EXPERT ASSESMENT IN TEAM SPORT: Integral Sport Intelligence System

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Croatia…

Area - 56 542 km², Population - 4.284.889,
GDP - $21,791

Small population base for the selection of athletes, poor infrastructure, modest financial background

Solution – SMART/HARD work

And…SIS (first steps)

- Meal info
- Locker room info
- Physio room info

Table 1. Methods used to measure the external demands and internal responses during basketball training and competition.*

	Methods used to measure external demands		Methods used to measure internal responses			
Study	Time-motion	Microtechnology	Hematological markers	Heart rate	RPE	TRIMP
Training						
Coe and Pivarnik (12)		X		X		
Conte et al. (13)	X			X	X	X
Foster et al. (16)					X	
Klusemann et al. (18)	X			X	X	
Manzi et al. (21)				X	X	X
Montgomery et al. (24)		X		X	X	
Moreira et al. (25)					X	
Narazaki et al. (26)	X		X	X		
Scanlan et al. (30)				X	X	X
Scanlan et al. (31)		X		X	X	X
Schelling et al. (33)		X				
Torres-Ronda et al. (35)	X			X		
Competition						
Ben Abdelkrim et al. (7)	X		X	X		
Ben Abdelkrim et al. (4)	X		X	X		
Ben Abdelkrim et al. (5)			X	X		
Ben Abdelkrim et al. (6)	X		X	X		
Bishop and Wright (8)	X					
Hulka et al. (17)	X					
Klusemann et al. (19)	X			X		
Montgomery et al. (24)		X		X	X	
Moreira et al. (25)					X	
Scanlan et al. (28)	X					
Vaquera et al. (36)				X		

*RPE = rating of perceived exertion; TRIMP = training impulse.

Testing and training monitoring procedures

- Neuromuscular (FMS)
- Biomechanic (tensiometry)
- Biochemistry (hydratation, lactate, CK, Urea…)
- Physiology (Vo2max, Lactate treshold test)
- GPS
- RPE
- WQ
- HRV, HRR
- (SIS) Performance specialist

All tests with all players
+
Tests/measures on indication

Testing and training monitoring procedures

- Neuromuscular (FMS)
- GPS
- SIS (performance specialist, medical doctor, physiotherapist, assistant football coach, head coach)

Individual approach

Locomotor funcionality

DEFICITS
Mobility/Stability/Balance

COMPENSATIONS
Lumbar, pelvis, knee,...

IMBALANCES AND ASSIMETRIES
Front/Back, Left/Right,…

Individualized corrective programs!

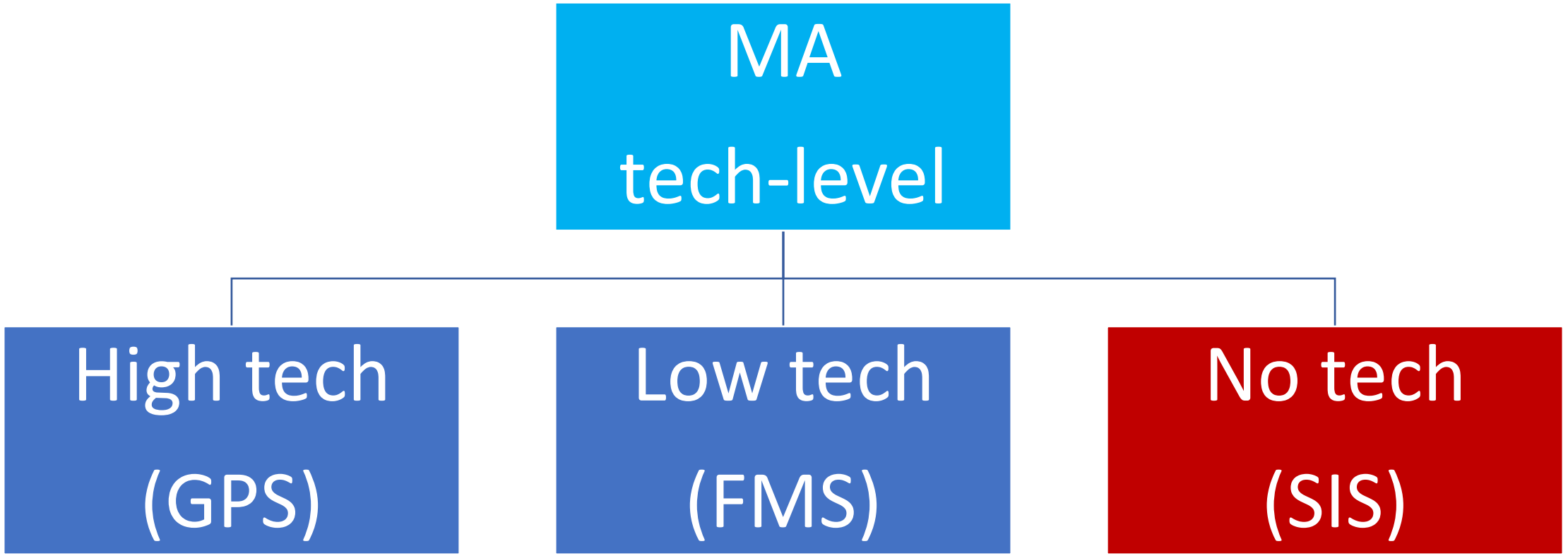
Based on training history and diagnostics

TRAINING ANALYSIS

PHYSICAL ANALYSIS

- GPS monitoring of all training session
  - Except Recovery and Game -1
- Reports
  - Total Distance – HI Distance
  - Accelerations – Deccelerations
  - Heart Rate
- Staff Meetings
- Medical Team
  - Injury Clips

Measurment/Assesment tech-level



SOLUTIONS…

- Individualization
- Selectiveness (strategy, number of tests…)
- Priority (Singular! One at a time)
- Simplification
- External and internal parameters
- Objective + Subjective

?

Why testing and monitoring?

Demands…

- Congested competition calendar (50-70 matches in the club schedule)
- Large number of travels related to competitions (causing significant disruption of the regular biorhythm)
- Insufficient time for developmental sport training
- Frequent changes of coaches and players
- Extreme public pressure (fans, media, social networks)
- High expectations and pressure from the owners and club/federation management

Consequences…

- High oscillations in team and individual peak performance
- Increased number of sport-related injuries
- Disruption of the immunity of the athletes
- Significant psycho-social issues within the sport team
- Negative events in the private life of athletes
- Difficult to have long-term individual and team sport development

