Sport Science and S&C Practices at the Western Bulldogs: a 2015 – 2017 Overview

PRESENTER	Sam Robertson
EVENT	SPRINZ Strength & Conditioning Conference
LOCATION & DATE	Auckland, 17th November, 2017

Robertson_SJ

sam.robertson@westernbulldogs.com.au

Overview

01 Western Bulldogs - VU Background

02 Our Research and Innovation philosophy

03 Doom and gloom…

04 Example applications

VICTORIA UNIVERSITY
MELBOURNE AUSTRALIA

WESTERN BULLDOGS
SINCE 1883

1 Independent review in 2012

2 x co-appointed staff and 2 x PhD 2

3 Sport Science formed part of HP

Increased breadth and depth 4

Research & Innovation

- Head of Research & Innovation
  - Sport Scientist
    - List Management / Recruiting
      - PhD
      - PhD
      - Cadet
      - Cadet
      - Cadet
      - Cadet
      - Cadet
      - Cadet
    - Physical Preparation
      - PhD
      - PhD
      - Honours
      - Honours
      - Cadet
      - Cadet
    - Medical
      - PhD
      - Honours
    - Coaching/PA
      - PhD
      - PhD
      - PhD
      - Honours
      - Cadet
      - Cadet

1 Independent review in 2012

2 x co-appointed staff and 2 x PhD 2

3 Sport Science formed part of HP

Increased breadth and depth 4

5 Innovation emphasis

LIVE & FREE
TOYOTA HILUX
UNBREAKABLE
4TH
00:03
SYDNEY SWANS 67
WESTERN BULLDOGS 88

THE AUSTRALIAN

SILICON VALLEY IN SYDNEY FEB 2018 — SingularityU Australia Summit

THE WEEKEND AUSTRALIAN

NEWS OPINION BUSINESS REVIEW NATIONAL AFFAIRS SPORT LIFE TECH ARTS TRAVEL HIGHER ED MEDIA PROPERTY

TECHNOLOGY

Western Bulldogs plan hackathon using team tracking data

SILICON VALLEY IN SYDNEY FEB 2018 SingularityU Australia Summit

Opinion

Peter Judd: Robots in the coaches box as AFL clubs adopt machine intelligence

Peter Judd, Geelong Advertiser
October 31, 2016 2:17pm

THERE'S a robot in the Western Bulldogs coaches box.

Not so much a Transformer, more a faceless machine intelligence that sucks in data and spits out insights only a PhD student could love.

This robot, let's call it Ruff, helped the Western Bulldogs win the AFL premiership.

ANTICIPATE and recommend the next best move, always playing the percentages, like Brad Pitt in Moneyball.

MEMBER Q&A: WHAT NOW FOR ASIA? > THE AUSTRALIAN FOR THE INFORMED AUSTRALIAN DISCUSS NORTH KOREA, CHINA AND MORE >

NEWS OPINION BUSINESS REVIEW NATIONAL AFFAIRS SPORT LIFE TECH ARTS TRAVEL HIGHER ED MEDIA PROPERTY

PERSONAL TECHNOLOGY

Western Bulldogs gain from artificial intelligence

The Australian 12:00AM October 6, 2016

CHRIS GRIFFITH
Technology reporter Sydney @chris_griffith

Winning Campaign

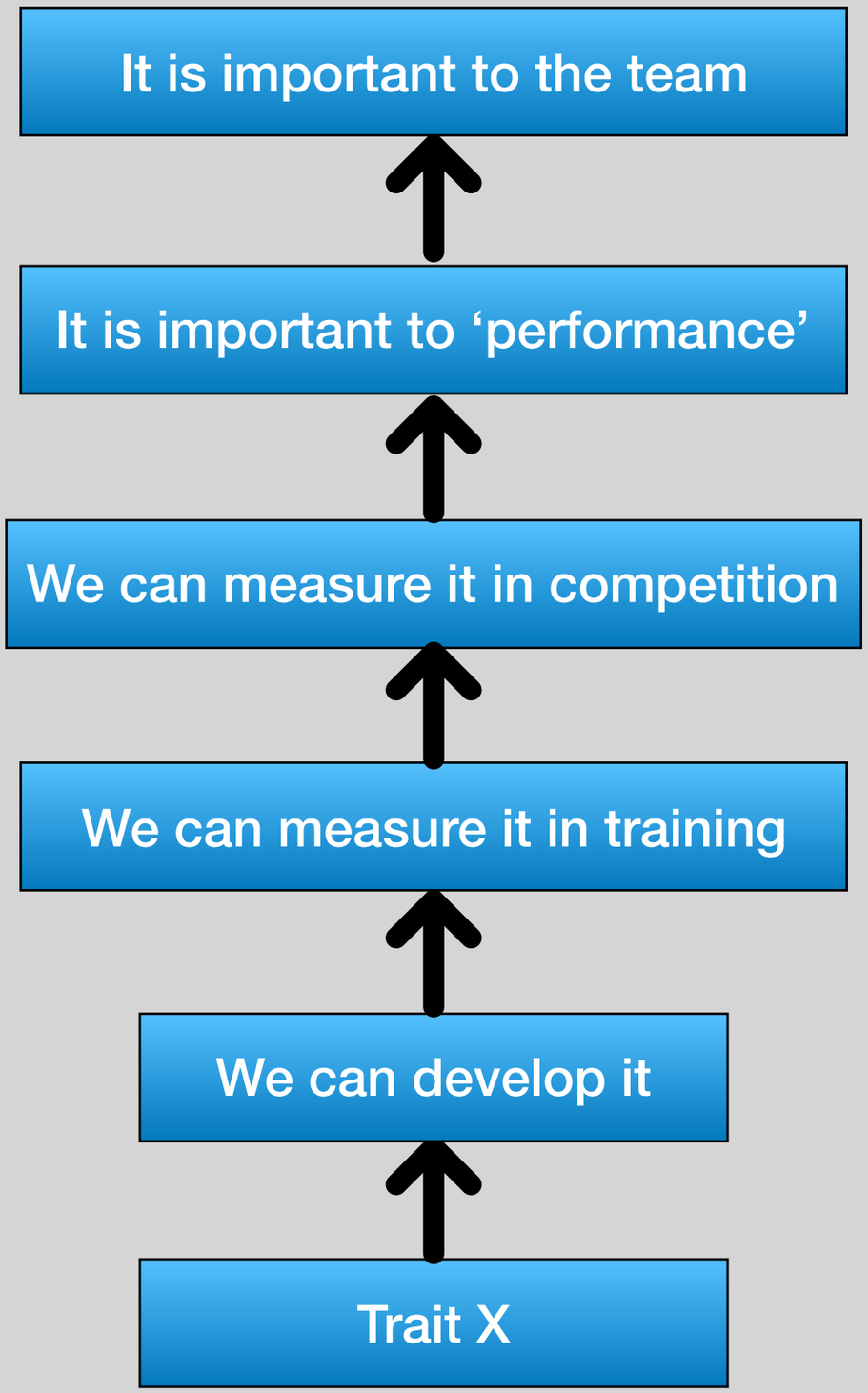
Our philosophy

SKEPTICISM

- Justification for approach
- Innovation is easy

Skepticism is not the same as negativity

Why skepticism?



Measurement error

‘I am improving Trait X in the athlete…

…therefore I am doing my job well’

‘The athlete is not improving their speed…

…what have I missed?’

Our philosophy

SKEPTICISM

- Base position
- Does not equate to negativity

QUALITY

- Connect to performance
- Layers of measurement

What can be asserted without evidence can also be dismissed without evidence…

What should we be skeptical of?

