officer for Wales
Dr. Catherine Calderwood, Chief Medical Officer for Scotland
Dr Michael McBride, Chief Medical Officer for the Republic of Ireland

Rt Hon Nicky Morgan, Secretary of State for Education for England
Huw Lewis AM, Minister for Education and Skills in Wales
Rt Hon Angela Constance, Secretary of State for Education and Lifelong Learning for Scotland
John O'Dowd MLA, Minister for Education in Northern Ireland
Jan O'Sullivan, Minister for Education for the Republic of Ireland

Rt Hon Jeremy Hunt, Secretary of State for Health for England
Rt Hon Shona Robison, Cabinet Secretary for Health, Wellbeing and Sport in Scotland
Mark Drakeford AM, Minister for Health and Social Services in Wales
Simon Hamilton MLA, Minister for Health, Social Services and Public Safety in Northern Ireland
Leo Varadkar, Minister for Health for the Republic of Ireland

Rt Hon John Whittingdale, Secretary of State for Culture, Media and Sport in England
Ken Skates AM, Deputy Minister for Culture, Sport and Tourism in Wales
Jamie Hepburn MSP, Cabinet Secretary for Health, Wellbeing & Sport in Scotland
Carál Ní Chuilín MLA, Minister for the Department of Culture, Arts and Leisure in Northern Ireland
Paschal Donohoe, Minister for Transport, Tourism and Sport in the Republic of Ireland.

+ epidemiology

Classical epidemiology studies require

- Huge sample sizes (entire population)
- Significant resources
- Long time spans
- Governing body responsibility



FAST

PRACTITIONER

IMMEDIATE DECISION-MAKING

HAS DIRECT APPLICATION

**FAST, AUTOMATIC,
INTUITIVE, NON-INVASIVE**

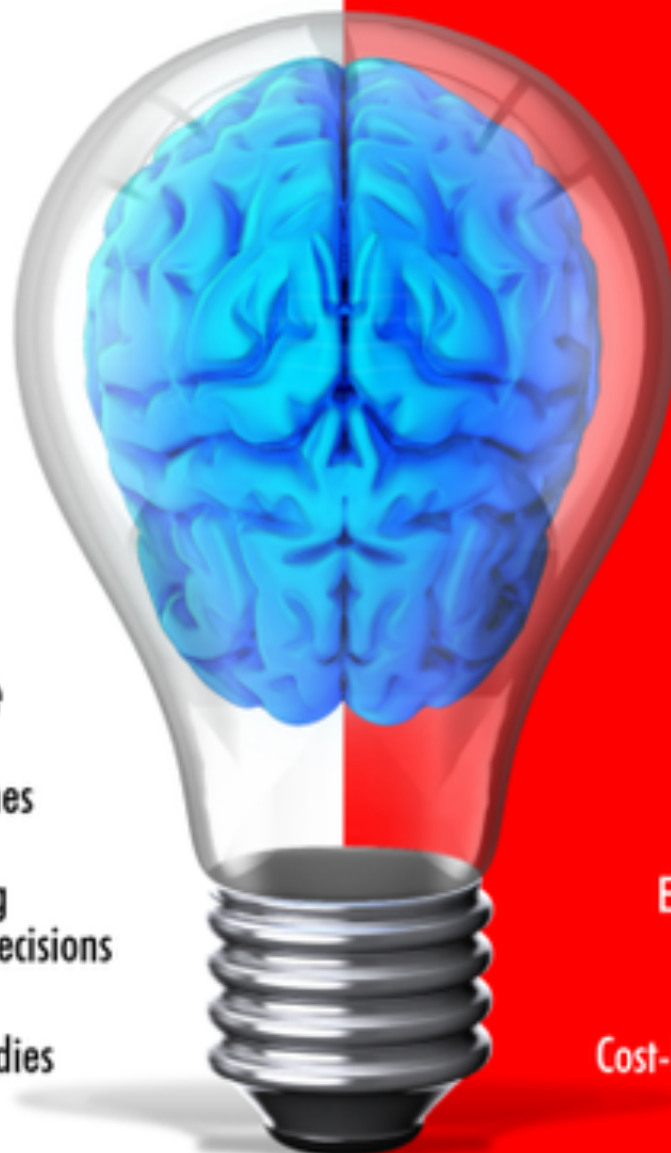
Service provision to players/coaches

Informing
coach/medical decisions

Case studies

Dashboard analytics

**FEEDS DATA TO
RESEARCH**



SLOW

RESEARCHER

QUALITY CONTROL, EXPLORATORY, VALIDATION

HAS INDIRECT APPLICATION

**SLOW, DELIBERATE,
FOCUSSED, EFFORT**

Provides evidences for system

Establishing signal
and noise

Cost-benefit analyses

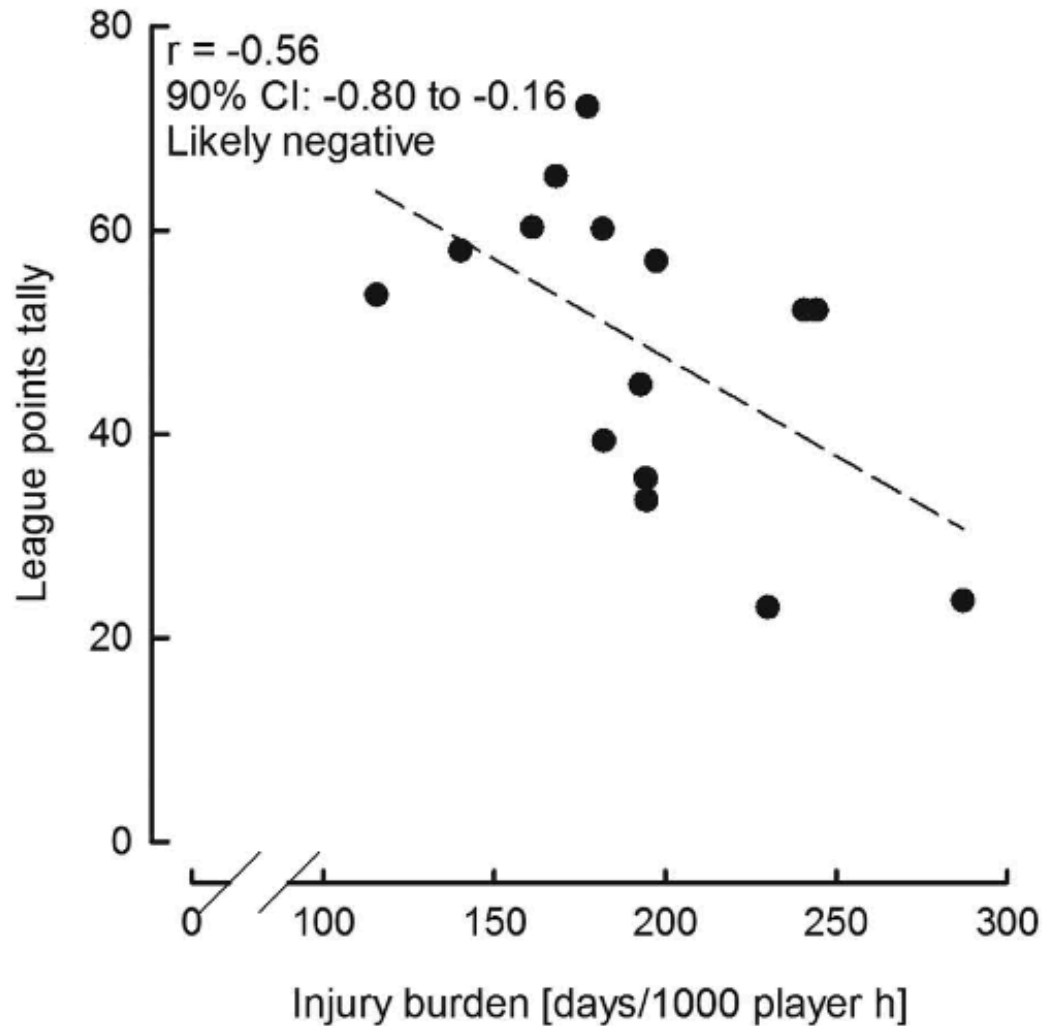
Statistics

**PROVIDES EVIDENCE
BASED TO DAILY SYSTEMS**



Reference: Aaron J Coutts, USPP, in press

+ Injury vs. Performance



+ Injury vs. performance

Injuries affect team performance negatively in professional football: an 11-year follow-up of the UEFA Champions League injury study

Martin Häggglund,^{1,2} Markus Waldén,^{2,3} Henrik Magnusson,^{1,2} Karolina Kristenson,^{2,3} Håkan Bengtsson,² Jan Ekstrand^{2,3}

Football

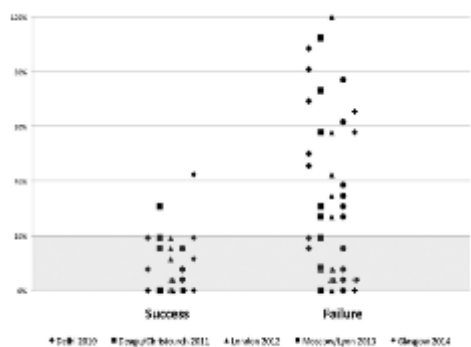
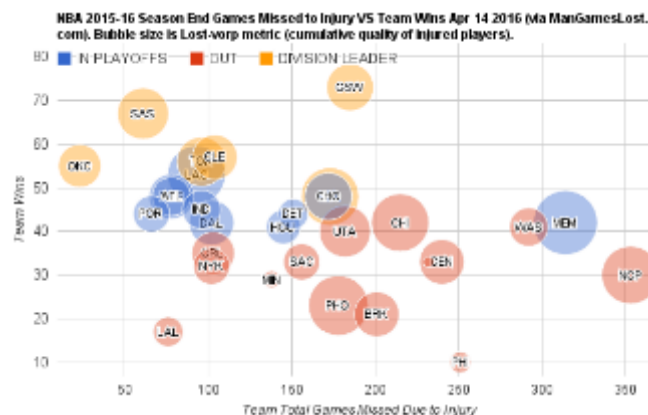
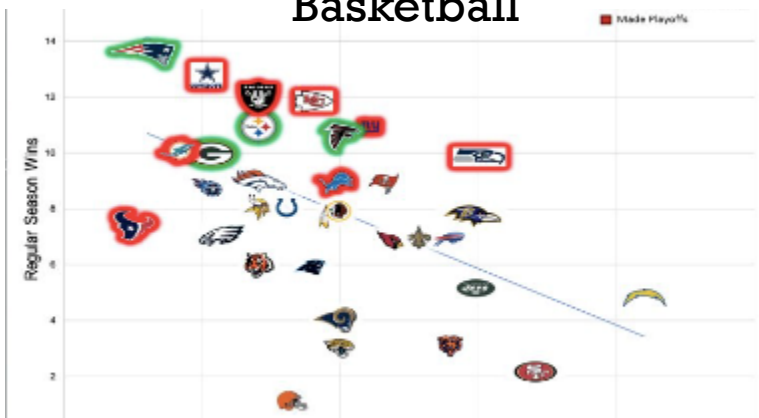


Fig. 1. Percentage modified training time by monitoring year for participants who failed or succeeded in reaching their key performance goal.