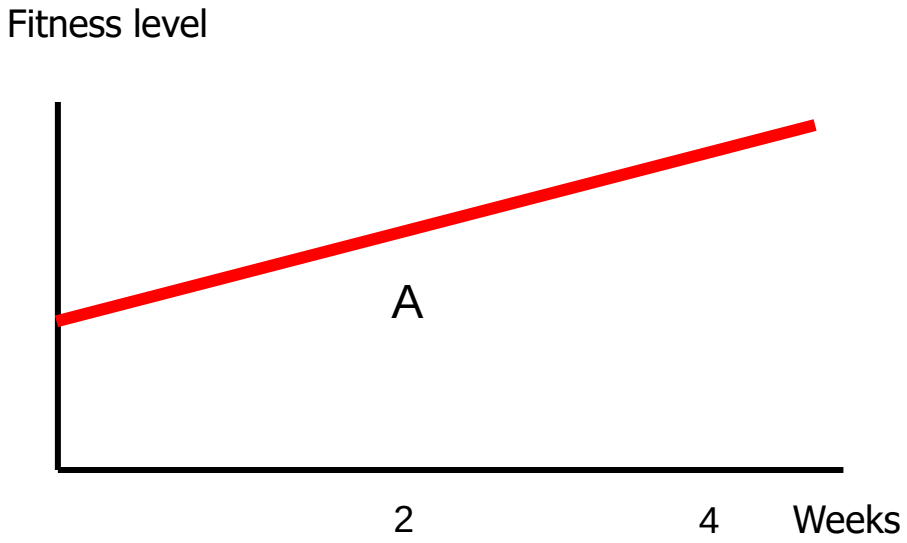
To see…

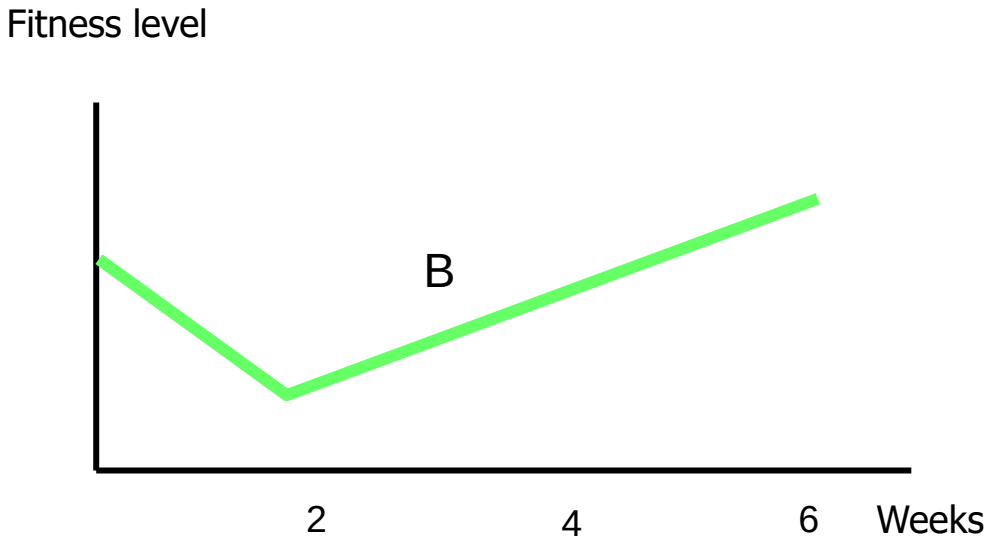
What player needs

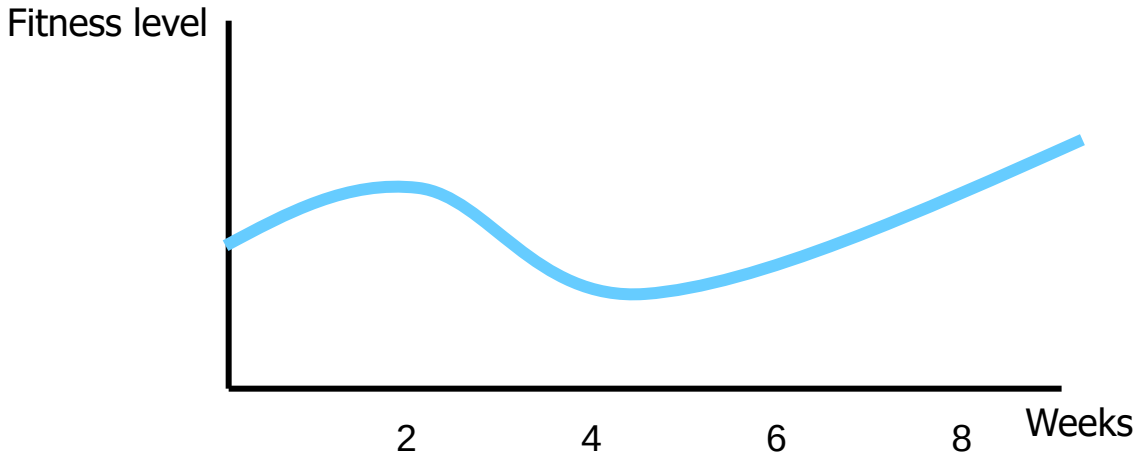
What coach needs

What team needs

Our job revolves around STRESS AND ADAPTATION







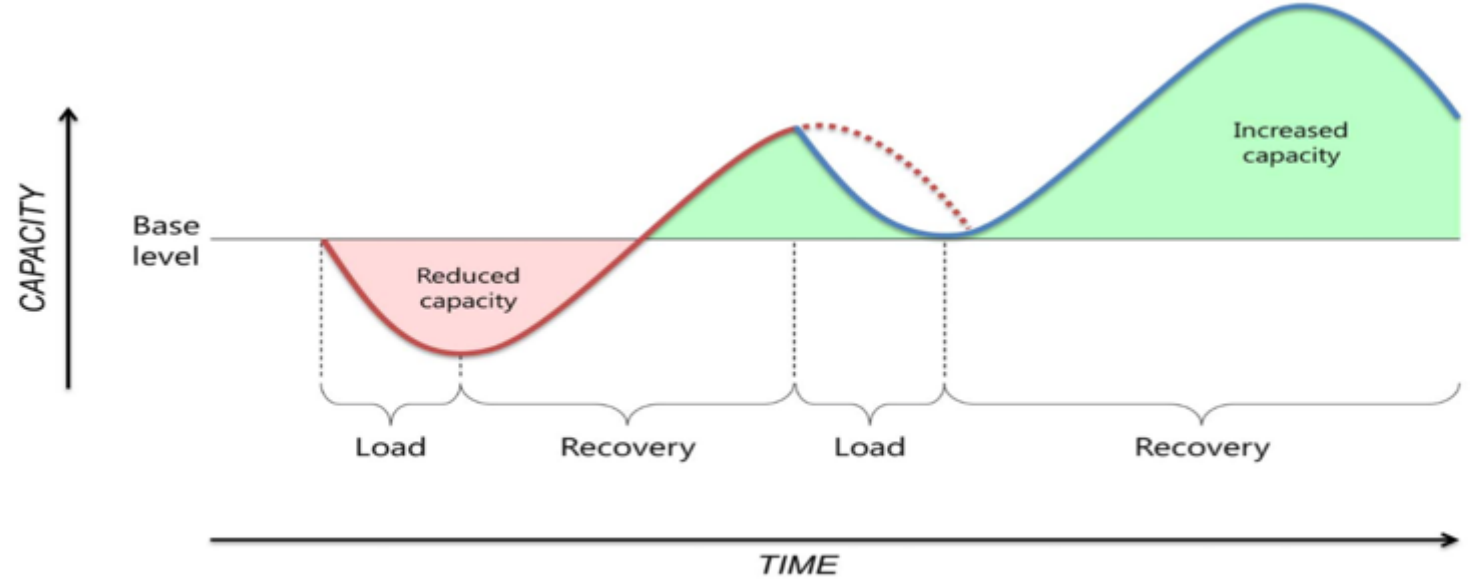


Figure 1 Biological adaptation through cycles of loading and recovery (adapted from Meeusen[6]).