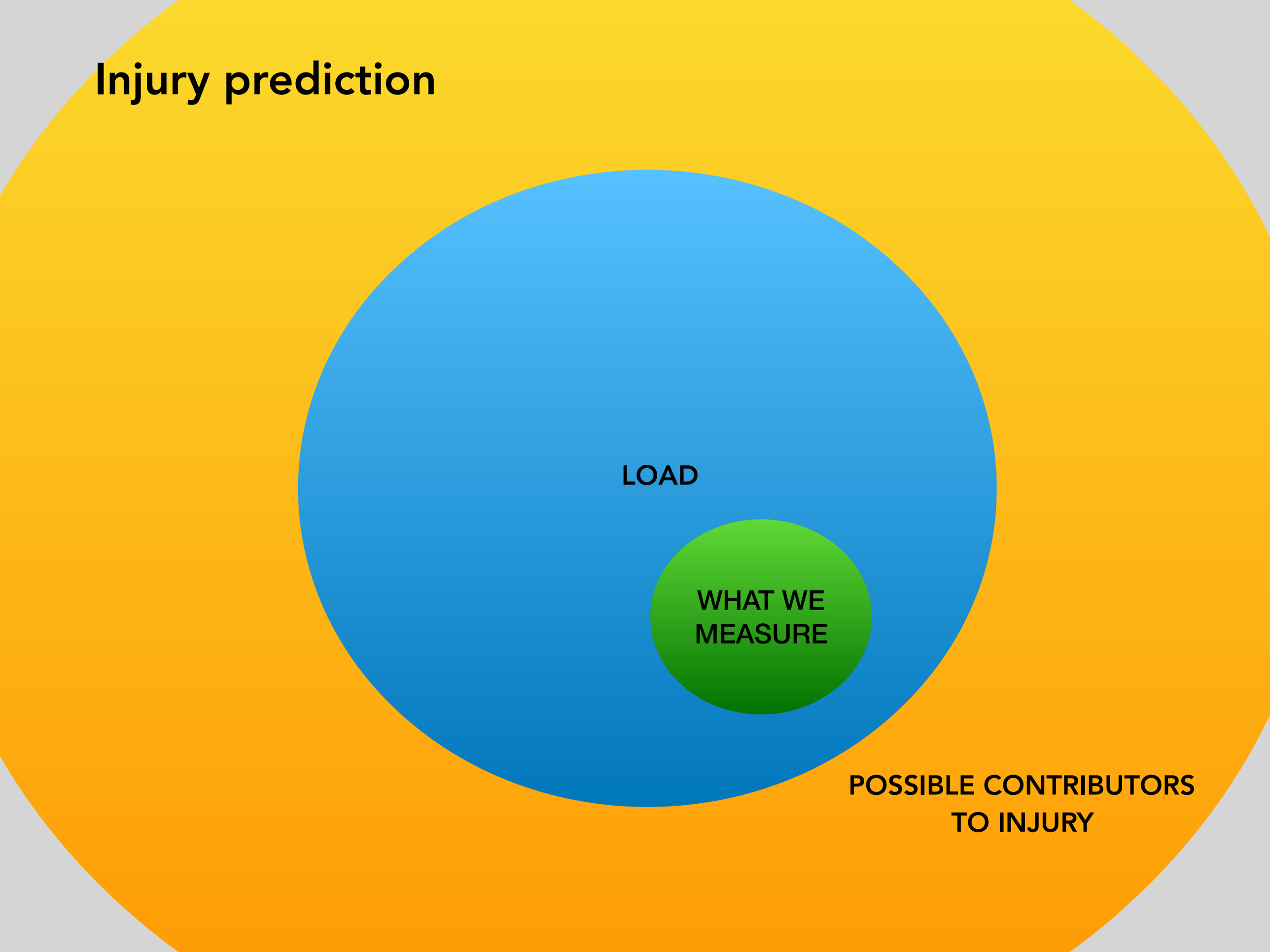
Injury prediction

Injury prediction

01 Data inputs of insufficient quality

02 Data inputs of insufficient quantity

Injury prediction



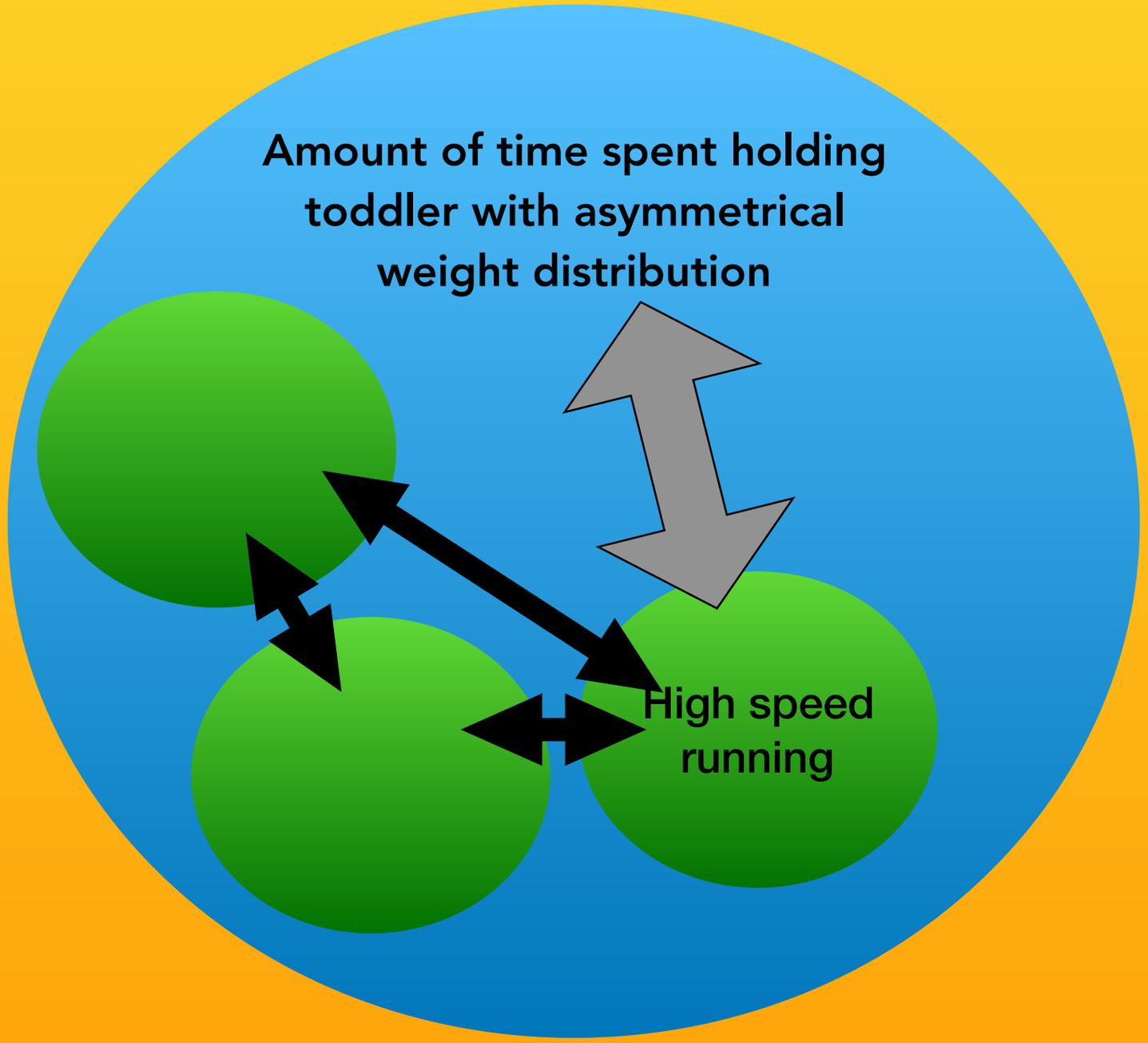
Injury prediction

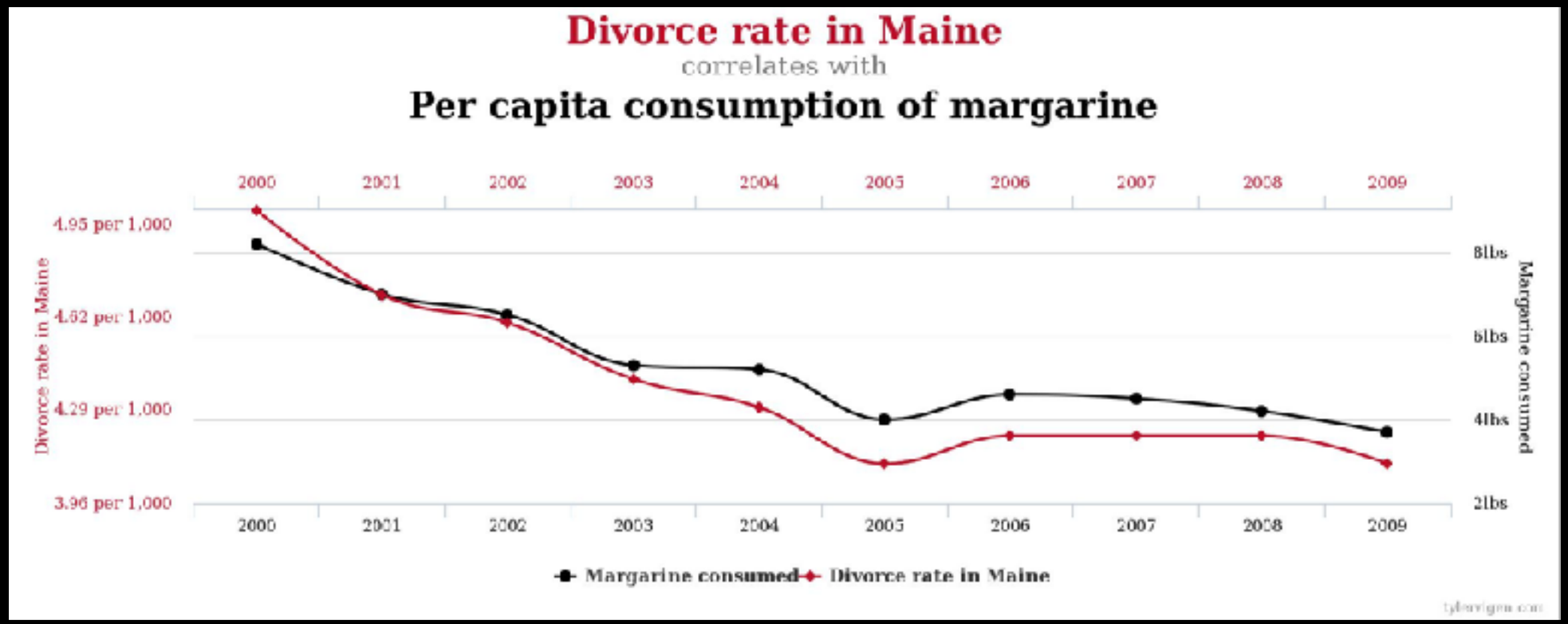
01 Data inputs of insufficient quality

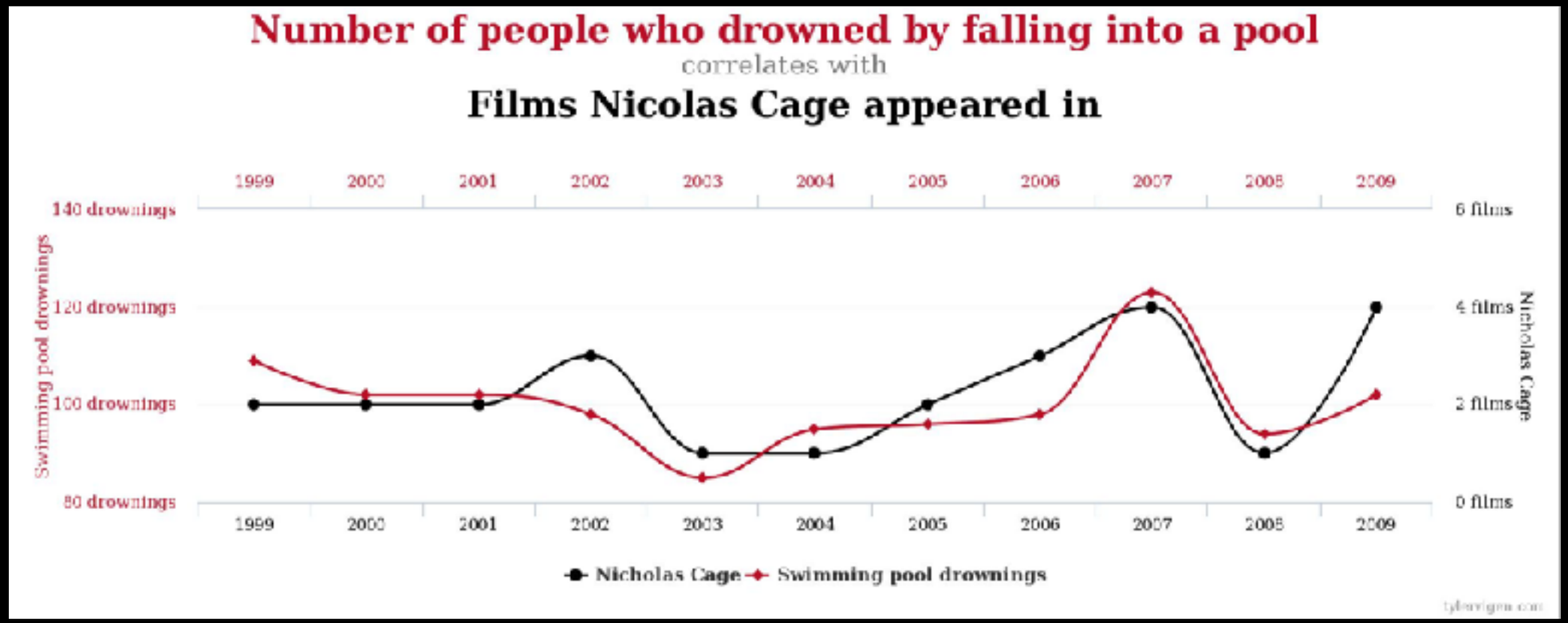
02 Data inputs of insufficient quantity

03 Linear analysis cannot provide insight to non-linear phenomena

Non-linearity




Divorce rate in Maine
correlates with
Per capita consumption of margarine
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
4.95 per 1,000
4.62 per 1,000
4.29 per 1,000
3.96 per 1,000
Divorce rate in Maine
8lbs
6lbs
4lbs
2lbs
Margarine consumed
Margarine consumed
Divorce rate in Maine