Track and field



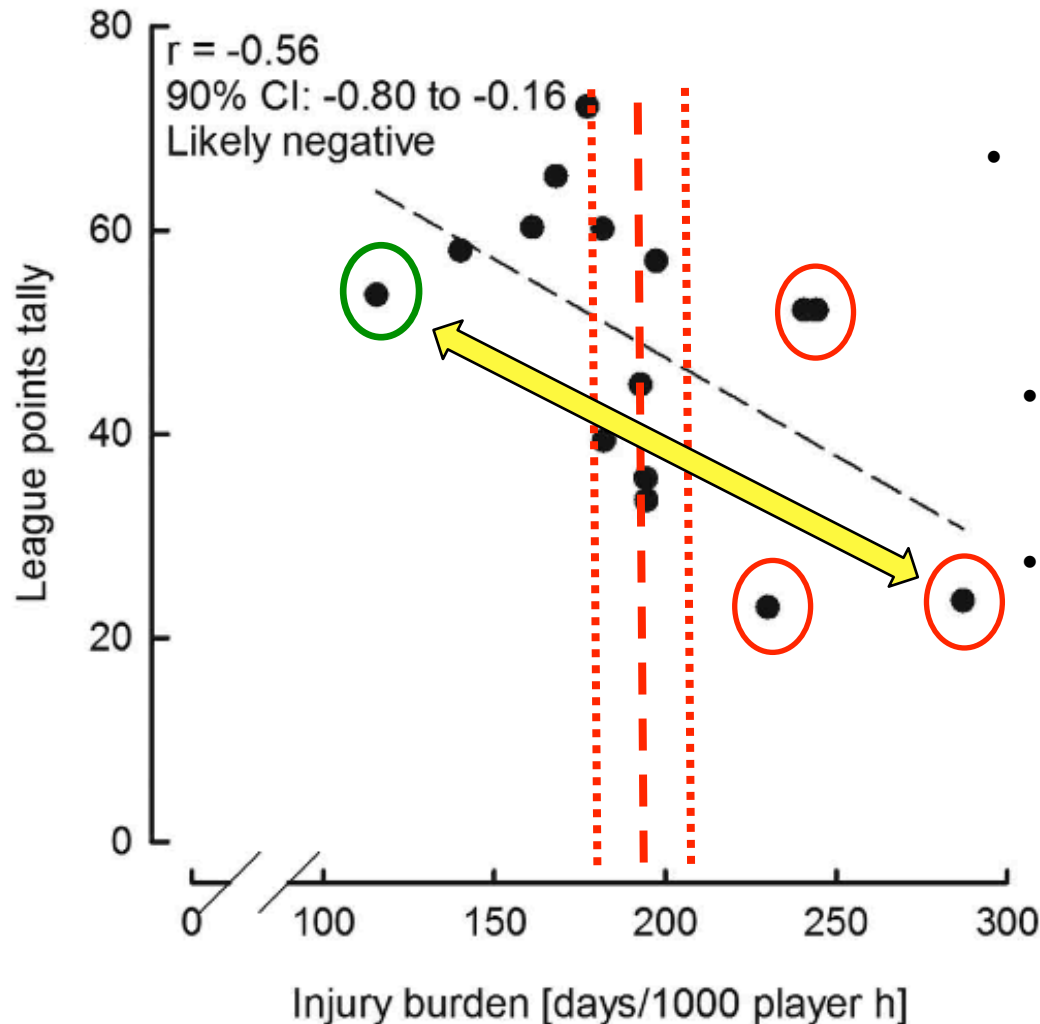
Basketball



American Football

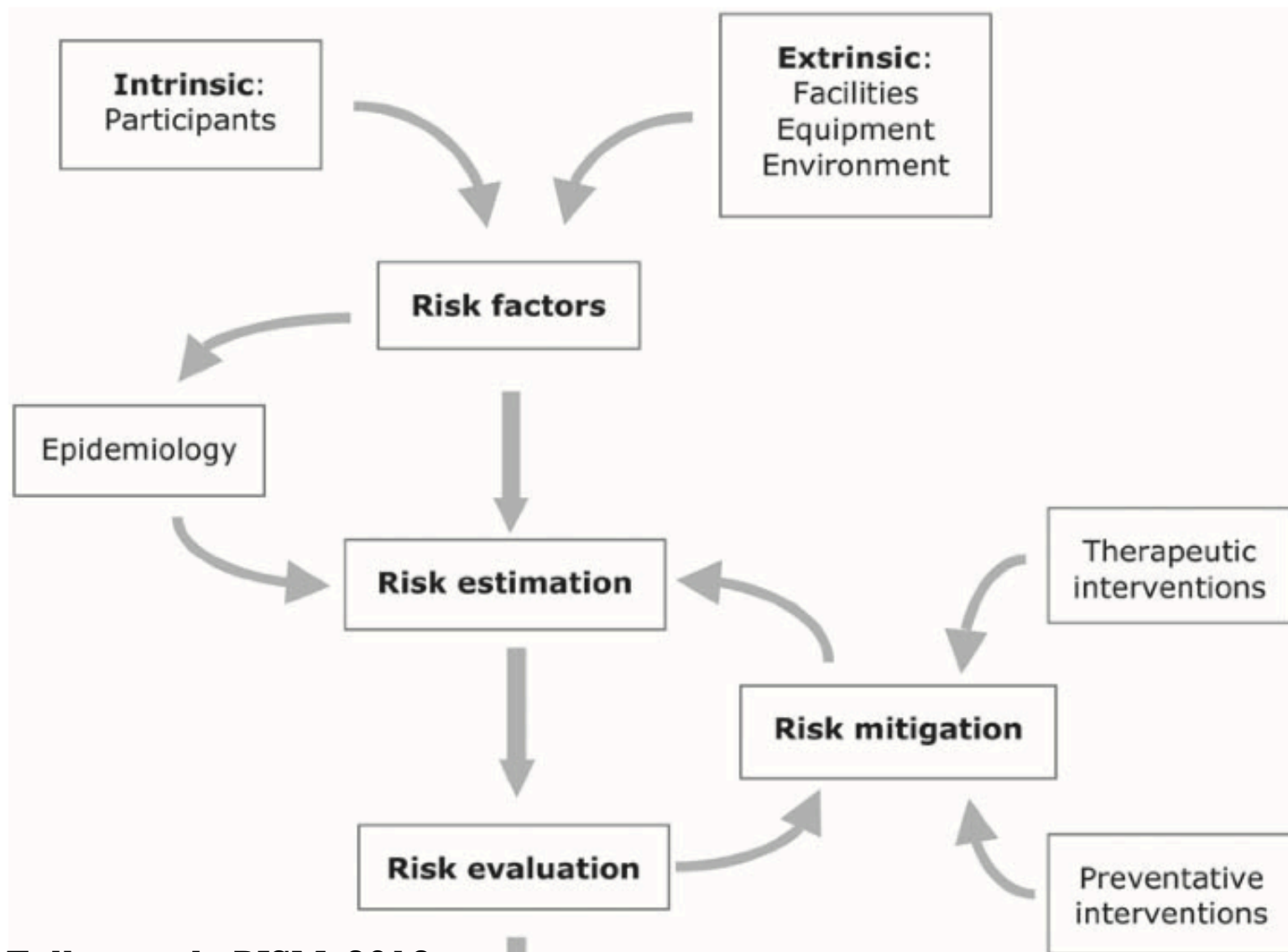
@JasonCTee

+ Injury vs. Performance



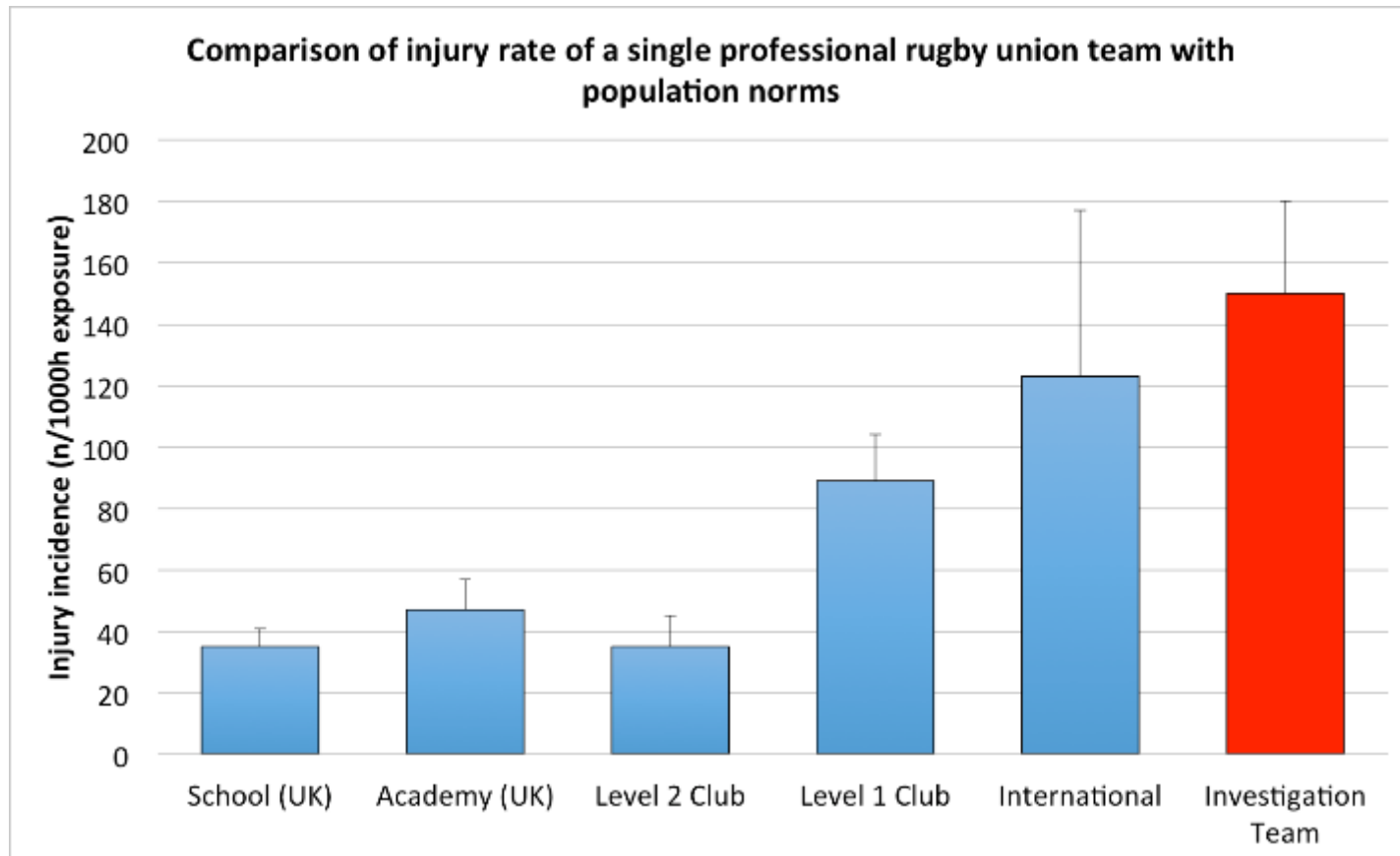
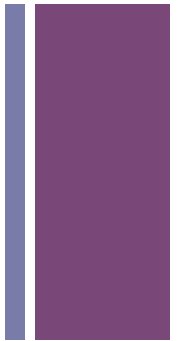
- What are these teams doing wrong?
- What is this team doing right?
- How do we get from here to here?

+ Injury risk management model

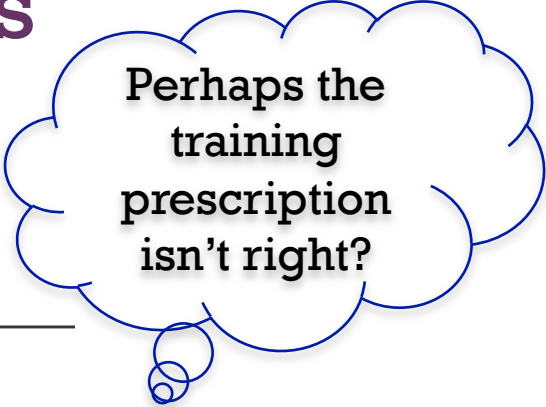




Risk estimation



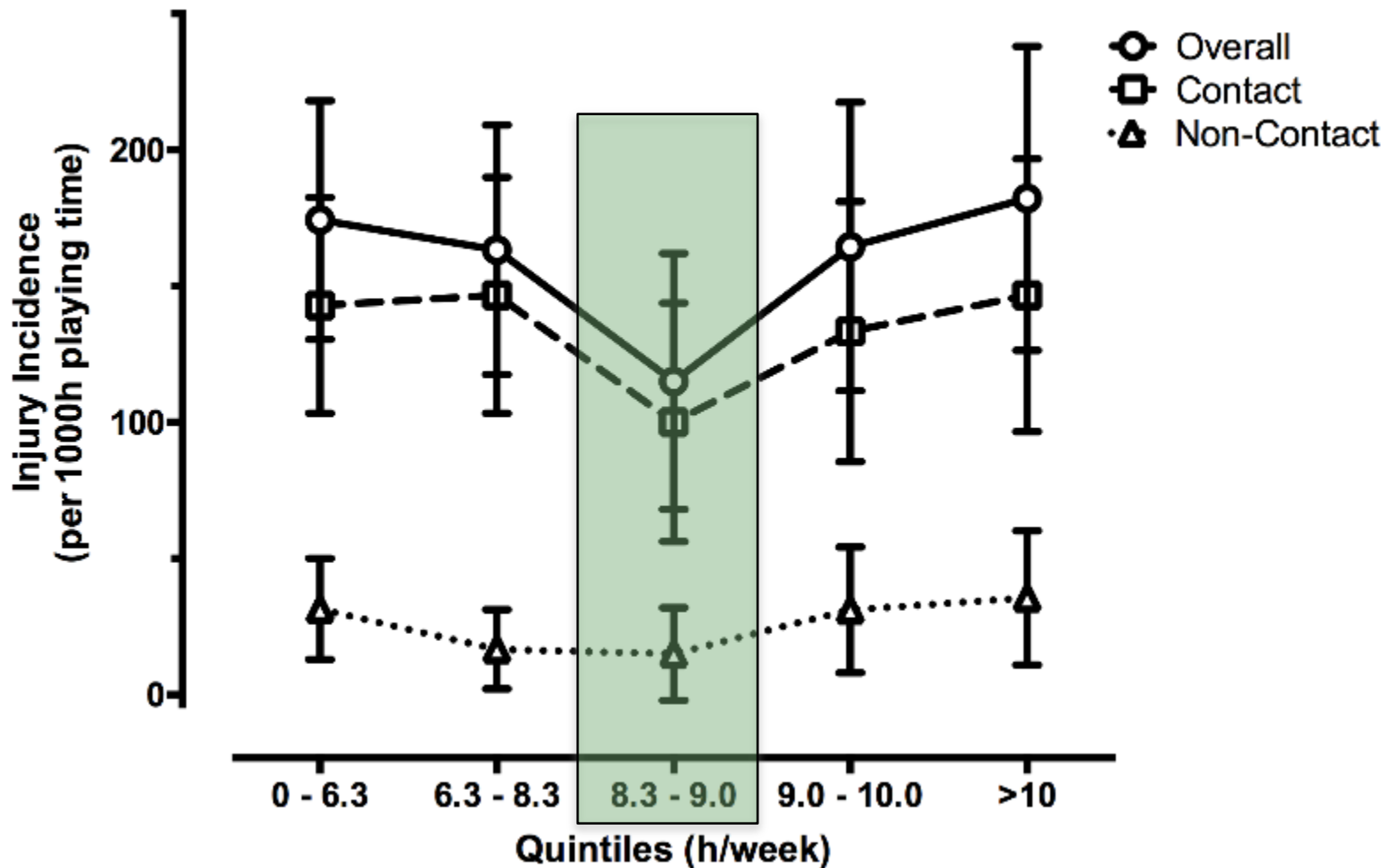
+ Targeting interventions



Perhaps the
training
prescription
isn't right?

<hr/> <i>Injury Burden</i>	
<i>(total days lost)</i>	3056
<hr/>	
<i>Injury circumstances</i>	
<i>(% total injury burden)</i>	
Match	52.7
Training	47.3
<hr/>	
<i>Injury Mechanism %</i>	
<i>(% total injury burden)</i>	
Contact	49.9
Non-Contact	50.1
<hr/>	

+ The training sweet spot



Tee, unpublished observations



What do players actually have to do in matches?

ORIGINAL RESEARCH

Movement and impact characteristics of South African professional rugby union players