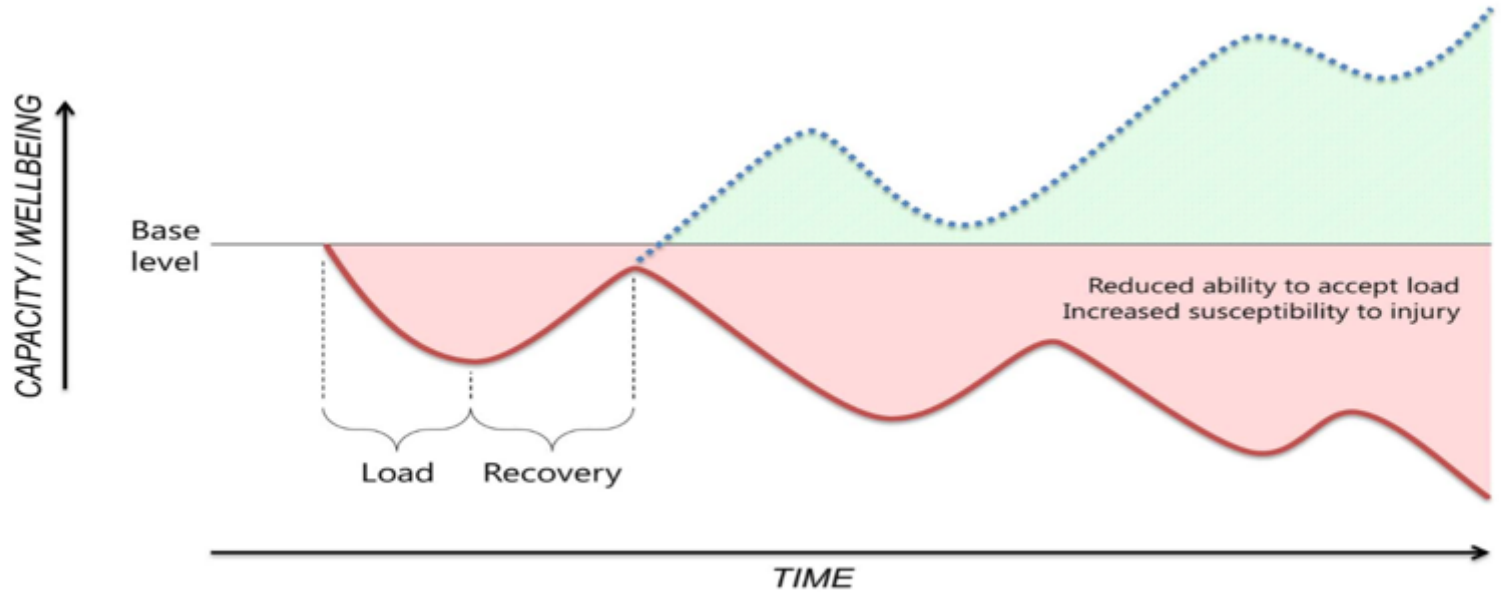
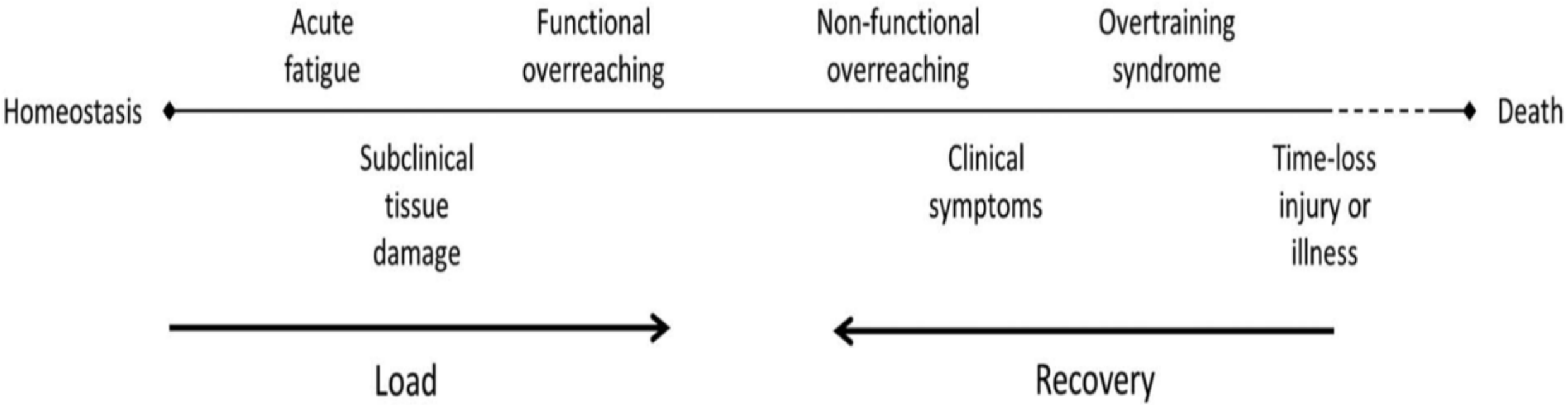
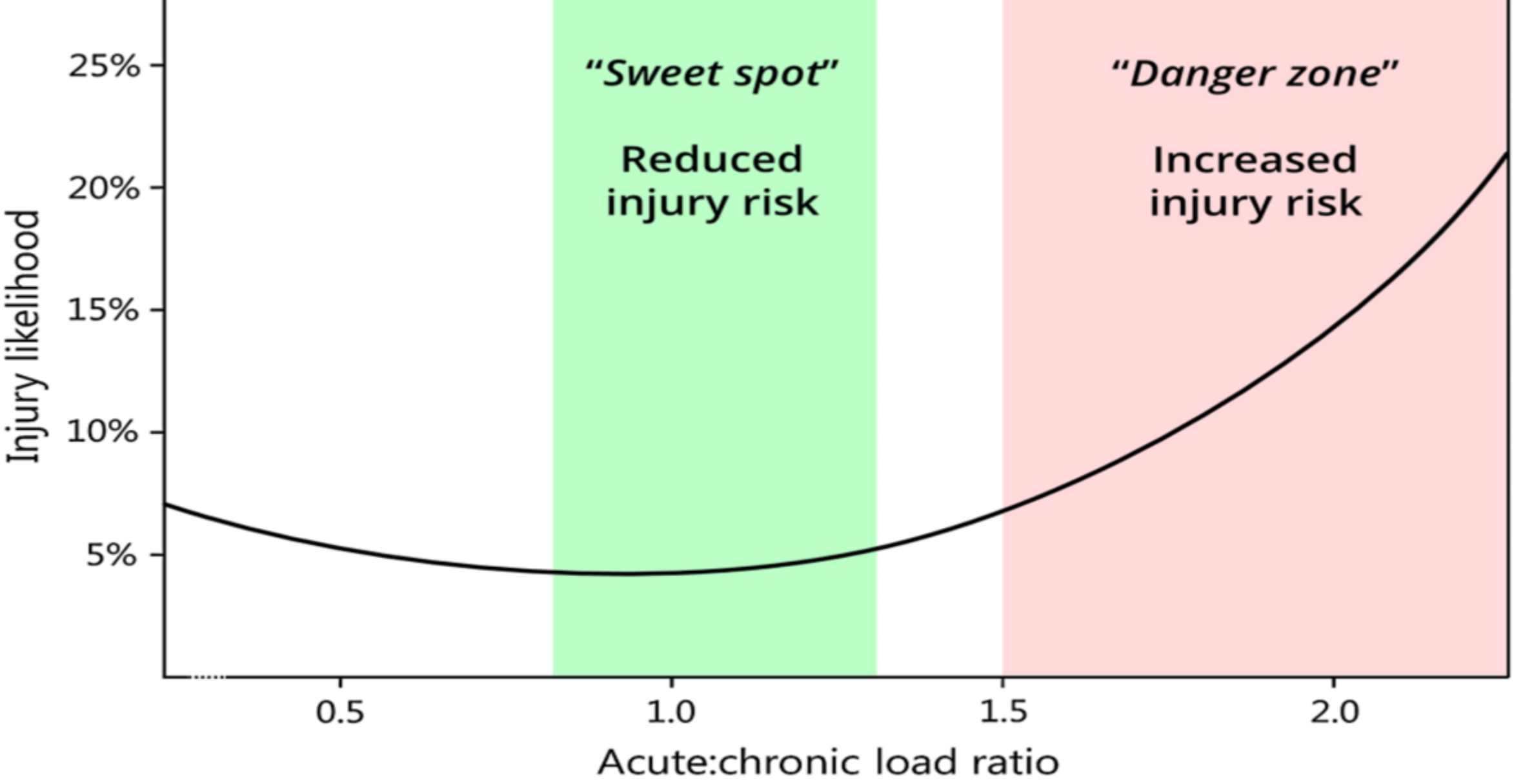


Figure 2 Biological maladaptation through cycles of excessive loading and/or inadequate recovery (adapted from Meeusen[6]).

Soligard T, Schwellnus M, Alonso J-M, et al. Br J Sports Med

Well being continuum (Fry et al., 1991.)