Number of people who drowned by falling into a pool
correlates with
Films Nicolas Cage appeared in
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
140 drownings
120 drownings
100 drownings
80 drownings
Swimming pool drownings
6 films
4 films
2 films
0 films
Nicholas Cage
Nicholas Cage
Swimming pool drownings

Injury prediction

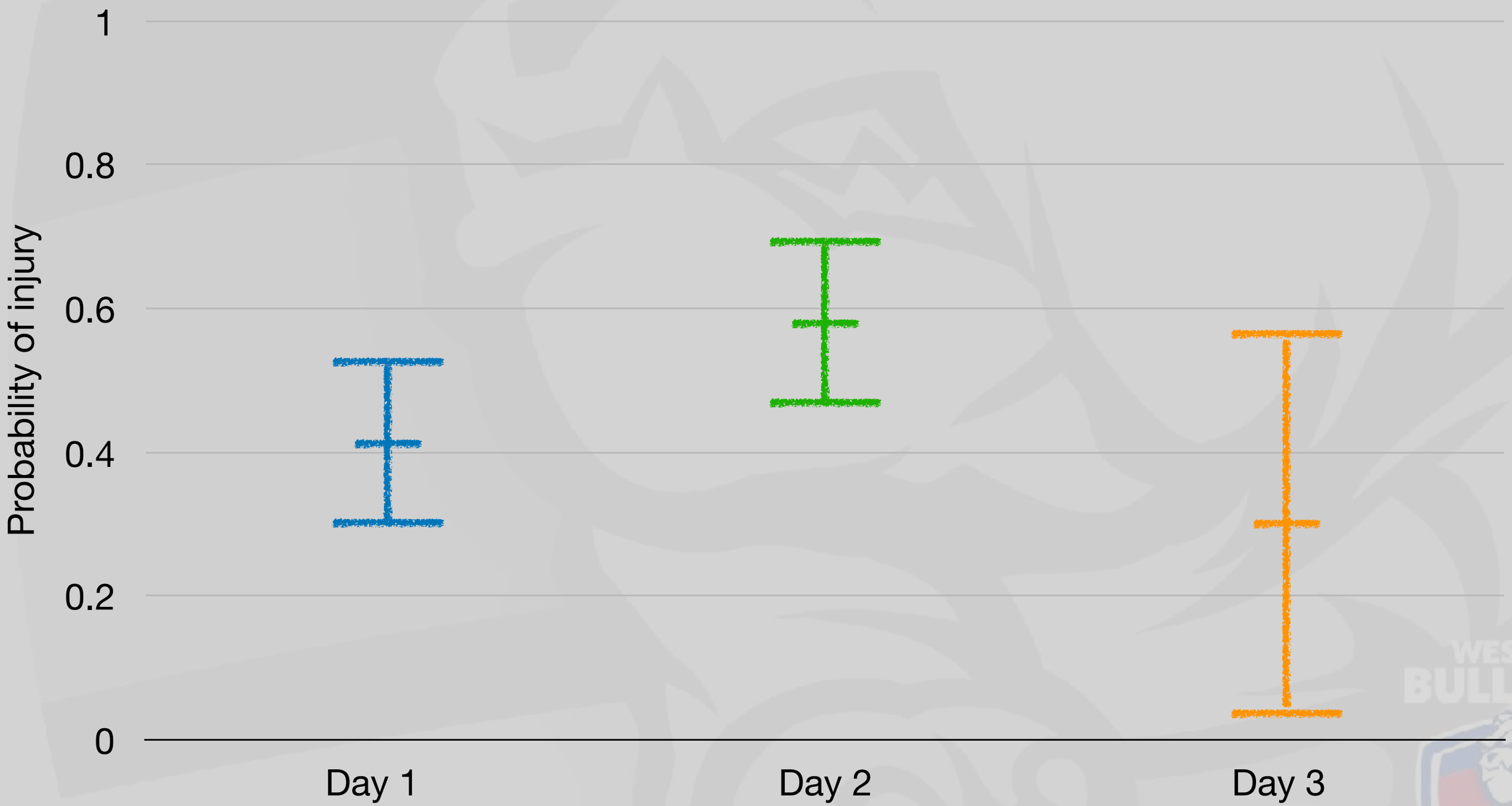
01 Data inputs of insufficient quality

02 Data inputs of insufficient quantity

03 Linear analysis cannot provide insight to non-linear phenomena

04 How is the output operationalised?

Injury prediction



Injury prediction

1	2	3	4	5	6	7	8	9	10
11	12	13	14	[illegible]	16	17	[illegible]	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	[illegible]
41	42	[illegible]	44	45	46	47	48	49	50
51	52	53	54	[illegible]	56	[illegible]	58	59	[illegible]
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	[illegible]	84	85	86	87	88	89	90
91	92	93	94	95	96	[illegible]	98	99	100

Injury prediction

01 Data inputs of insufficient quality

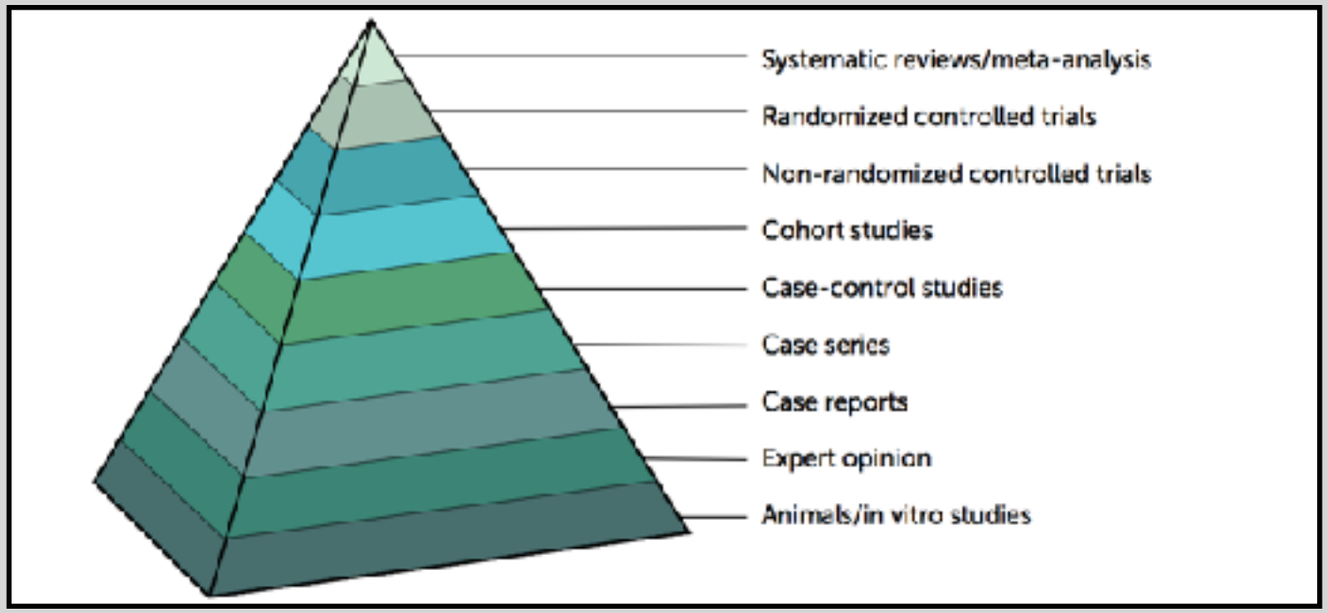
02 Data inputs of insufficient quantity

03 Linear analysis cannot provide insight to non-linear phenomena

04 How is the output operationalised?

05 No ability to generate predictions in real-time

What to prioritise?