J C Tee, MSc (Exercise Science); Y Coopoo, DPhil, FACSM

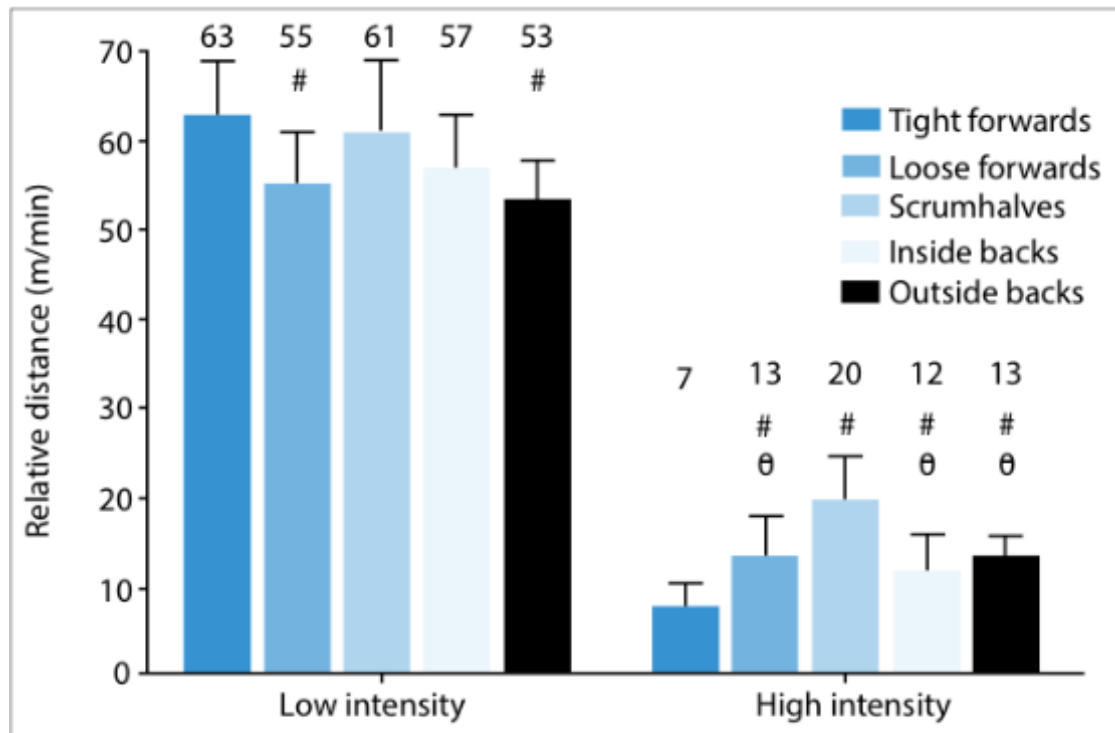
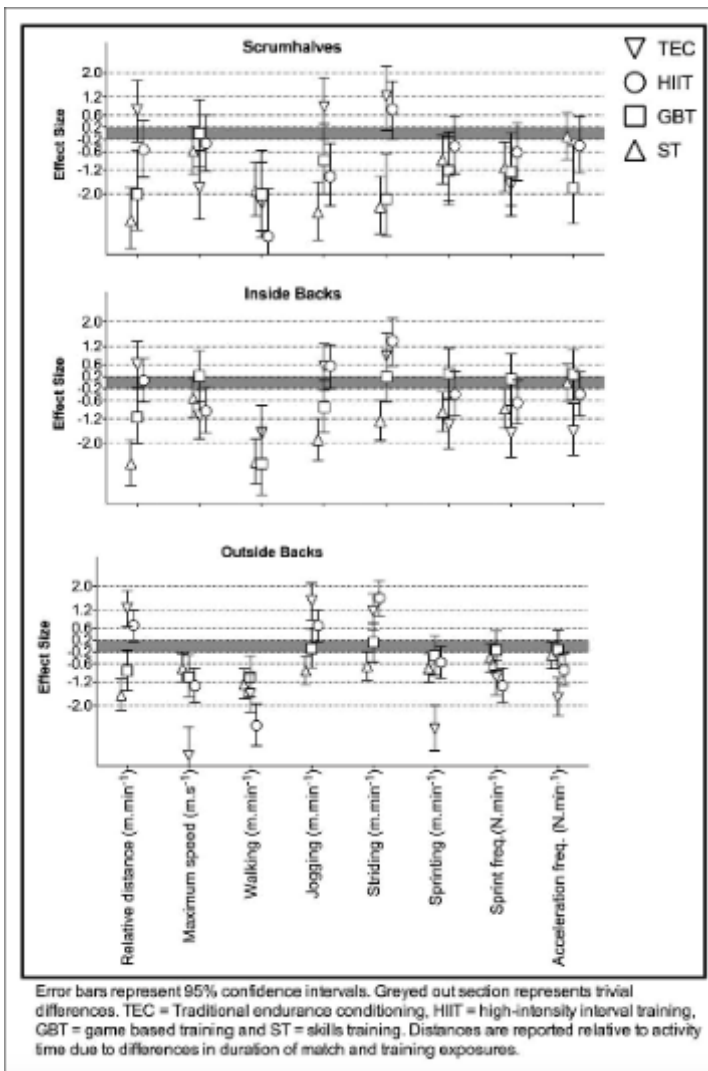
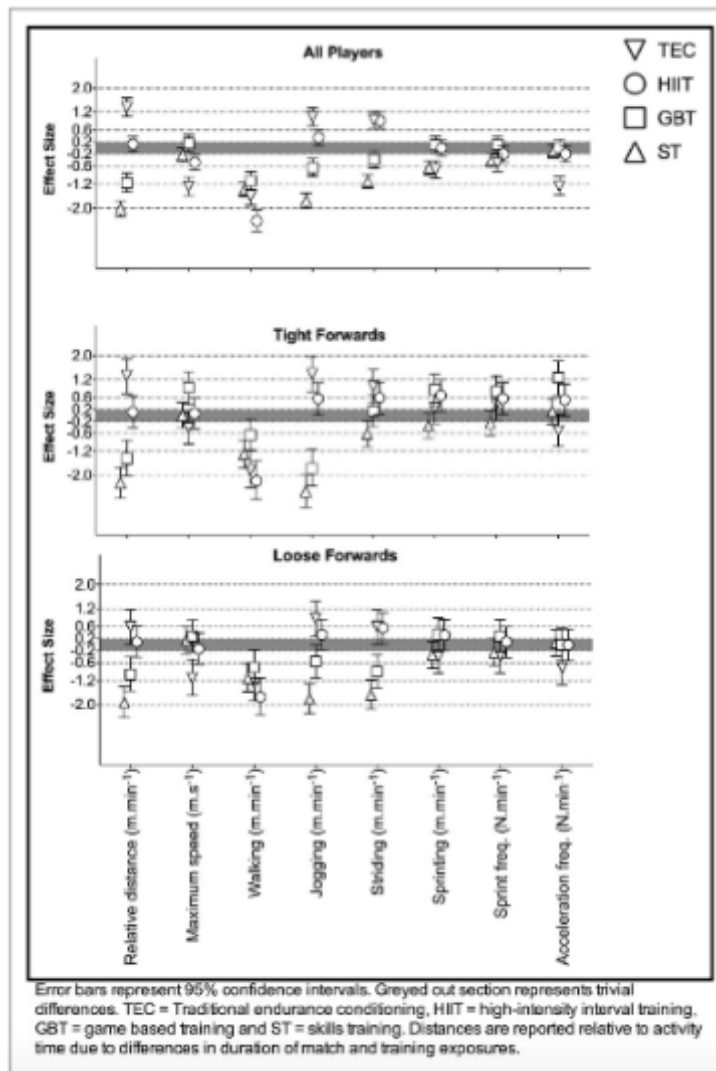
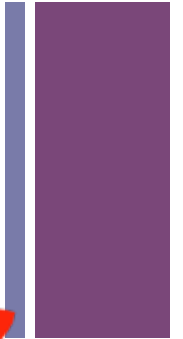


Fig. 4. Distance covered in high-intensity and low-speed zones by tight forwards, loose forwards, scrumhalves, inside backs and outside backs. (# and θ indicate significant difference from tight forwards and scrumhalves, respectively ($p < 0.05$)).

+ How is this reflected in training?



+ So how did we do?



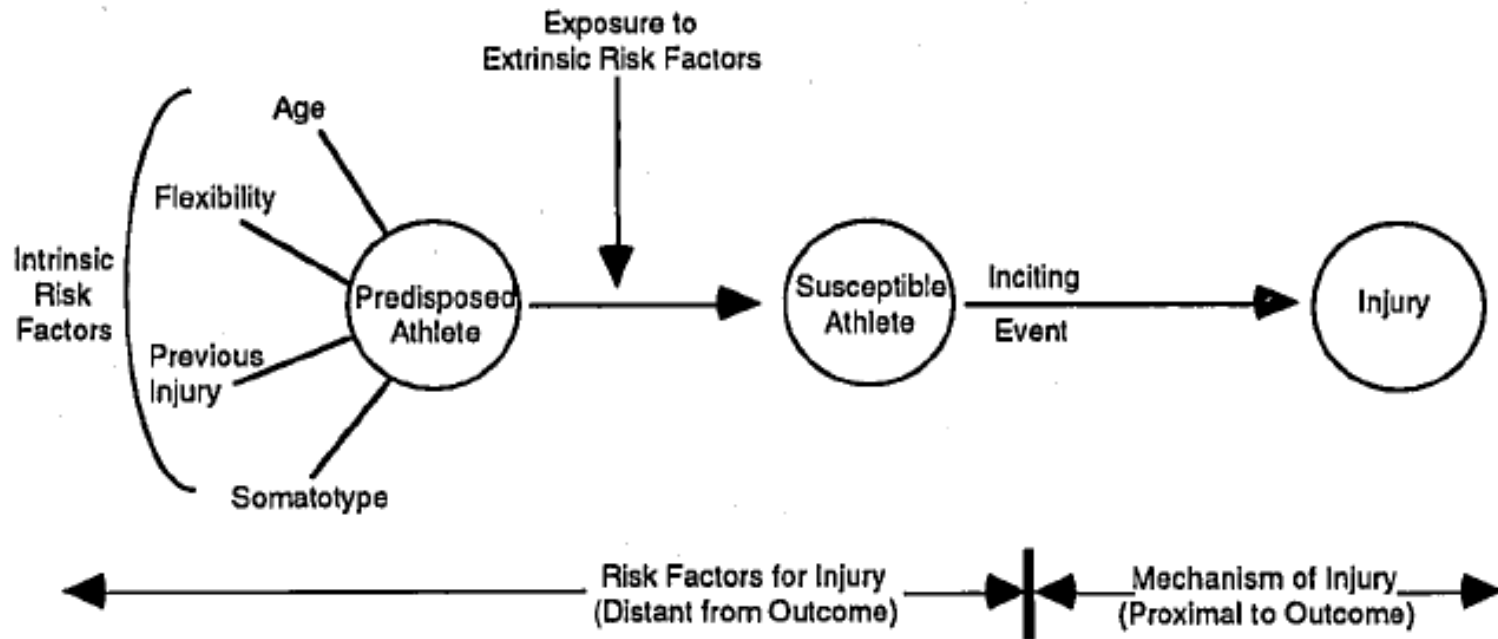
<i>Injury Burden</i>		
<i>(total days lost)</i>	3056	3647
<i>Injury circumstances</i>		
<i>(% total injury burden)</i>		
Match	52.7	72.5
Training	47.3	27.5*
<i>Injury Mechanism %</i>		
<i>(% total injury burden)</i>		
Contact	49.9	71.8
Non-Contact	50.1	28.2*

* indicates significant difference between 2012 and 2013, $p < 0.05$.