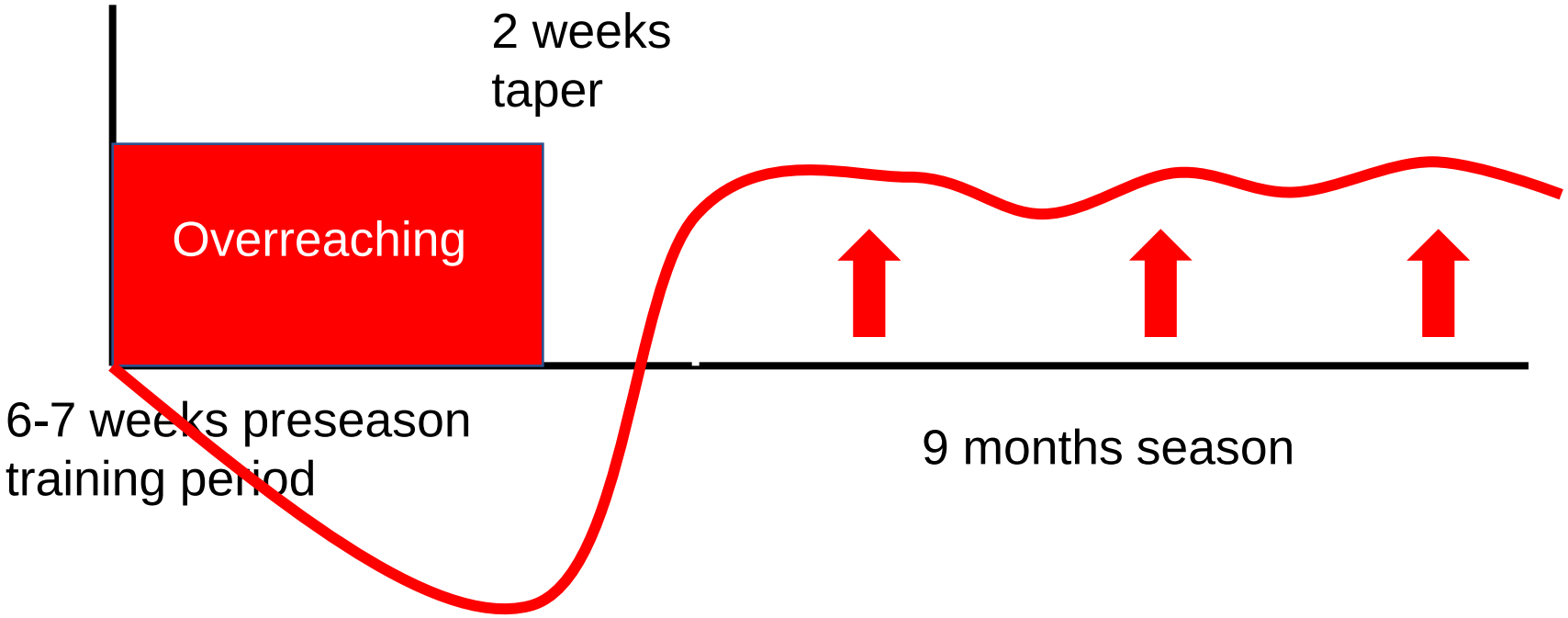


Acute:chronic load ratio (redrawn from Gabbett).

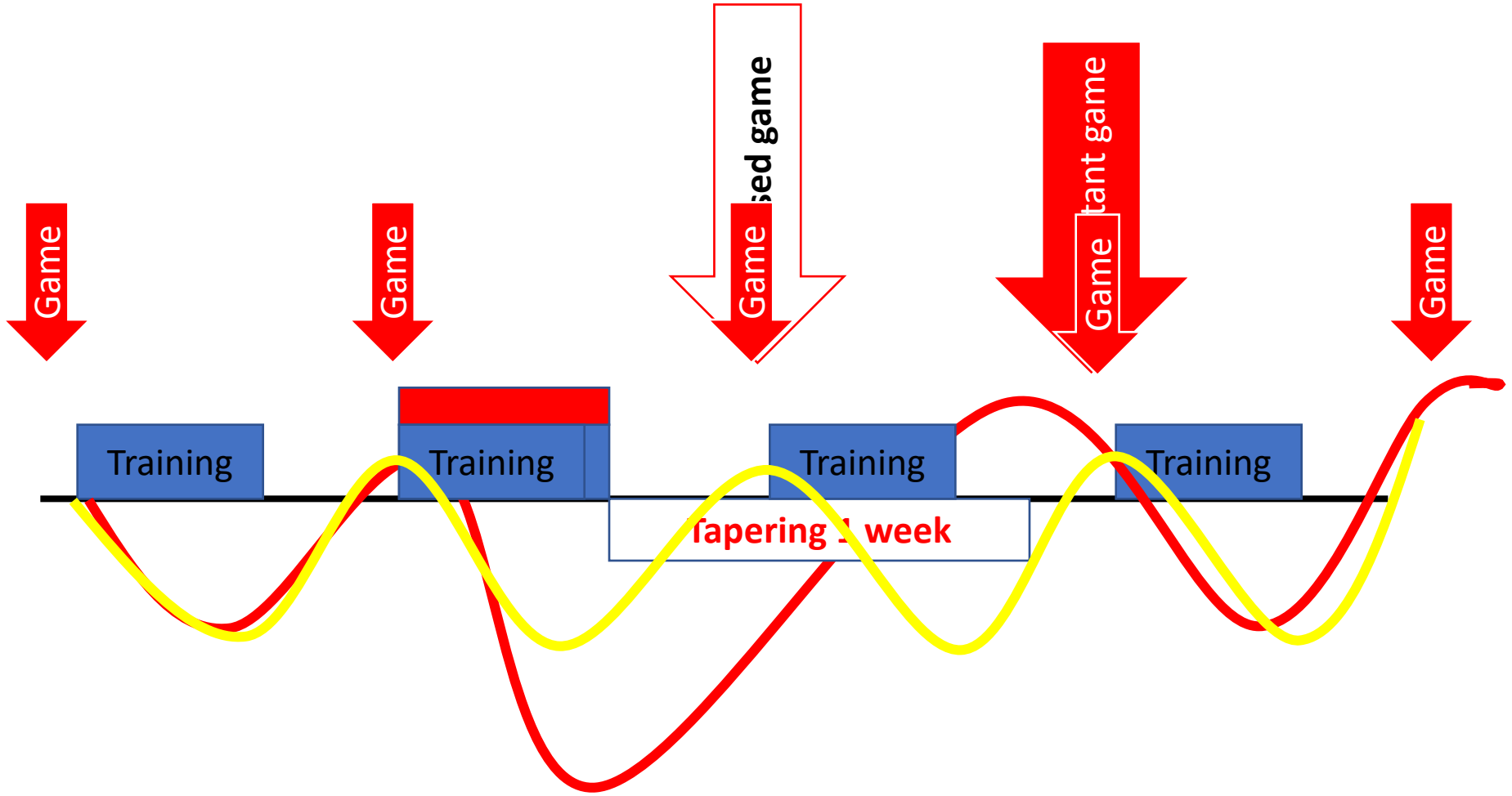
Soligard T, Schwellnus M, Alonso J-M, et al. Br J Sports Med 2016;50:1030
1041

TAPERING FOR SEASON IN TEAM SPORTS

- Overreaching preseason period (6 weeks)
- 7 day progressive taper
- Tapering on muscular strength, power and endurance (Coutts et al., 2007)