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Journal of Clinical Epidemiology

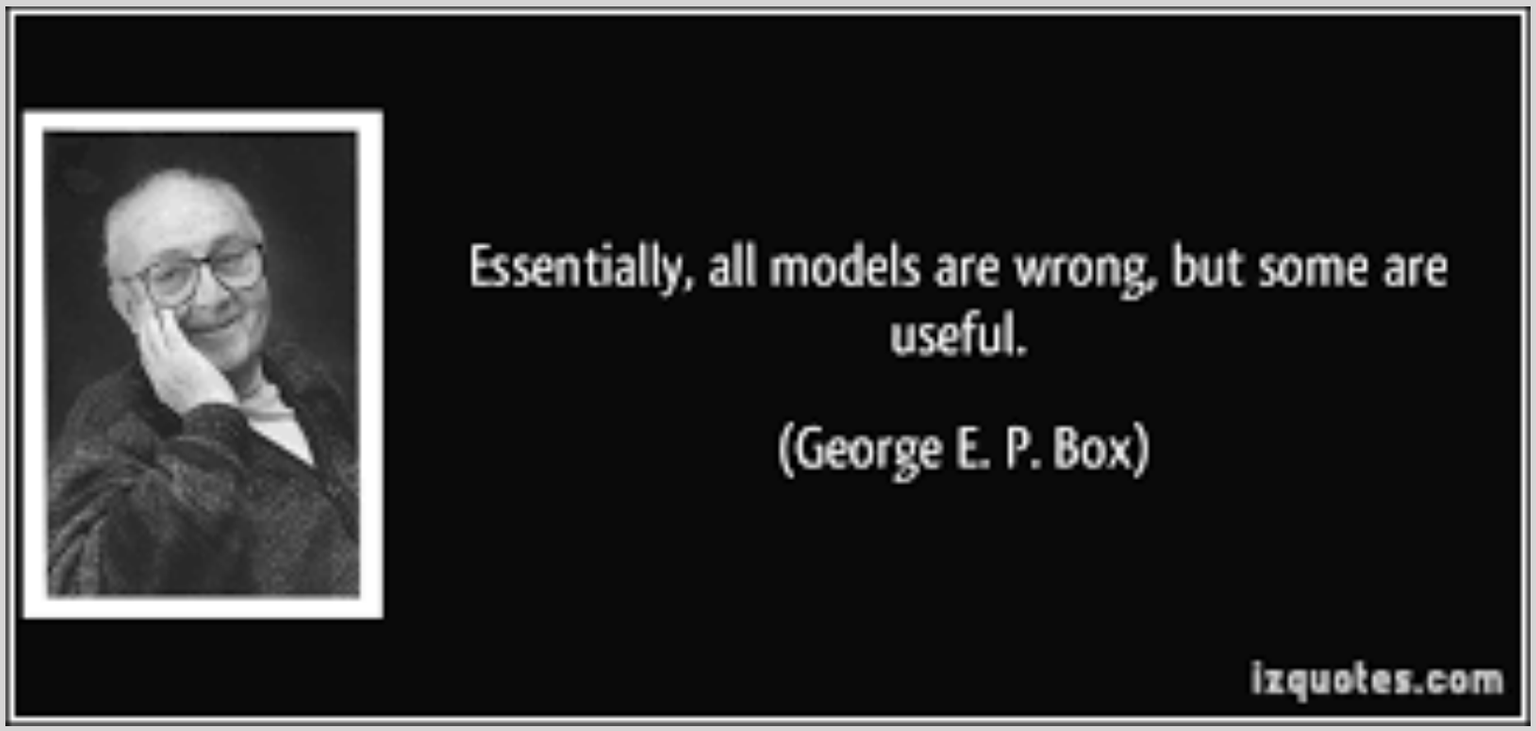
ELSEVIER
FREE Full-Text Article

J Clin Epidemiol. 2016 Jan; 69: 225–234.
doi: 10.1016/j.jclinepi.2015.06.005

ROBIS: A new tool to assess risk of bias in systematic reviews was developed

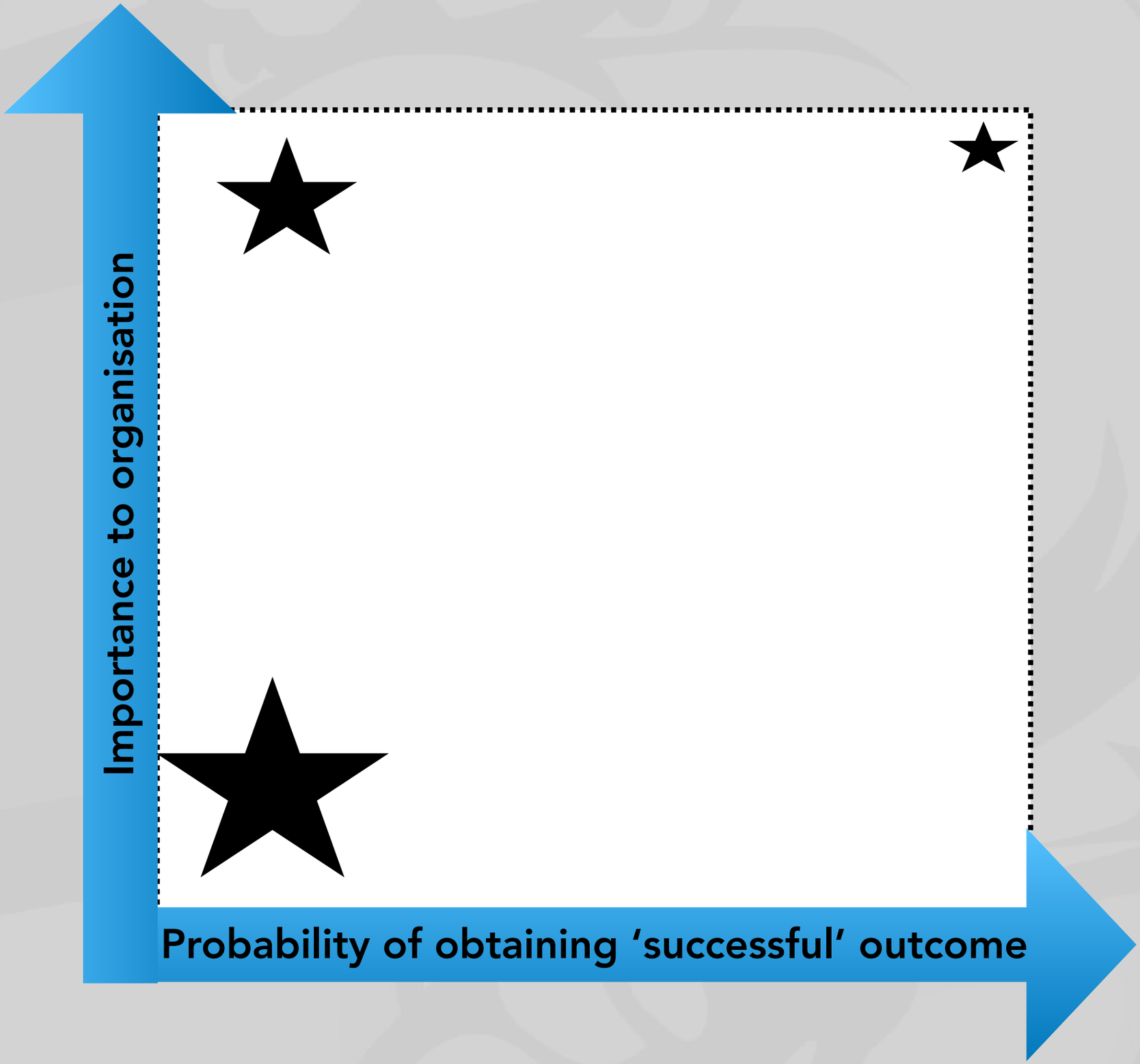
Penny Whiting,[a,b,*] Jelena Savović,[a,b] Julian P.T. Higgins,[c,d] Deborah M. Caldwell,[a] Ramsay C. Reeves,[a] Beverley Shea,[f] Philippa Davies,[a,b] Jos Kleijnen,[a,g] Rachel Churchill,[a] and ROBIS group

Author information ▶ Article notes ▶ Copyright and License information ▶



Now for some good news...

What to prioritise?



Providing the evidence

Robertson *et al. Sports Medicine - Open* (2017) 3:2
DOI 10.1186/s40798-016-0071-y

Sports Medicine - Open

ORIGINAL RESEARCH ARTICLE Open Access

Consensus on measurement properties and feasibility of performance tests for the exercise and sport sciences: a Delphi study

Sam Robertson[1,2*], Peter Kremer[1], Brad Aisbett[3], Jacqueline Tran[1] and Ester Cerin[3,4]

What is measurement quality?

RELIABILITY	VALIDITY
Stability	Content
Re-test reliability	Discriminant
Intra-rater reliability	Convergent
Inter-rater reliability	Concurrent
Internal consistency	Predictive

RESPONSIVENESS	FEASIBILITY
Responsiveness / sensitivity	Interpretability
Minimum important difference / smallest worthwhile change	Familiarity required
Floor & ceiling effects	Scoring complexity
	Completion complexity
	Cost
	Duration

A hypothetical…

'Trait X'

1	Content	• Are we capturing everything we need to? • Inductive approach
2	Construct	• How well does this metric relate to competition outcome? • Does it differentiate better athletes?
3	Concurrent	• Can we reduce data collection burden? • Remove redundancies

Concurrent validity

	Total HIR	Distance	sRPE Load	Metres/Min	Duration	25 Kph +	%HIR/TD
Total HIR		0.95	0.82	0.74	0.68	0.53	0.93
Distance	0.95		0.90	0.73	0.78	0.59	0.88
sRPE Load	0.82	0.90		0.48	0.93	0.59	0.70
Metres/Min	0.74	0.73	0.48		0.30	0.25	0.78
Duration	0.68	0.78	0.93	0.48		0.56	0.58
25 Kph +	0.53	0.59	0.59	0.25	0.56		0.35
%HIR/TD	0.93	0.88	0.70	0.78	0.58	0.35	

A hypothetical…

'Trait X'

1	Content	• Are we capturing everything we need to? • Inductive approach	✓
2	Construct	• How well does this metric relate to competition outcome? • Does it differentiate better athletes?	✓
3	Concurrent	• Can we reduce data collection burden? • Remove redundancies	✗
4	Predictive	• Diagnostic • Performance	?
5	Responsiveness	• How changeable is the metric? • Can we detect 'meaningful' variations and trends?	✗

Measurement quality?