+ Injuries are complicated

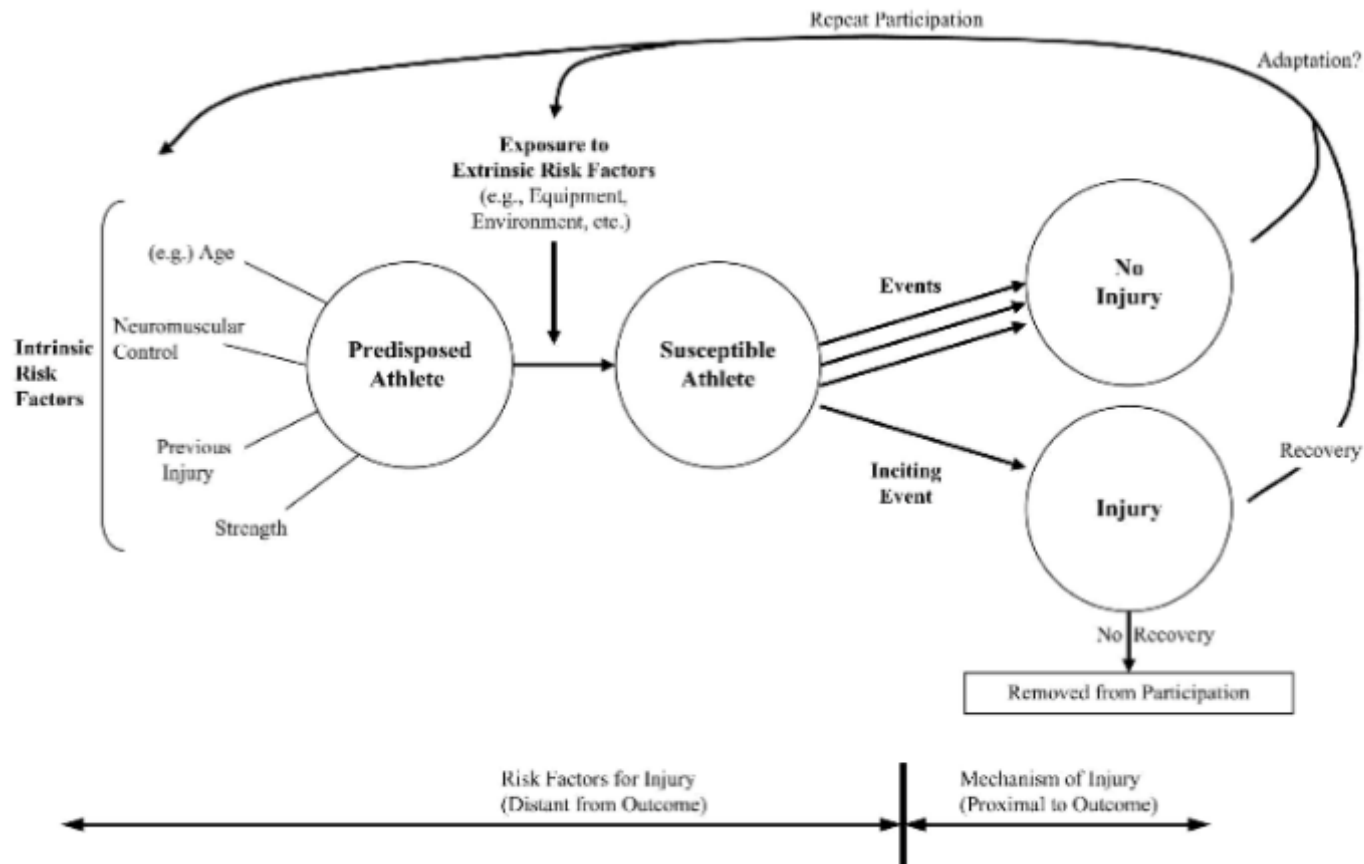
1994



Meeuwisse et. al., Clin J Sport Med, 1994

+ Injuries are complicated

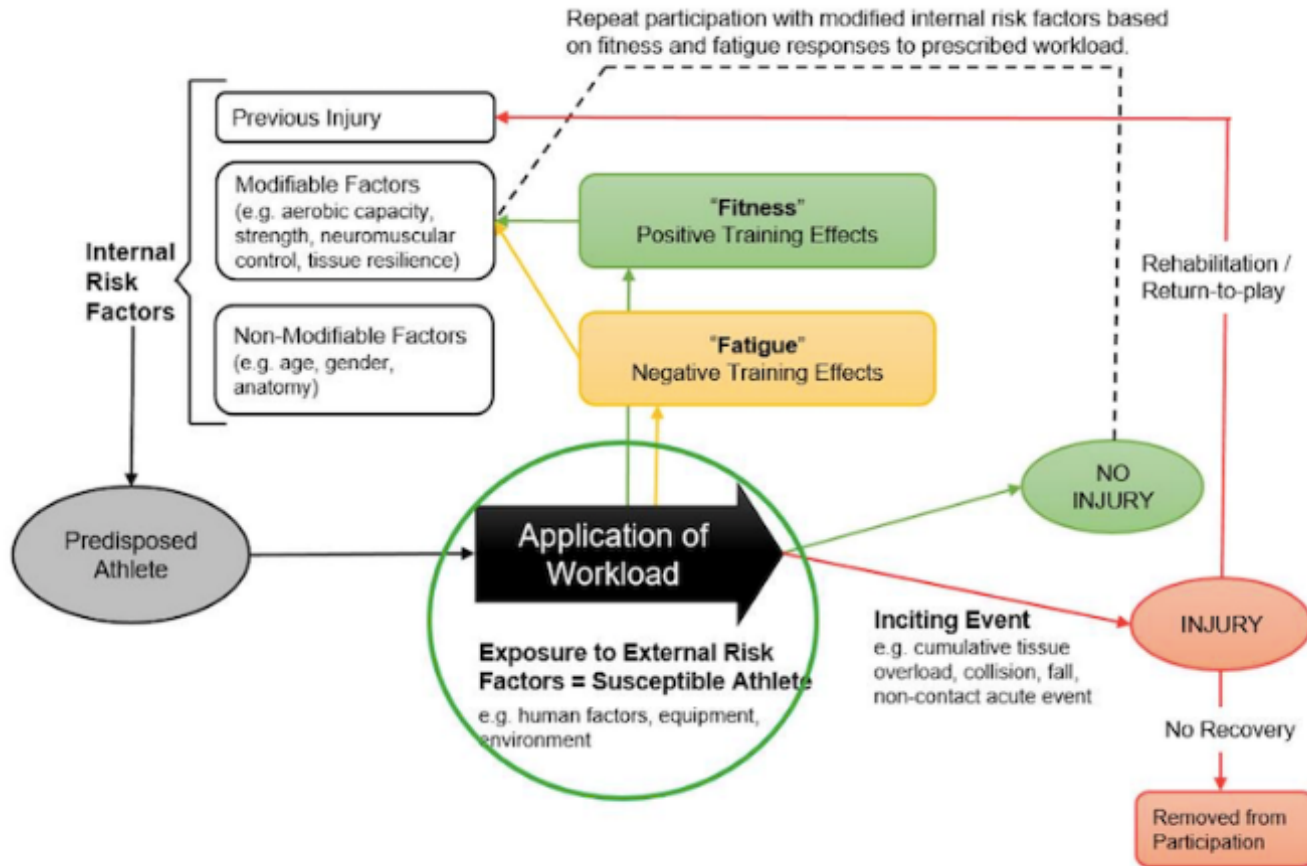
2007



Meeuwisse et. al., Clin J Sport Med, 2007

+ Injuries are complicated

2016



Windt and Gabbett, BJSM, 2016

+ Predicting injuries is near impossible

Coin toss:



50%

ECC hamstring strength in dynamometer:



56%

FMS:

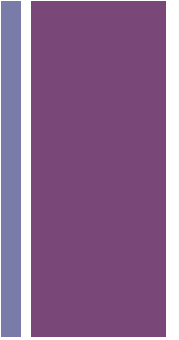


58%

Knee angle during drop jump:



60%

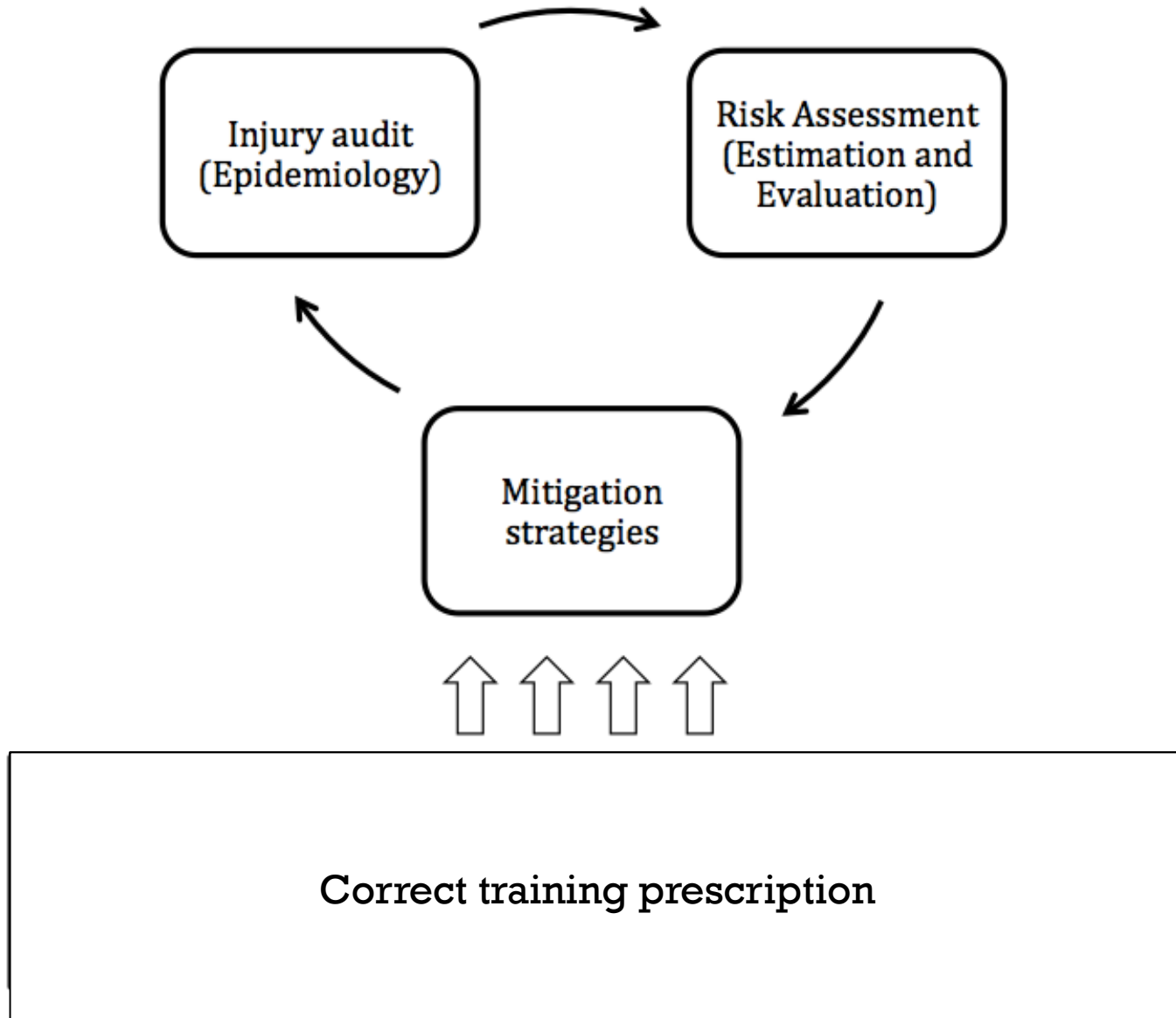
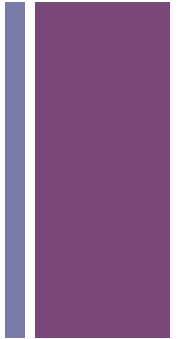