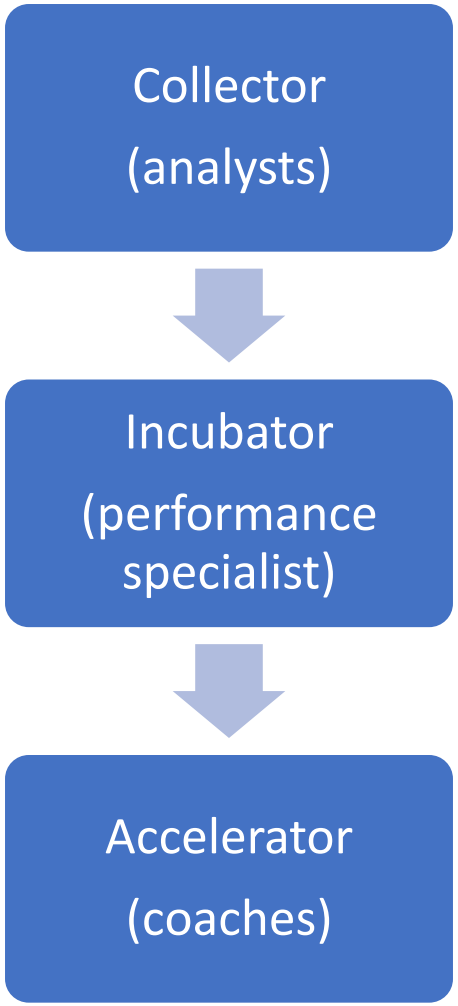
MONTH TAPER


Game
Game
Game
Game
Game
Training
Training
Training
Training
Tapering 1 week

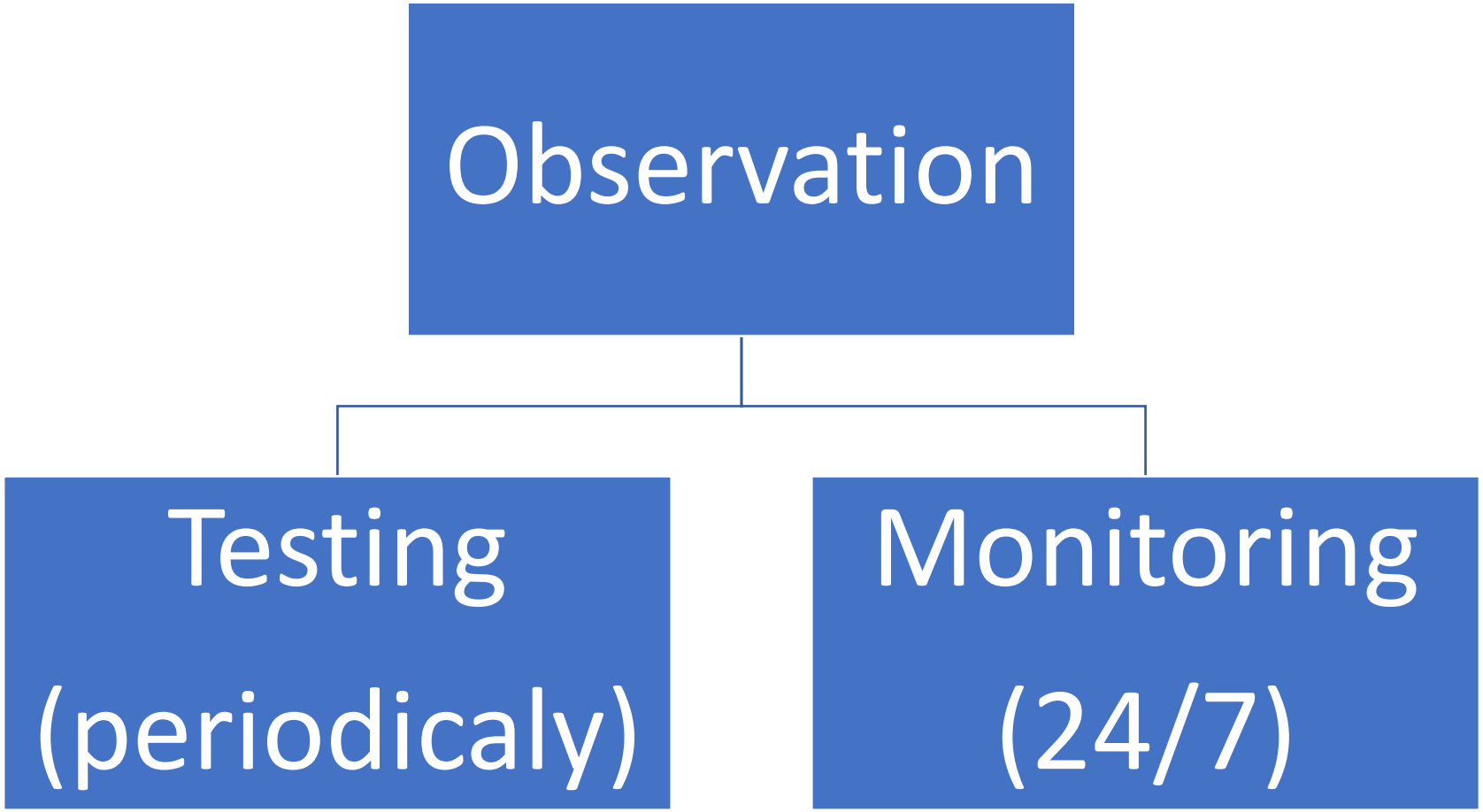
Performance process…

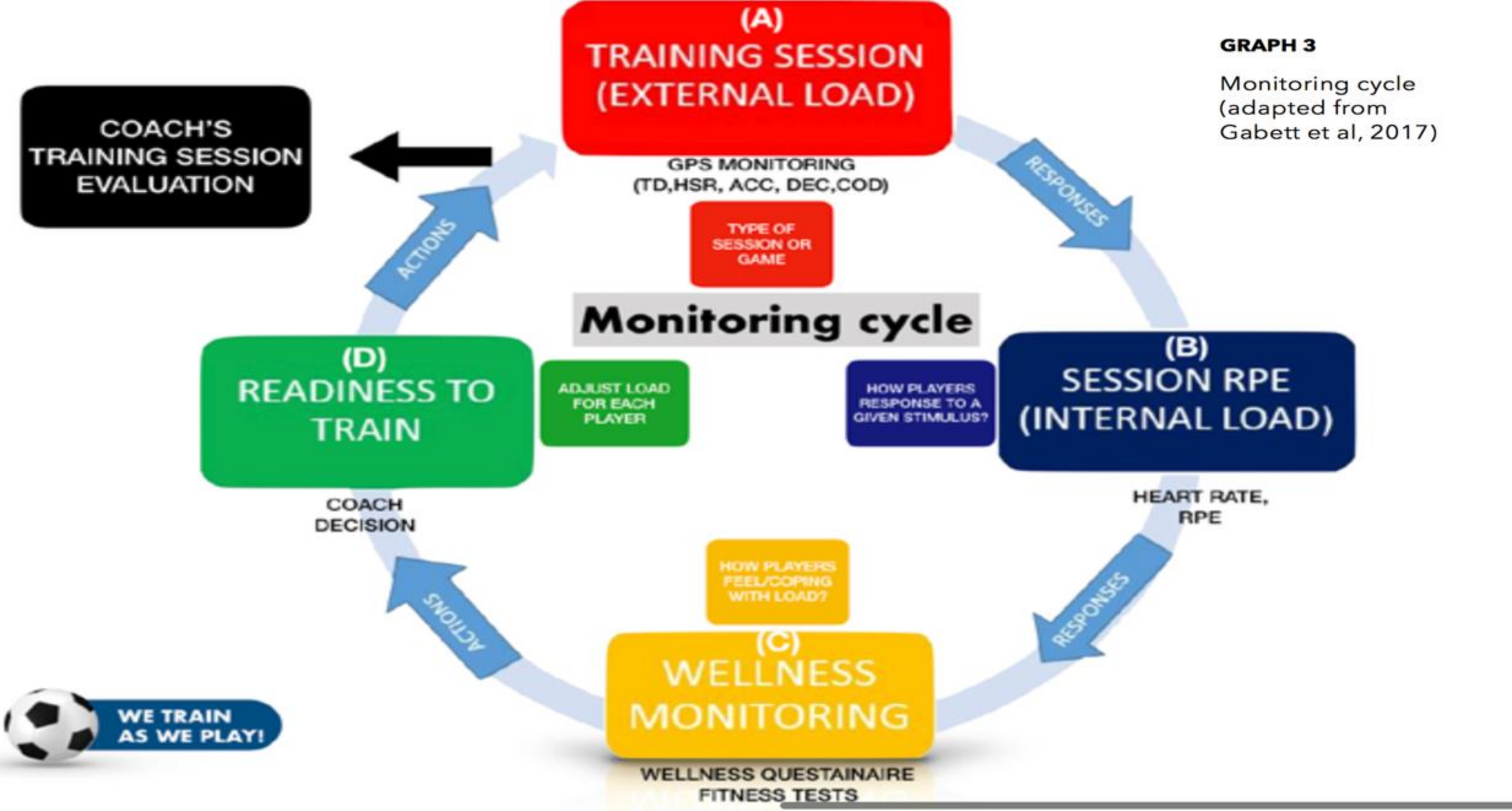
Observation…

Data sectors…



Observation…





GRAPH 3

Monitoring cycle (adapted from Gabett et al, 2017)