Our philosophy

SKEPTICISM

- Base position
- Does not equate to negativity

QUALITY

- Connect to performance
- Layers of measurement

DYNAMICITY

- Understand and expect non-linearity
- Embrace fuzziness

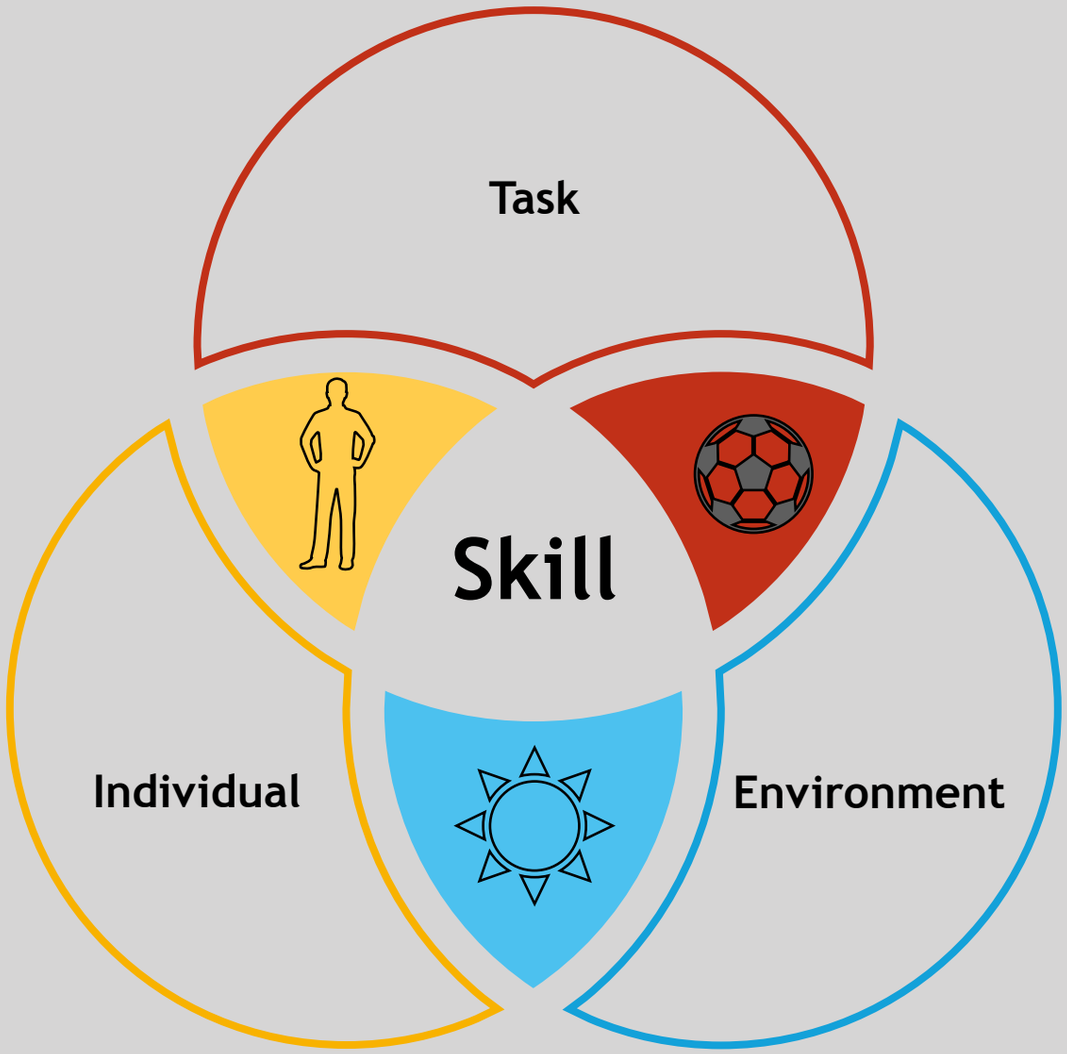
Interaction of contextual variables

Individual

- Skill level
- Physiology
- Current fatigue levels

Task

- Time prior to execution
- Pressure
- Target density



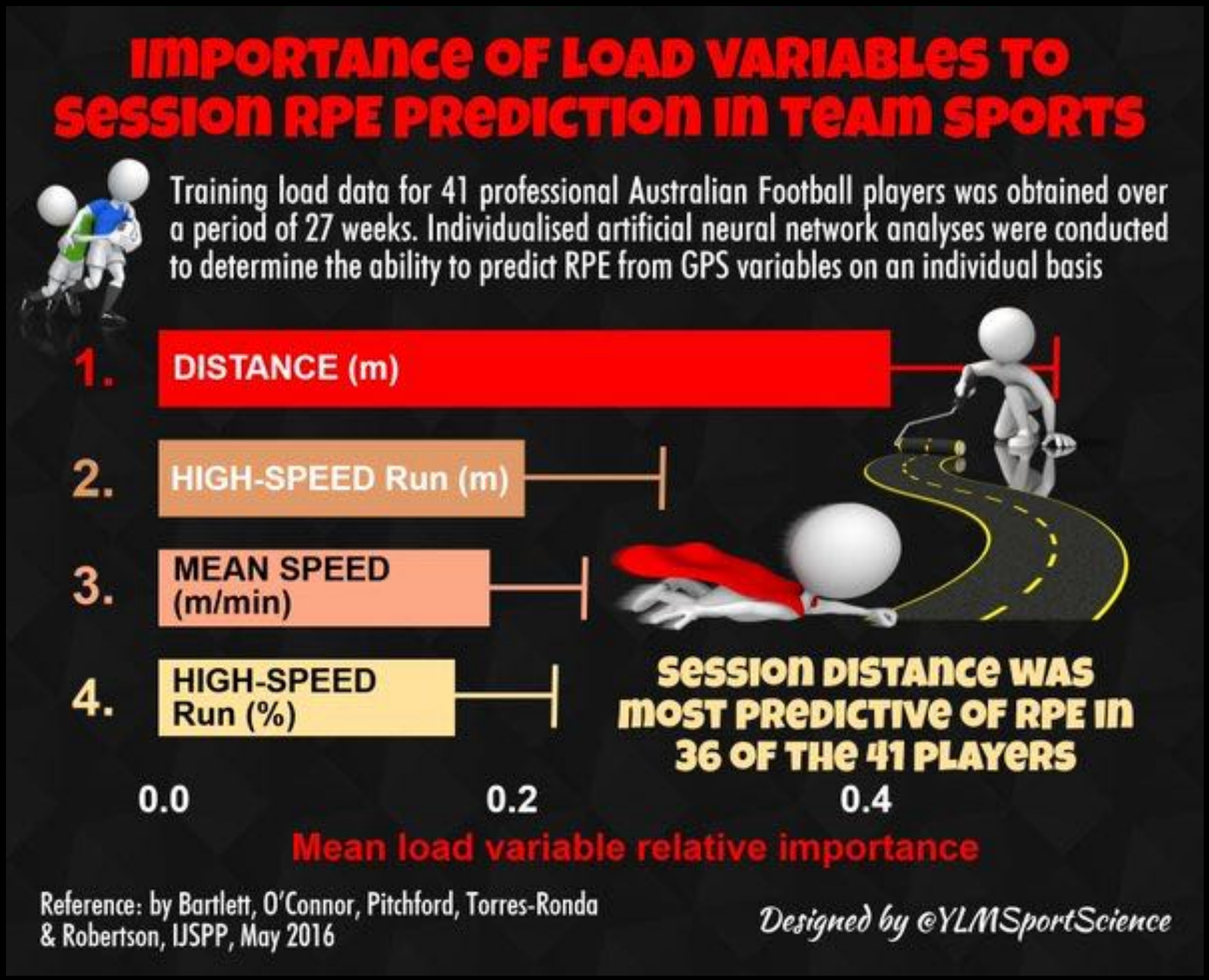
Skill

- Skilled behaviour (event)
- Coaching instruction
- Game plan

Environment

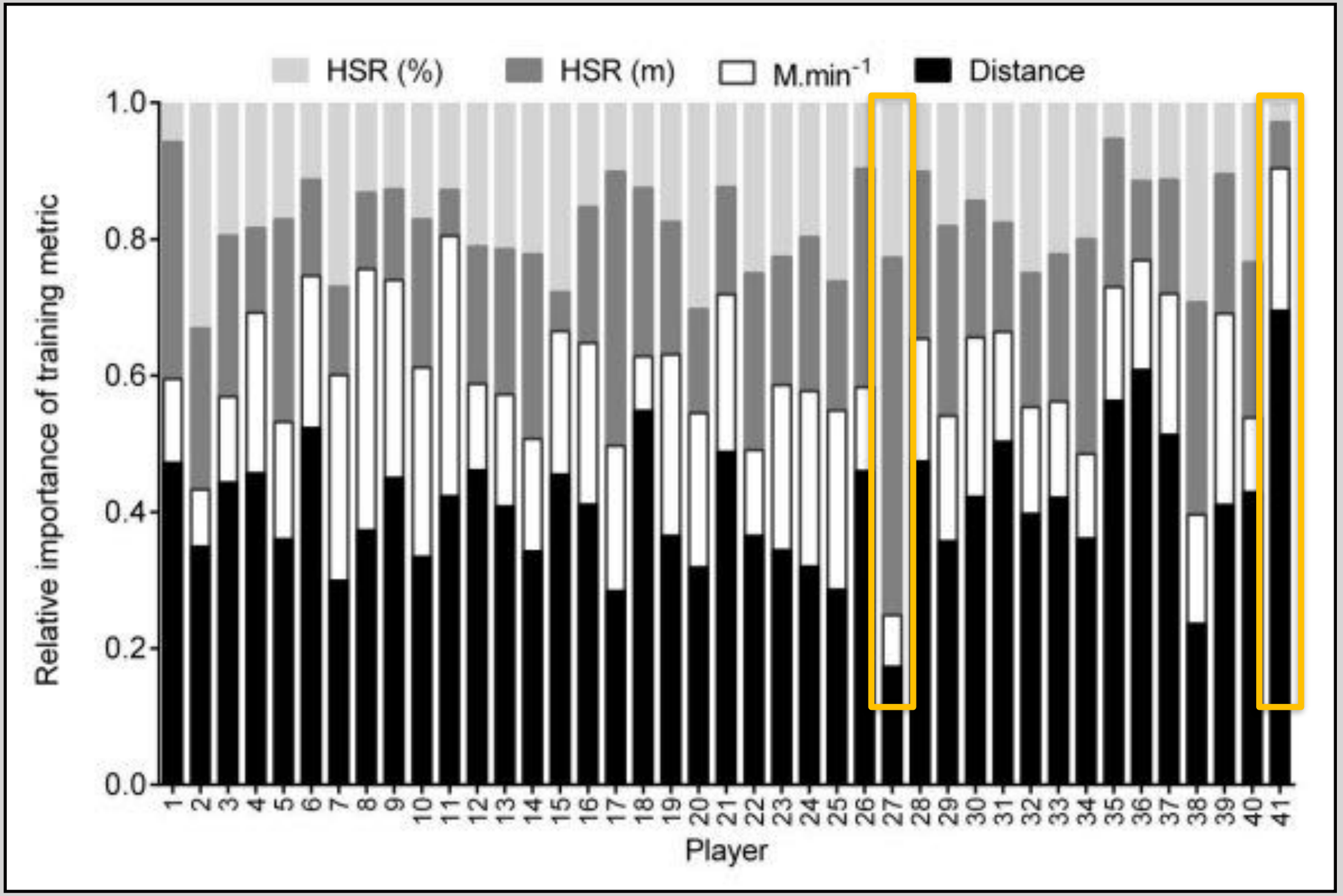
- Field location
- Wind
- Noise

Concurrent validity



Concurrent validity

Rule-based monitoring



Our philosophy

SKEPTICISM

- Base position