Injuries are complex and multifactorial

One intervention is unlikely to make a significant difference

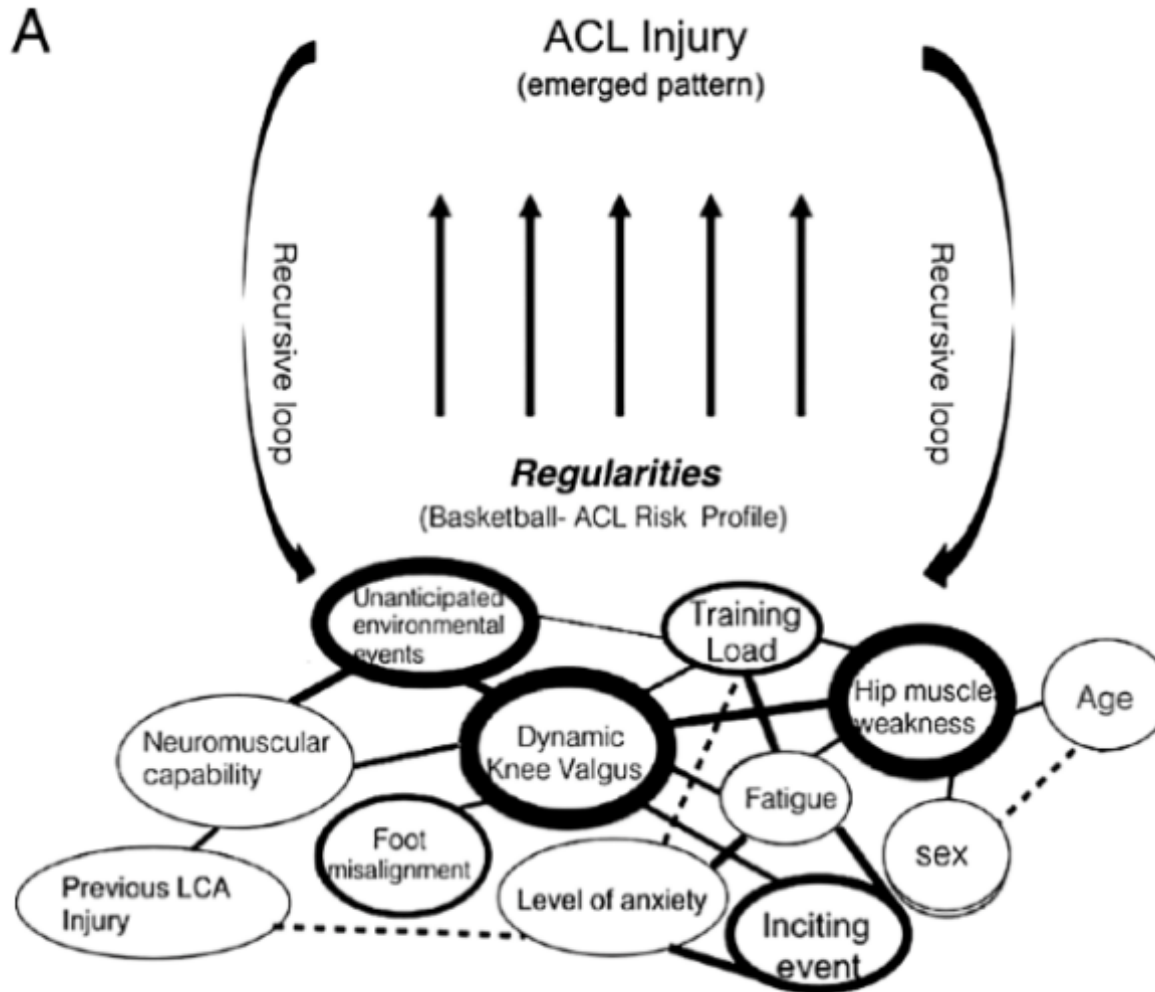
+ Use every tool in the box!!!





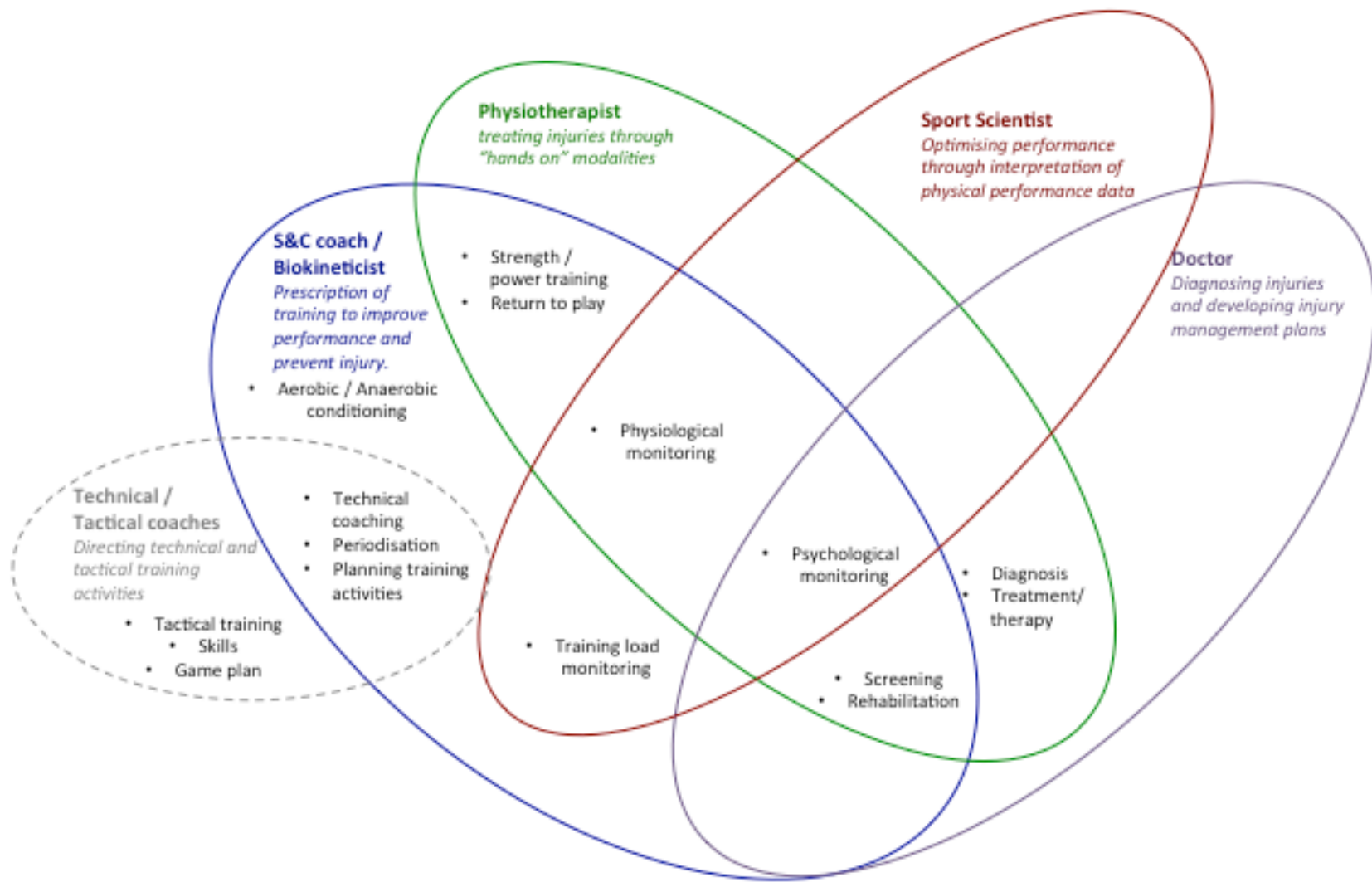


Complex systems model



Bittencourt et al., BJSM, 2016

Multi-disciplinary approach to managing team injury risk





Current research on multi-disciplinary approach



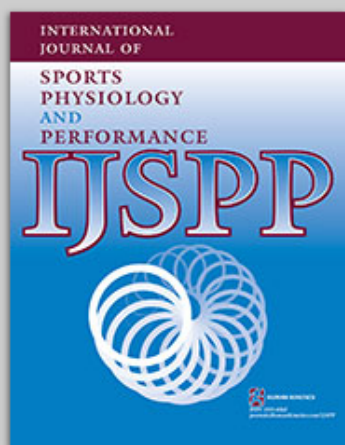
+ Current research on multi-disciplinary approach

SPORTS SCIENCE DEPARTMENT





Current research on multi-disciplinary approach

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INVITED BRIEF REVIEW

Two Training-Load Paradoxes: Can We Work Harder and Smarter, Can Physical Preparation and Medical be Team-Mates?