Table 1 Examples of measurement tools to monitor external and internal load

Load type	Examples of measurements
External load	Training or competition time (seconds, minutes, hours or days)[36]
	Training or competition frequency (eg, sessions or competitions per day, week, month)[37]
	Type of training or competition[38]
	Time-motion analysis (eg, global positioning system analysis)[39]
	Power output, speed, acceleration[40]
	Neuromuscular function (eg, jump test, isokinetic dy
	Movement repetition counts (eg, pitches, throws, bo
	Distance (eg, kilometres run, cycled or swam)[44]
	Acute:chronic load ratio[45]
Internal load	Perception of effort (eg, rating of perceived exertion
	Session rating of perceived effort (eg, session durati
	Psychological inventories (eg, profile of mood states athletes (REST-Q-Sport),[48] daily analysis of life demands for athletes (DALDA),[49] total recovery scale (TQR),[17] life A),[50] multicomponent training distress scale (MTDS),[51] the hassle and uplift scale,[52] brief COPE,[53] the Swedish ate trait anxiety inventory (STAI),[55] sport anxiety scale (SAS),[56] athletic coping skills inventory-28 (ACSI-28) otivational climate in sport questionnaire (PMCSQ)[59] and commitment to exercise scale (CtES))[60]
	Sleep (eg, sleep quality and sleep duration)[61]
	Biochemical/hormonal/immunological assessments[18]
	Psychomotor speed[62]
	HR[63]
	HR to RPE ratio[64]
	HR recovery (HRR)[65]
	HR variability (HRV)[66]
	Training impulse (TRIMP)[67]
	Blood lactate concentrations[68]
	Blood lactate to RPE ratio[69]

HR, heart rate; RPE, ratings of perceived exertion.

NO expert opinion

Soligard T, Schwellnus M, Alonso J-M, et al. Br J Sports Med

Table 1 Summary and Evaluation of Some Common Methods Used to Monitor Athlete Training Load and/or Responses

Method	Cost	Hardware needed	Software needed	Ease of use	Valid	Reliable	Used to interpret	Used to prescribe	Variables
Internal Measures									
RPE	L	N	Y/N	H	M–H	M–H	Y	Y	Single variable in AU (time dependent)
Session rating of perceived exertion	L	N	Y/N	H	M–H	M–H	Y	Y	Single variable in AU (time dependent)
TRIMP[4]	L–M	Y	Y	M	M–H	M–H	Y	N	Single variable in AU (time dependent)
Wellness questionnaires*	L	N	Y/N	M–H	M	M–H	Y	Y/N	Ratings, checklists, AU scale measures
Psychological inventories (eg, POMS, Rest-Q-Sport)*	L–M	N	Y/N	M–H	M–H	M–H	Y	Y	Ratings, checklists, AU scale measures
Heart-rate indices	L–M	Y	Y	H	H	M–H	Y	Y	Heart rate, time in zones, HR variability/recovery measures, etc
Oxygen uptake	H	Y	Y	L	H	H	Y	Y	VO_2, metabolic equivalents
Blood lactate	M	Y	Y/N	M	H	H	Y	Y	Concentration
Biochemical/hematological assessments	M–H	Y	Y/N	L	H	M–H	Y	Y	Concentrations, volumes
External Measures									
Time	L	Y	Y/N	H	H	H	Y	Y	Units of time (s, min, h, d, wk, y)
Training frequency	L	N	N	H	H	H	Y	Y	Session count
Distance/mileage	L	Y/N	Y/N	H	H	H	Y	Y	Units of distance (m, km)
Movement repetition counts	L	Y/N	Y/N	M–H	H	M–H	Y	Y	Activity counts (eg, steps, jumps, throws)
Training mode	L	Y/N	N	H	H	H	Y	Y	Weight training, run, cycle, swim, row, etc
Power output	M–H	Y	Y	L–M	H	H	Y	Y	Relative (W/kg) and absolute power (W)
Speed	L–M	Y	Y/N	M–H	H	H	Y	Y	Speed measures (m/s, m/min, km/h)
Acceleration	L–M	Y	Y	L	H	H	Y	Y	Acceleration measures (m/s^2)
Functional neuromuscular tests	L–M	Y	Y/N	M	M–H	H	Y	Y	Countermovement-jump and drop-jump measures
Acute:chronic-workload ratio	L–M	Y/N	Y	M	M–H	M–H	Y	Y	Size of acute training load relative to chronic load
GPS measures	M	Y	Y	M	M–H	M	Y	Y	Velocity, distance, acceleration, time in zones, location
Metabolic power	M	Y	Y	L–M	L–M	M	Y	N	Energy equivalent
Time–motion analysis video (automated)	H	Y	Y	L	M–H	M	Y	Y	Velocity, location, acceleration
Time–motion analysis video (nonautomated)	M–H	Y	Y	L	M–H	M	Y	Y	Velocity, location, acceleration
Accelerometry	M	Y	Y	L–M	M–H	M	Y	N	*x*-*y*-*z* *g* force
Player load	M	Y	Y	M	M	M	Y	Y	Single variable in AU (time dependent)

Abbreviations: L, low; M, medium; H, high; Y, yes; N, no; AU, arbitrary units.

*Measures of training response.

***Bourdon et al., International Journal of Sports Physiology and Performance,* 2017, 12, S2-161-S2-170**

https://doi.org/10.1123/IJSPP.2017-0208

Table 4. *The skill requirements (Key Performance Indicators) for the different positions in soccer.*

PERFORMANCE INDICATORS	GK	Full Backs	Centre Backs	HM	AM	WM	Strikers
Physiological	Height Strength Power Agility Coordination Reaction Time	Speed Power Stamina	Height Strength Speed Power Stamina	Stamina Speed Power Strength	Stamina Speed Power Strength	Speed Stamina Power Strength	Speed Agility Power Strength Stamina
Tactical	Vision Organisation Communication Distribution	Support play When to cross Passing Running off the ball Forcing offside	Vision Organisation Communication Passing	Vision Organisation Communication	Vision Organisation Communication	Vision Organisation Communication	Vision – awareness of space Anticipation Organisation Communication
Technical – Def	Shot stopping Coordination Recovery speed Save Punch	Tackle Pressing opposition Interception – anticipation Clearance Defensive header	Tackle Defensive header Pressing opposition Interception – anticipation Clearance	Tackle Pressing opposition Interception – anticipation Heading	Tackle Pressing opposition Interception – anticipation Heading	Tackle Pressing opposition Cover full-back Interception – anticipation Heading	Tackle Pressing opposition Interception – anticipation Heading
Technical – Att	Passing Throw Ball control with feet Kick Tackle	Tackle Interception – anticipation Dribbling Running with the ball Clearance Defensive header	Passing Heading Running with the ball Support play Dribbling Crossing Shooting	Passing Running with the ball Dribbling Support play Crossing Shooting Heading	Passing Running with the ball Dribbling Support play Crossing Shooting Heading	Passing Running with the ball Dribbling Support play Crossing Shooting Heading	Shooting Heading Reception Dribbling Passing Running with the ball Support play Crossing
Psychological	Concentration Motivation Attitude Body language	Concentration Motivation Attitude Body language	Concentration Motivation Attitude Body language	Concentration Motivation Attitude Body language	Concentration Motivation Attitude Body language	Concentration Motivation Attitude Body language	Concentration Motivation Attitude Body language

GK – Goal Keepers; HM – Holding Midfield; AM – Attacking Midfield; WM – Wide Midfield.

Hughes, M. et all. JOURNAL OF HUMAN SPORT & EXERCISE; VOLUME7|ISSUE2|2012|

Relationship between RPE and GPS

Int J Sports Physiol Perform. 2017 Feb;12(2):230-234. doi: 10.1123/ijspp.2015-0791. Epub 2016 Aug 24.

Relationships Between Internal and External Training Load in Team-Sport Athletes: Evidence for an Individualized Approach.

Bartlett JD, O'Connor F, Pitchford N, Torres-Ronda L, Robertson SJ.

- **This study demonstrates that machine learning approaches may outperform more traditional methodologies with respect to predicting athlete responses to TL. These approaches enable further individualization of load monitoring, leading to more accurate training prescription and evaluation.**

Relationship between RPE and GPS

Int J Sports Physiol Perform. 2013 Mar;8(2):195-202.

A comparison of methods to quantify the in-season training load of professional soccer players.

Scott BR, Lockie RG, Knight TJ, Clark AC, Janse de Jonge XA.