- Does not equate to negativity

QUALITY

- Connect to performance
- Layers of measurement

DYNAMICITY

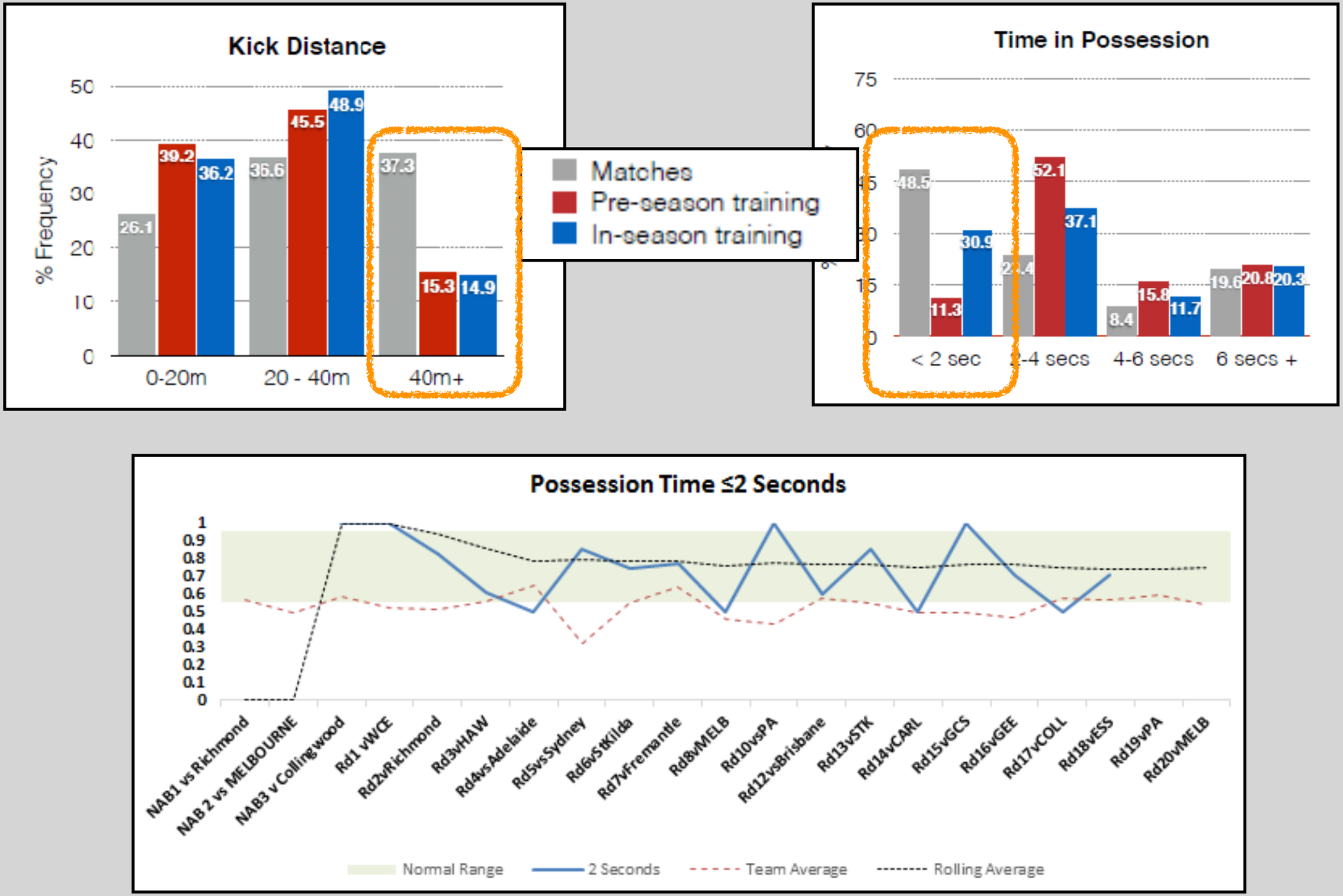
- Understand and expect non-linearity
- Embrace fuzziness

TRANSLATIONAL

- Research that addresses applied sport questions

Training design

Representative Design



Training design

Representative Design

SCIENCE AND MEDICINE IN FOOTBALL, 2017
https://doi.org/10.1080/24733938.2017.1381344

Routledge
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ARTICLE

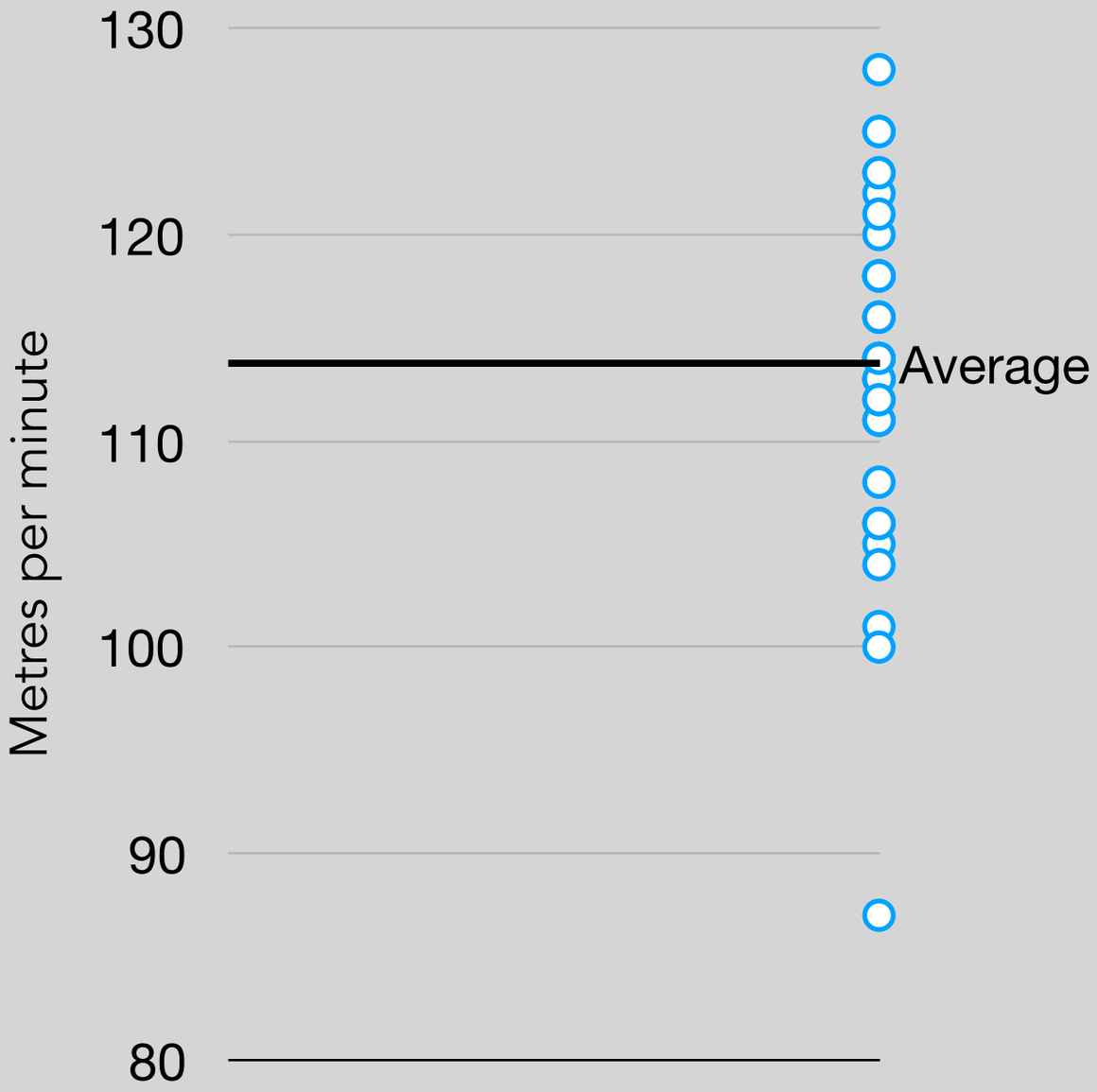
Check for updates

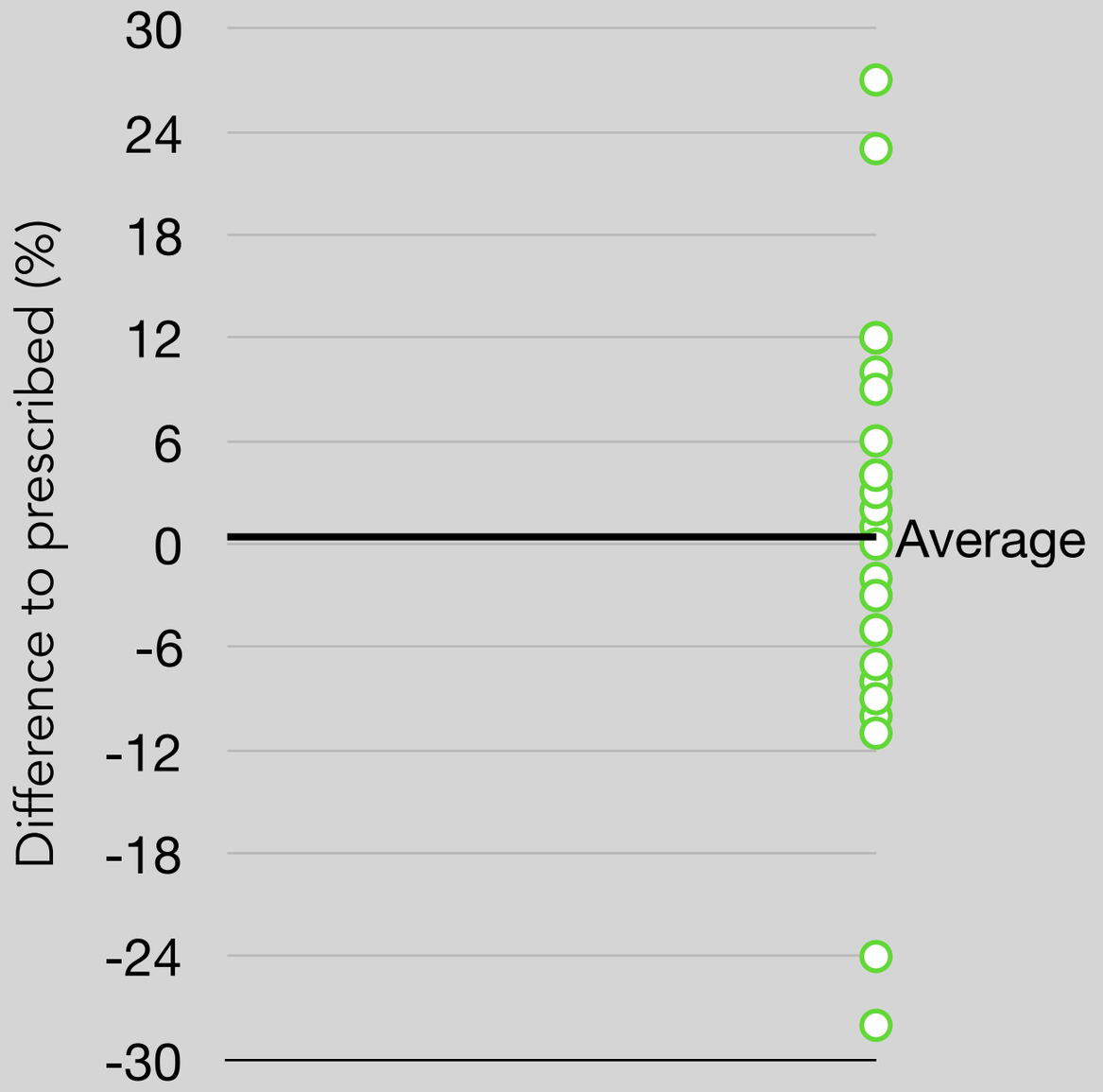
Development of physical and skill training drill prescription systems for elite Australian Rules football