Authors: Tim J. Gabbett^{1*} Rod Whiteley²

AFFILIATIONS

¹Gabbett Performance Solutions, Brisbane, Australia. ²Aspetar Orthopaedic and Sports Medicine Hospital, Doha, Qatar. *Correspondence to: Dr. Rod Whiteley Aspetar Orthopaedic and Sports Medicine Hospital Doha, Qatar Email: Rodney.whiteley@aspetar.com

Volume: 0 **Issue:** 0 **Pages:** 1-16

doi: <http://dx.doi.org/10.1123/ijsp.2016-0321>

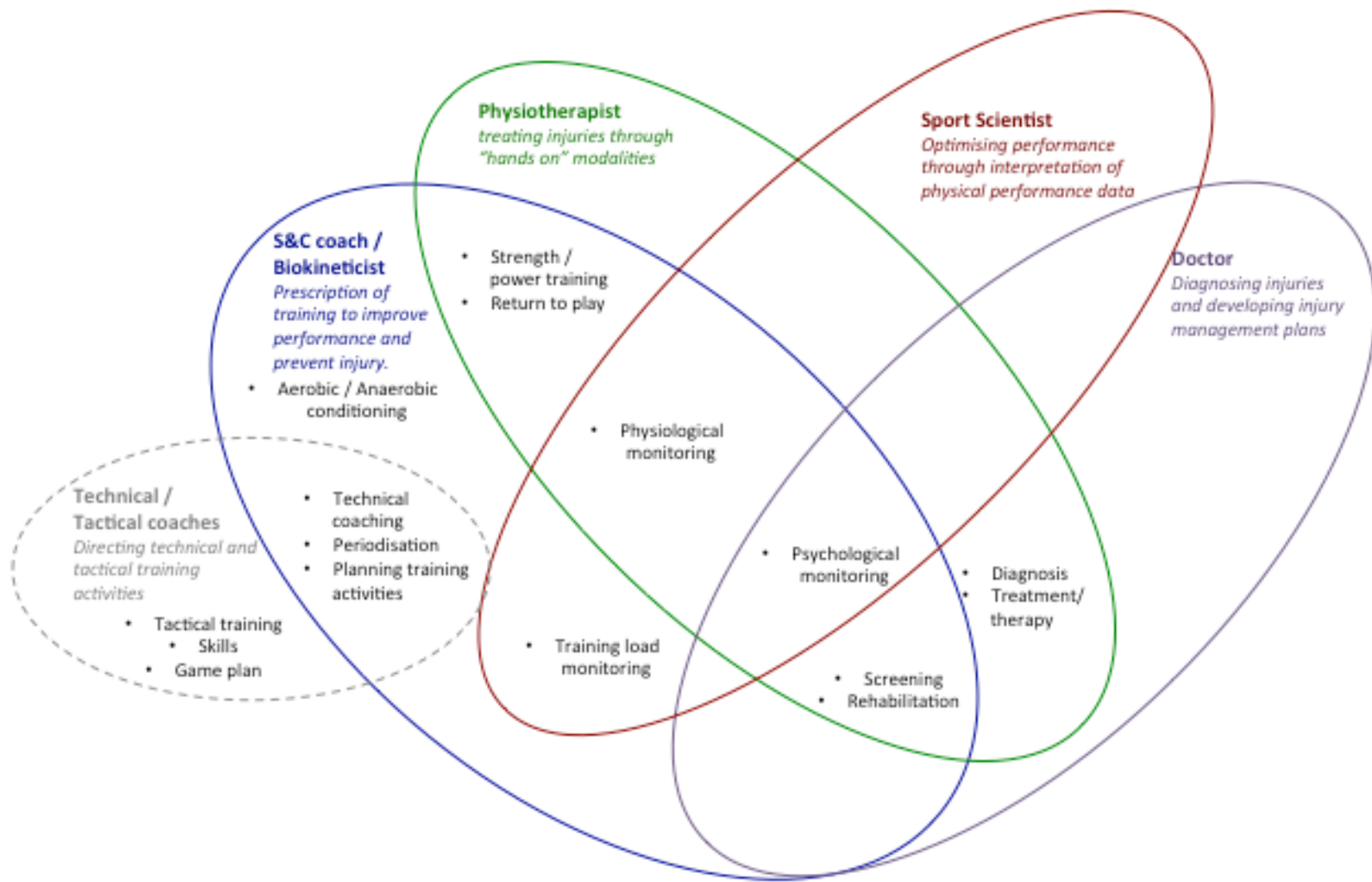
DOI: <http://dx.doi.org/10.1123/ijsp.2016-0321>

Accepted: September 19, 2016

[ABSTRACT](#)[PDF](#)

We have observed that in professional sporting organisations the staff responsible for physical preparation and medical care typically practice in relative isolation and display tension in regards their attitudes toward training load prescription (much more, and much less training respectively). Recent evidence shows that relatively high chronic training loads, when they are appropriately reached, are associated with reduced injury risk and better performance. Understanding this link between performance and training loads removes this tension, but requires a better understanding of the relationship between the acute:chronic workload ratio (ACWR), and it's association with performance and injury. However there remain many questions to be answered in the area of ACWR, and we are likely at an early stage of our understanding of these parameters and their inter-relationships. This opinion paper explores these themes and makes recommendations for improving performance through better synergies within support staff approaches. Further, aspects of the ACWR which remain to be clarified, the role of shared decision-making, risk:benefit estimation, and clearer accountability are discussed.

Multi-disciplinary approach to managing team injury risk



+ Successes - Screening

PRESEASON FUNCTIONAL MOVEMENT SCREEN COMPONENT TESTS PREDICT SEVERE CONTACT INJURIES IN PROFESSIONAL RUGBY UNION PLAYERS

**JASON C. TEE,¹ JANNIE F.G. KLINGBIEL,² ROBERT COLLINS,^{2,3} MIKE I. LAMBERT,⁴ AND
YOGA COOPPOO¹**





How does FMS predict contact injuries?

Dysfunctional movement pattern



Poor tackle technique

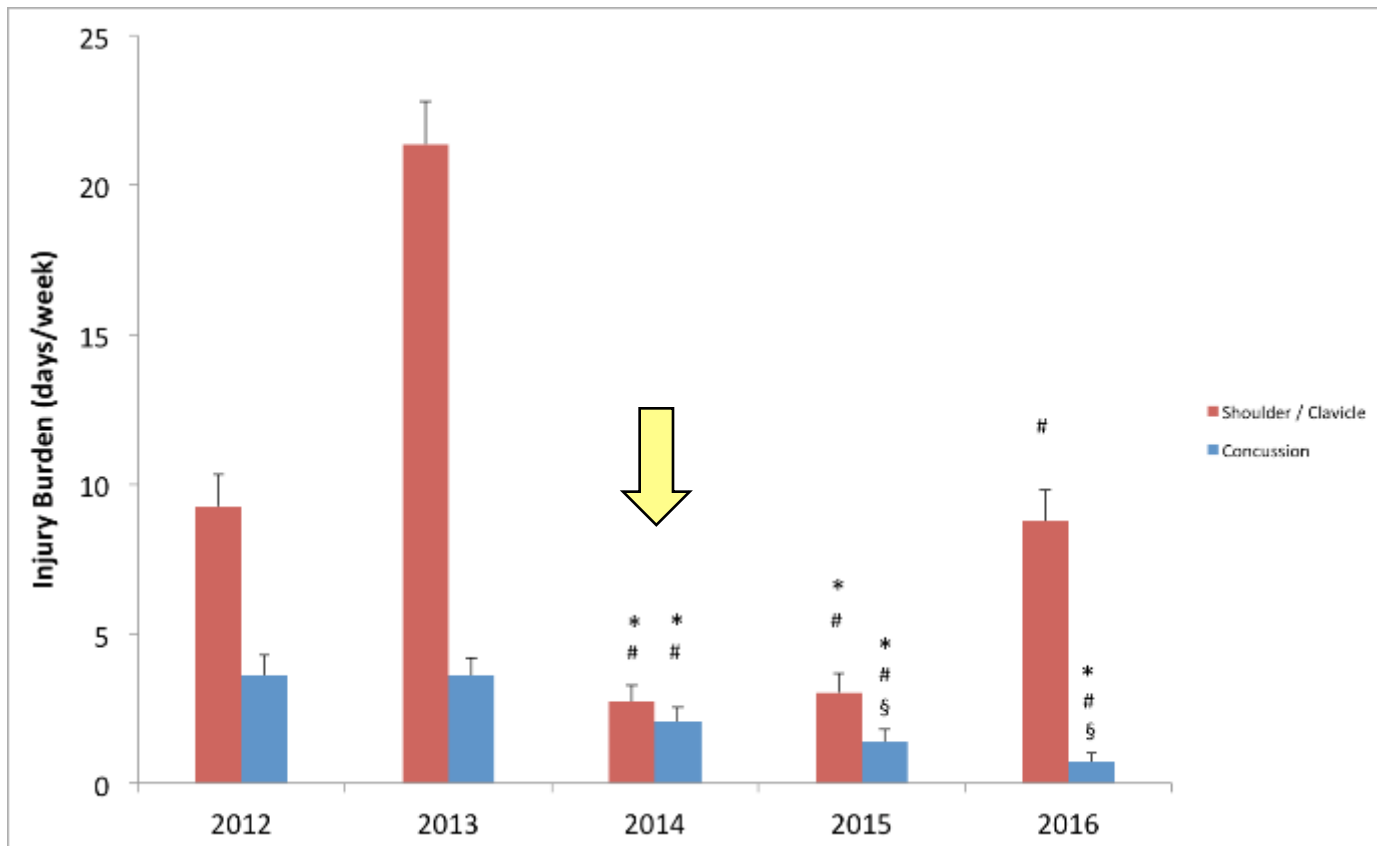




Successes – Tackle injuries

Interventions

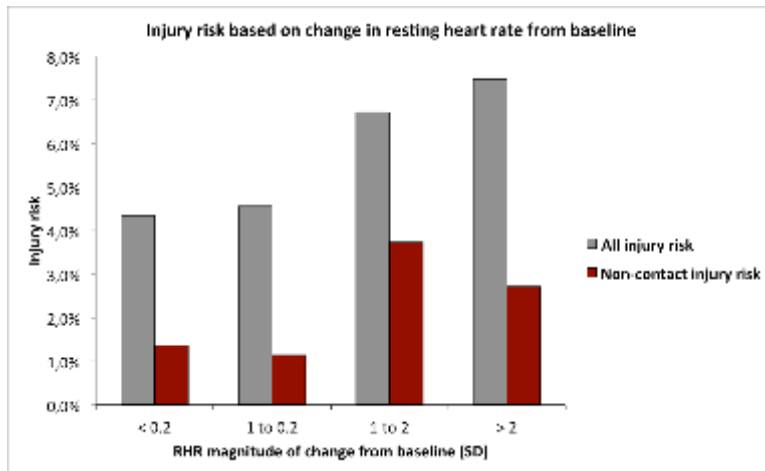
- Specific strength program
- Increased exposure to contact skills training