- **While the volume of HSR and VHSR provided significant relationships with internal TL, physical-performance measures of TD, LSA volume, and player load appear to be more acceptable indicators of external TL, due to the greater magnitude of their correlations with measures of internal TL.**

Relations between athletes and coaches RPE assesment…

Percept Mot Skills. 2017 Feb;124(1):264-276. doi: 10.1177/0031512516678727. Epub 2016 Nov 19.

The Relationship Between Coach and Player Training Load Perceptions in Professional Soccer.

Redkva PE, Gregorio da Silva S, Paes MR, Dos-Santos JW.

- **The results suggest that the S-RPE prescribed during the preseason period (by coaches) was not different from that perceived by professional soccer players.**

Relations between athletes and coaches RPE assesment…

Int J Sports Physiol Perform. 2014 May;9(3):497-502. doi: 10.1123/ijspp.2013-0009. Epub 2013 Nov 13.

Coaches' and players' perceptions of training dose: not a perfect match.

Brink MS, Frencken W GP, Jordet G, Lemmink KA.

- **The results indicate that young elite soccer players perceive training as harder than what was intended by the coach. These differences could lead to maladaptation to training. Monitoring of the planned and perceived training load of coaches and players may optimize performance and prevent players from overtraining.**

Deferences between players and coaches perception of the effort

	6.2.	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
D	90		60	105	45	60	90	75		45	90	45	90	75			75	90	90	75	60	
TL	8-9 (6,3)		6-7 (5,4)	7-8 (5,8)	5-6 (7,1)	6-7 (6,4)	7-8 (6,1)	7-8		6-7 (7,5)	7-8 (6,8)	4-5 (7,4)	6-7 (5,4)	6-7 (5,6)	(6,8)		5-6 (5,5)	6-7 (8,3)	7-8 (6,1)	6-7 (6,3)	5-6 (5,2)	
CP	7,5		6,5	7,0	8,0	7,25	7.0			8,5	7,75	7,75	6,5	7,0			6,5	8,75	7,5	7.5	6,5	
TG			NM	PK EN TT	IT	NM	PK EN TT	U + EN		NM	PK EN TT	IT	PK NM TT	PK TT			PK NM TT	PK EN TT	PK NM TT	PK TT	PK TT	

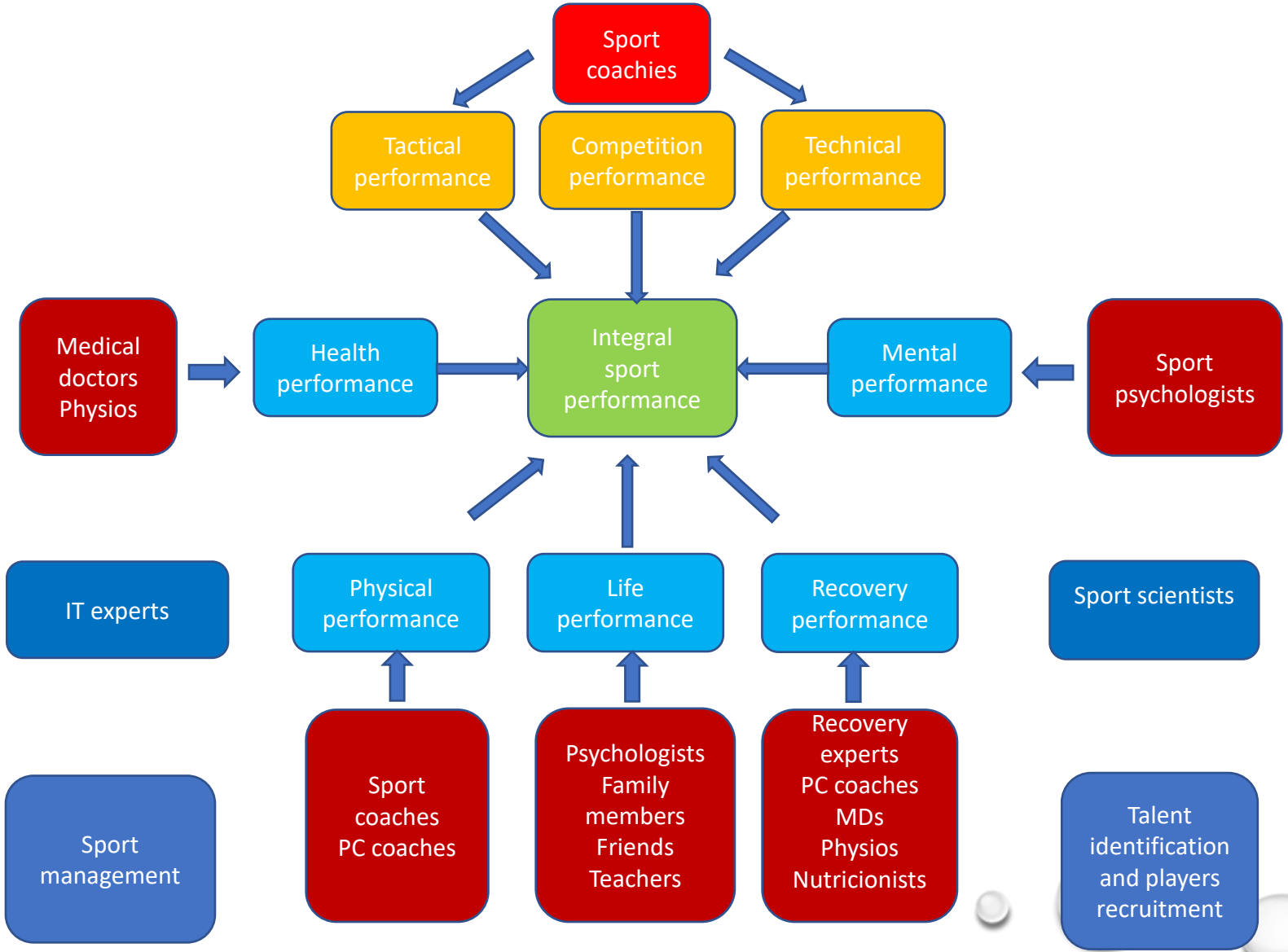
Biotrening Hub, internal non-published data

Coaches/Players load perception

- Football – coaches load perception is a bit higher then players load perception
- Basketball - coaches load perception is a bit lower then players load perception

Biotrening Hub, internal non-published data

Expert assessment fields (SIS)



WE TRAIN AS WE PLAY!

Technical Activities with Tactical Purpose

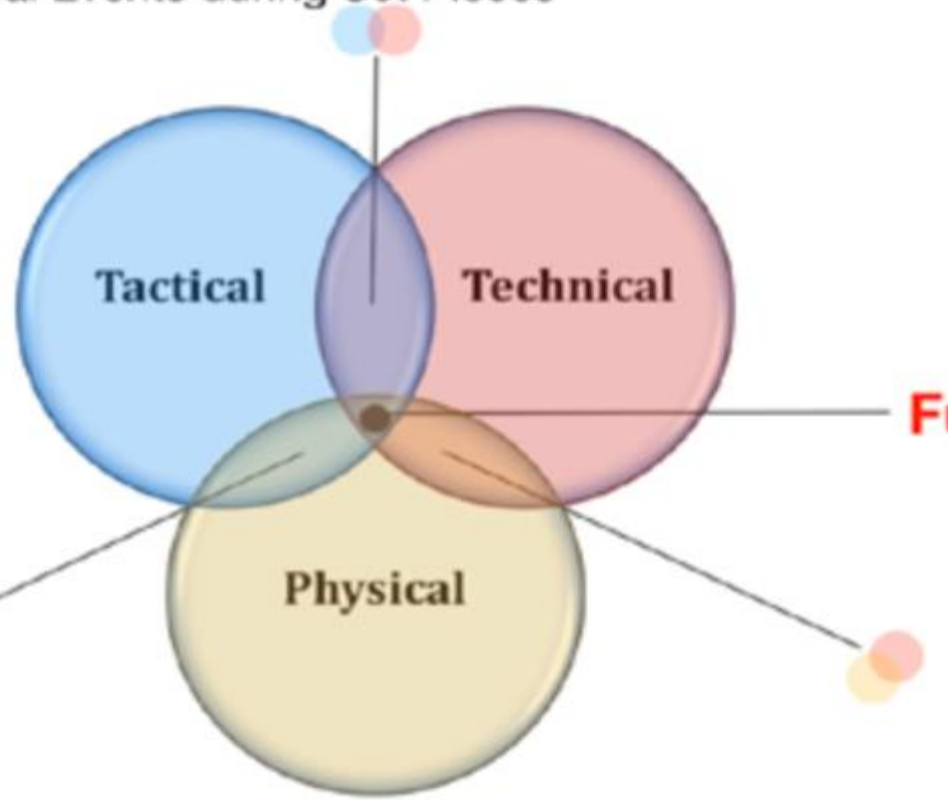
- Technical Events during Transitions/Phases of Play
- Technical Events during Set Pieces