David M. Corbett[a,b], Jonathan D. Bartlett [a,b], Fergus O'connor[a,b], Nicole Back[a], Lorena Torres-Ronda[a,c] and Sam Robertson [a,b]

[a]Institute of Sport, Exercise & Active Living (ISEAL), Victoria University, Footscray, Australia; [b]Western Bulldogs Football Club, Footscray, Australia; [c]Department of Health and Kinesiology, Exercise and Sport Nutrition Lab, Texas A&M University, College Station, TX, USA

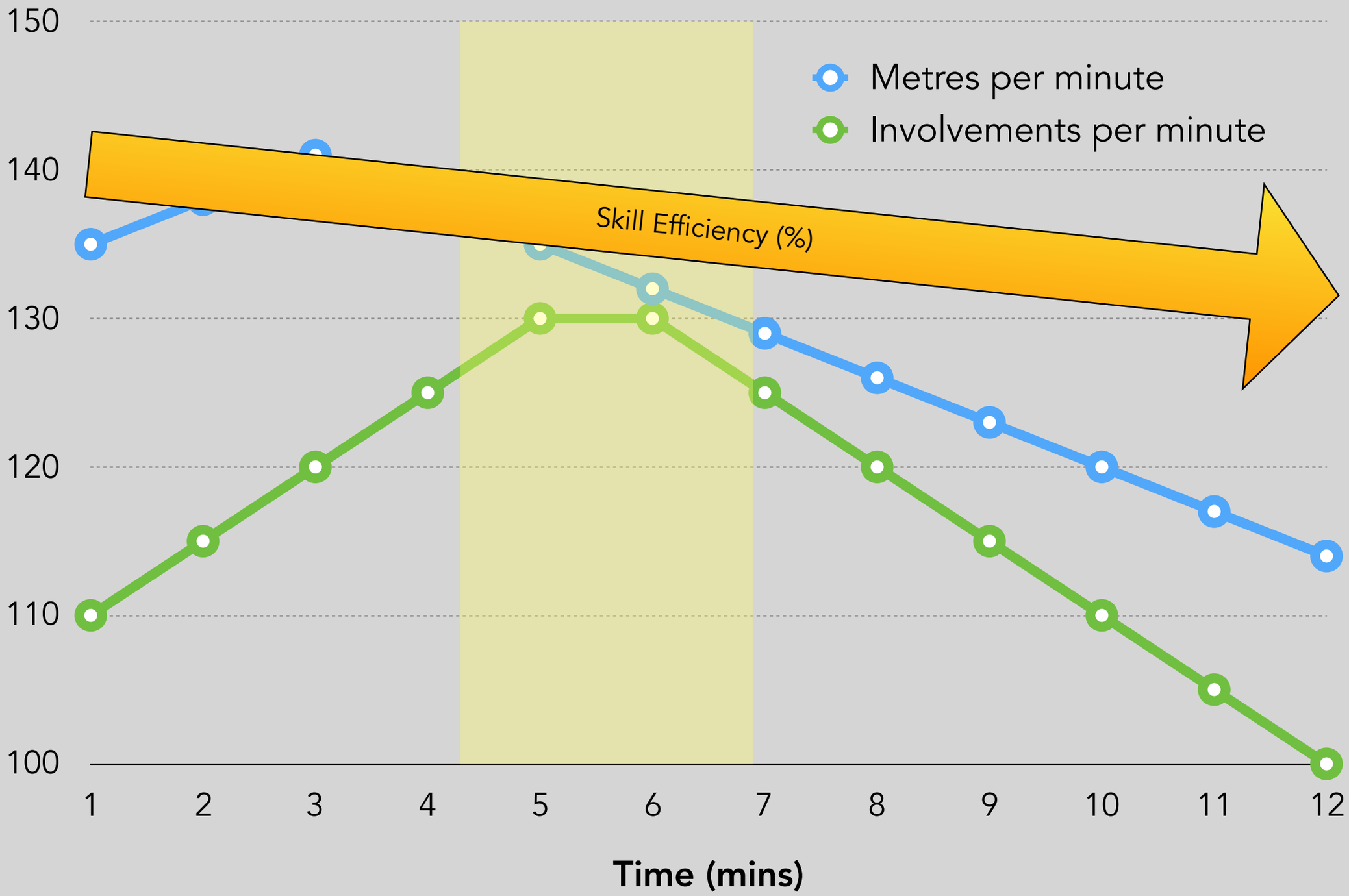
Drill Wizard





Challenge Point

Drill Wizard



Strategic periodisation

JOURNAL OF SPORTS SCIENCES, 2018
VOL. 36, NO. 3, 279–285
https://doi.org/10.1080/02640414.2017.1300315

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Check for updates

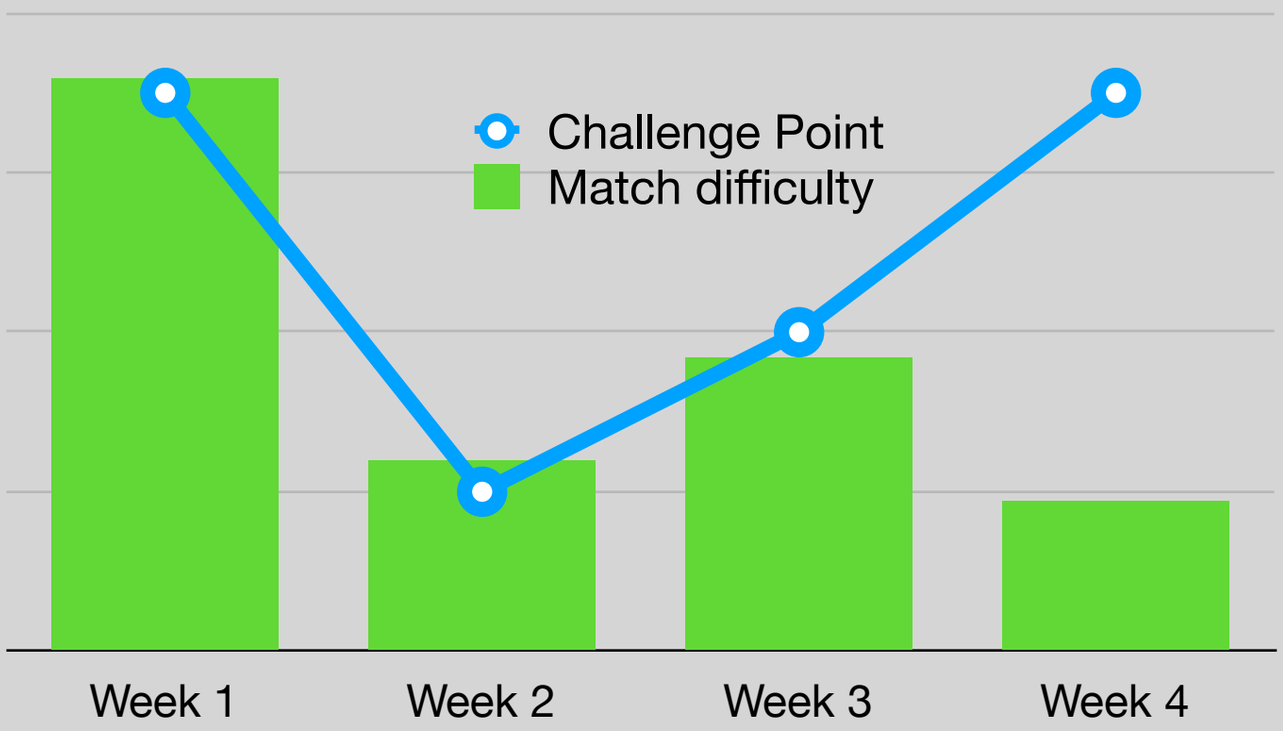
Evaluating strategic periodisation in team sport