Successes - Monitoring

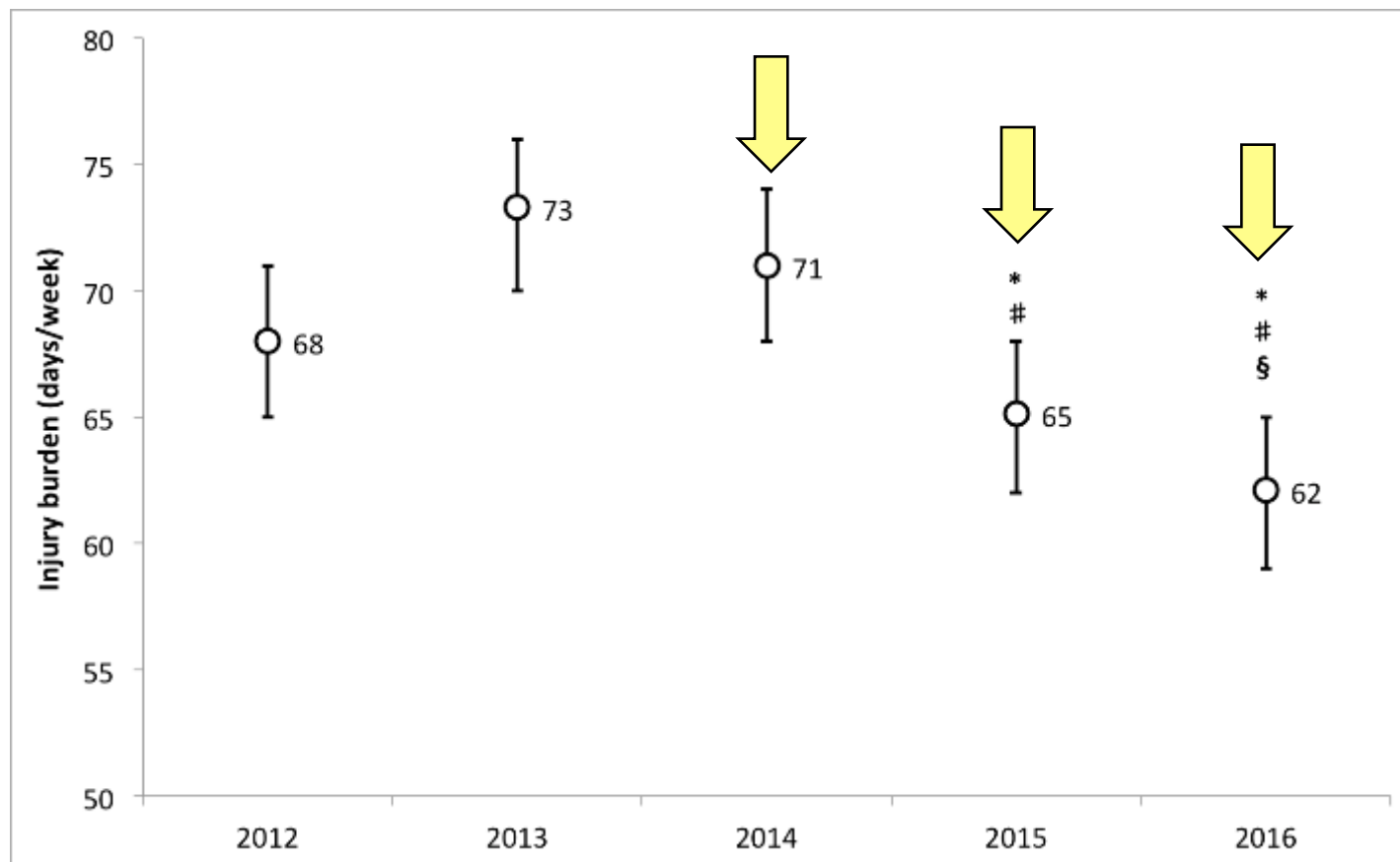
Resting heart rate



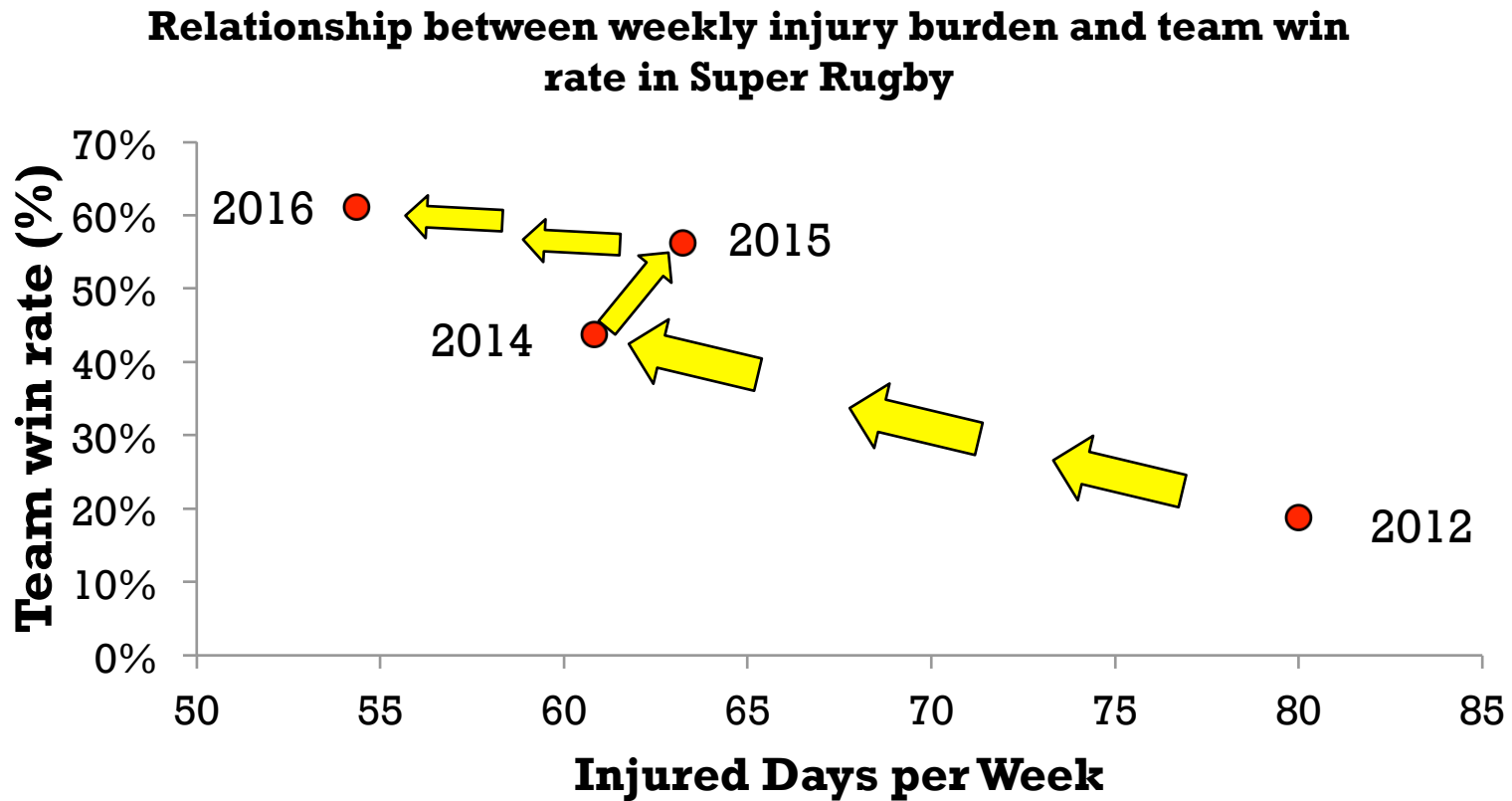
Sleep hours



+ Effectiveness of the multi-disciplinary approach



+ Effect on performance



+ Single team injury research

PERFORMANCE and ETHICAL MOTIVATIONS

Focused on CONTEXTUAL problems and solutions

Provides information to INFORM large scale
epidemiological studies

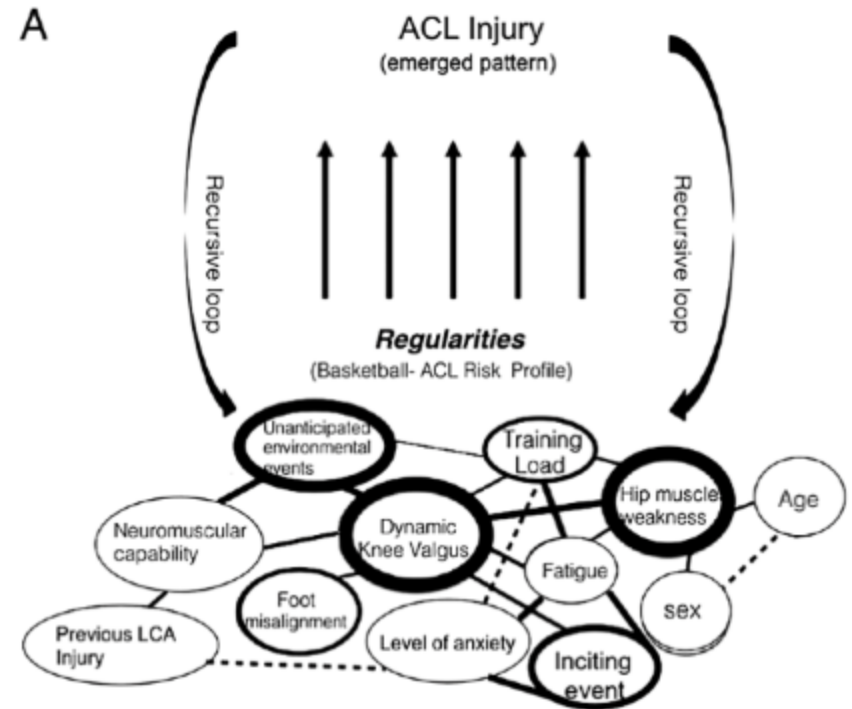


Single team injury research

Every team represents a
unique & individual
COMPLEX system

Applied injury research
requires an understanding of
how multiple risk factors
interact in an emergent
pattern

Multi-disciplinary teams are
best equipped to affect
complex systems





Thank you for your attention!!!



Are there any
questions?