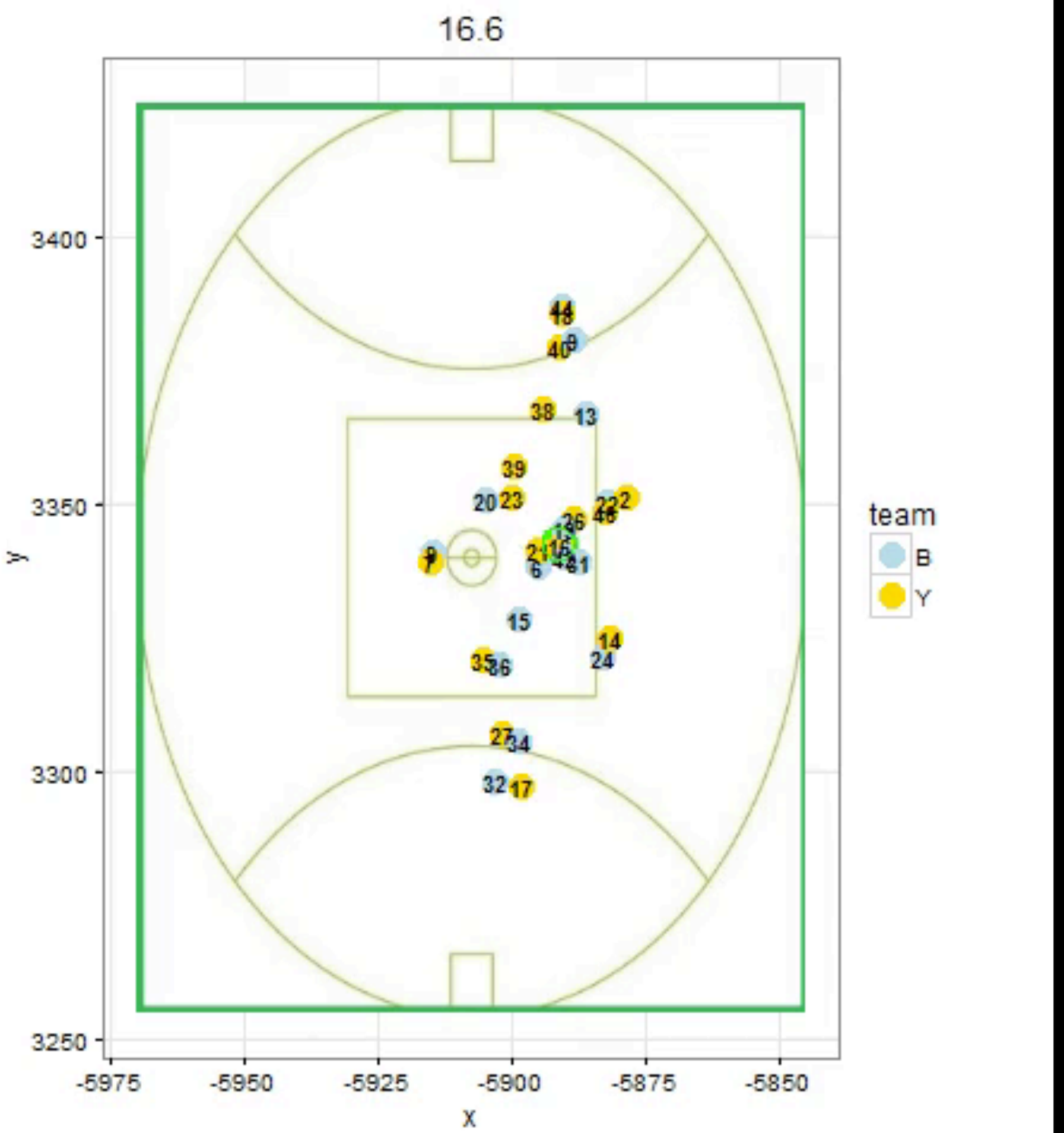
Sam Robertson [a,b] and David Joyce[c]

[a]Institute of Sport, Exercise & Active Living, Victoria University (ISEAL), Footscray, Australia; [b]Western Bulldogs Football Club, Footscray, Australia; [c]Greater Western Sydney Football Club, Sydney Olympic Park, Australia

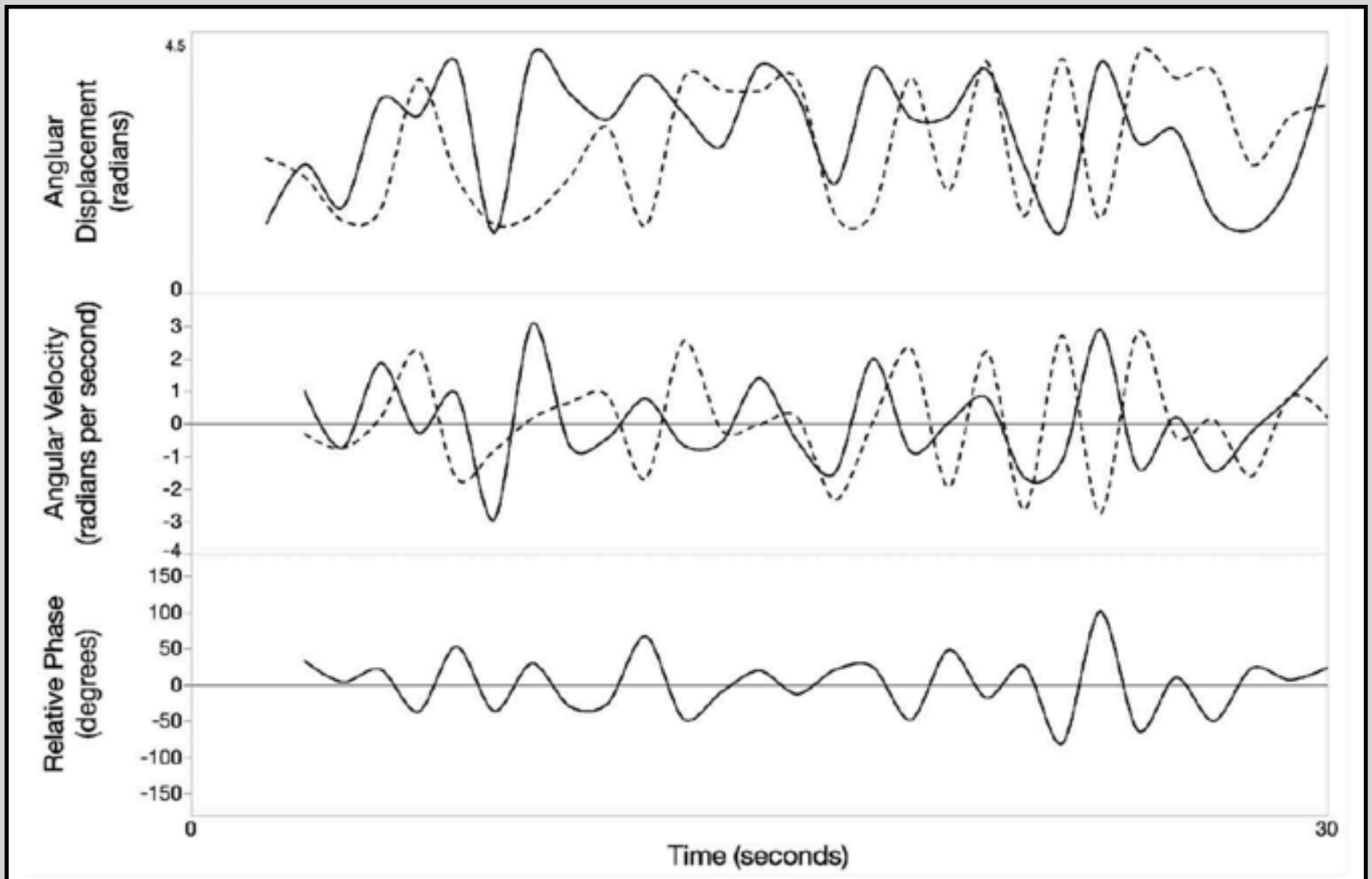
Strategic periodisation

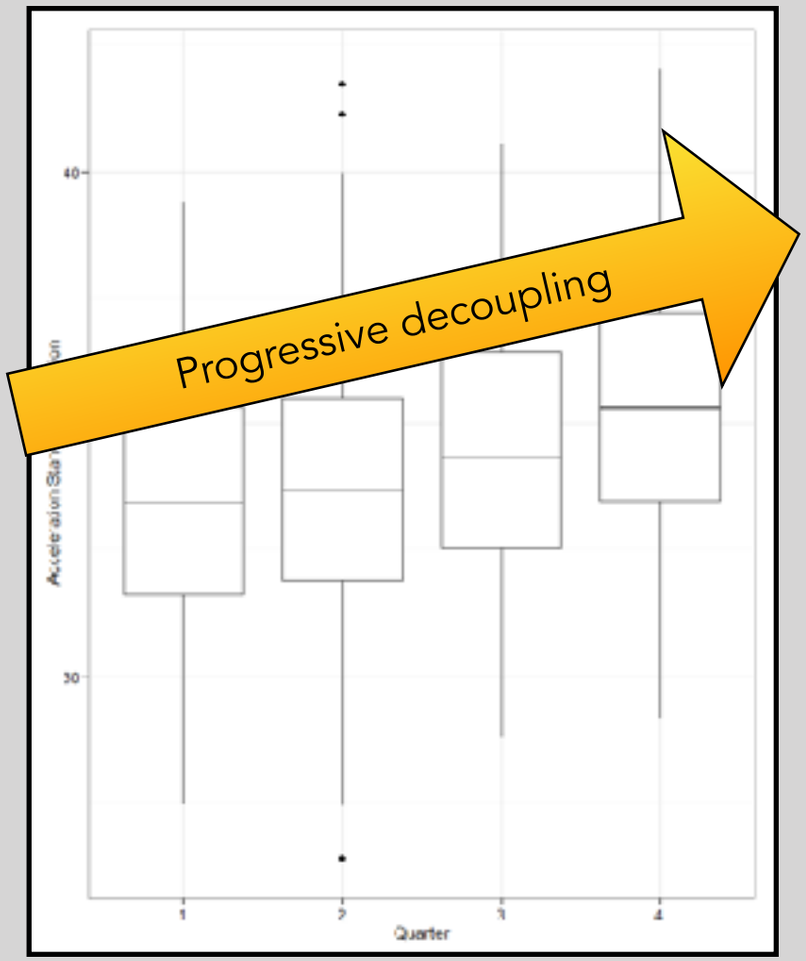
	Rank 2012	Rank Current	Location	MDI	Result
Brumbies	7	1	Away	7.2	-29
Cheetahs	10	13	Home	2.4	-1
Blues	12	4	Home	3.7	3
Force	14	12	Home	1.9	4
Hurricanes	8	7	Away	6.5	-12
Chiefs	2	2	Home	6.6	5




16.6
3400
3350
3300
3250
y
-5975
-5950
-5925
-5900
-5875
-5850
X
team
B
Y

Player coupling - by time





Summary

01 Be skeptical

02 Keep an open mind…but no so open that your brain falls out

03 Embrace non-linearity

04 Be comfortable with uncertainty

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Thank you

VICTORIA UNIVERSITY
MELBOURNE AUSTRALIA

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WESTERN BULLDOGS
SINCE 1883