Tactical

- Playing Style
- Phase of Play
- Formation
- Coaching Philosophy
- Position Role

Technical

- Passes
- Tackles
- Shots
- Headers
- Dribbling
- Crosses



Full Integration

Physical Activities with Technical Purpose

- Recovery Run
- Covering
- Overlapping
- Closing Down/Interception
- Push up Pitch
- Run in Behind
- Break into Box

Physical Activities with Technical Purpose

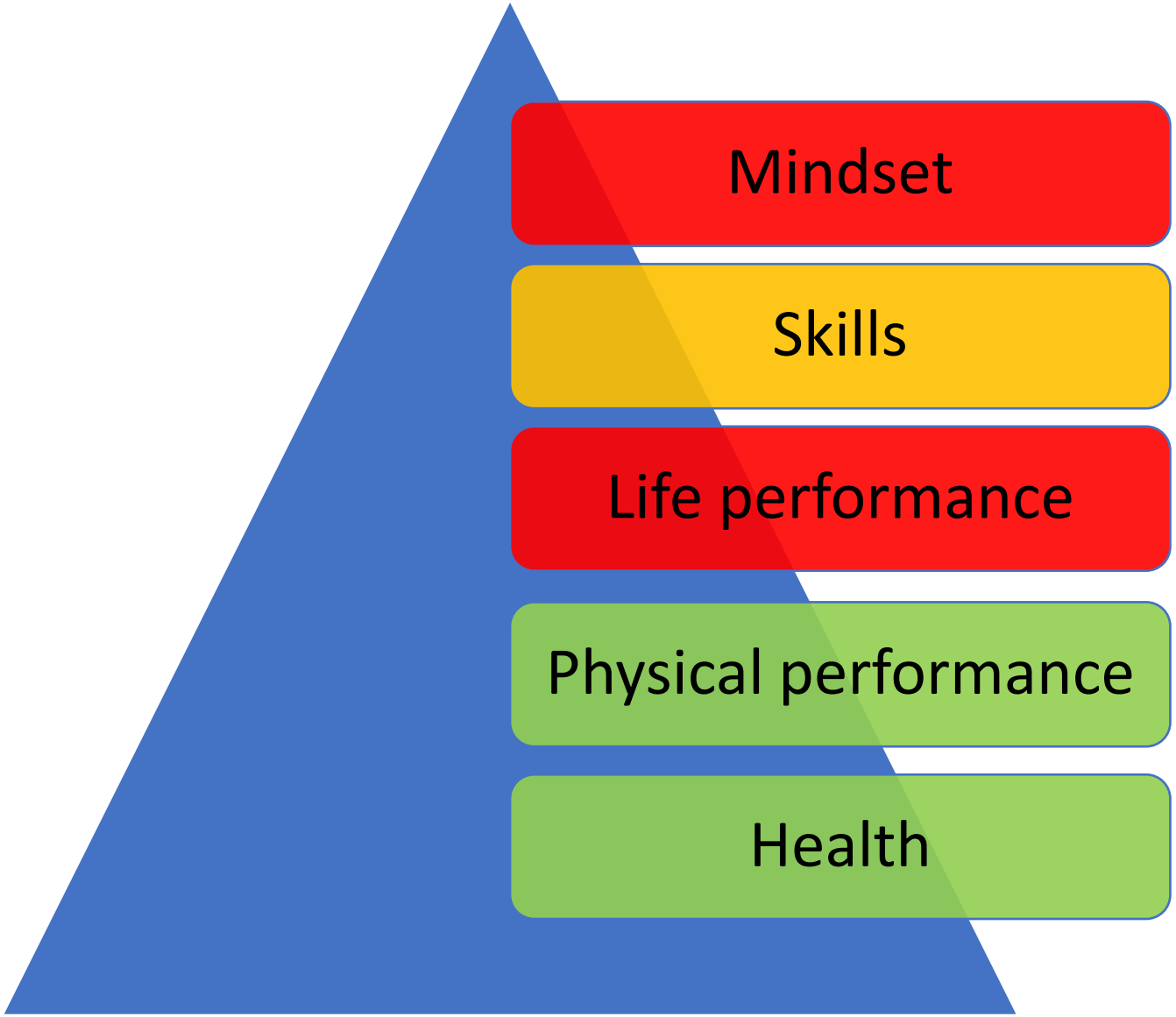
- Dribbling Ball
- Run to Cross Ball/Tackle
- Jumping to Head Ball

Physical

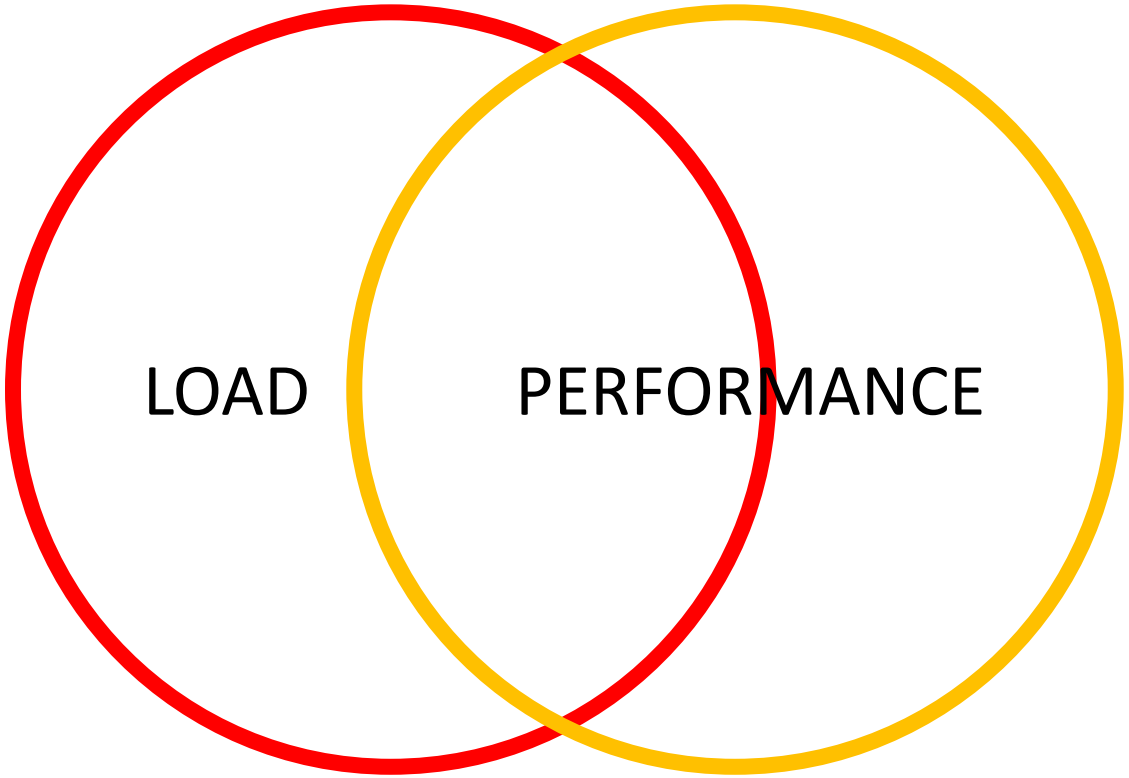
- Total Distance
- High-Intensity Running Distance
- Sprinting Distance
- Accelerations/Decelerations

GRAPH 4

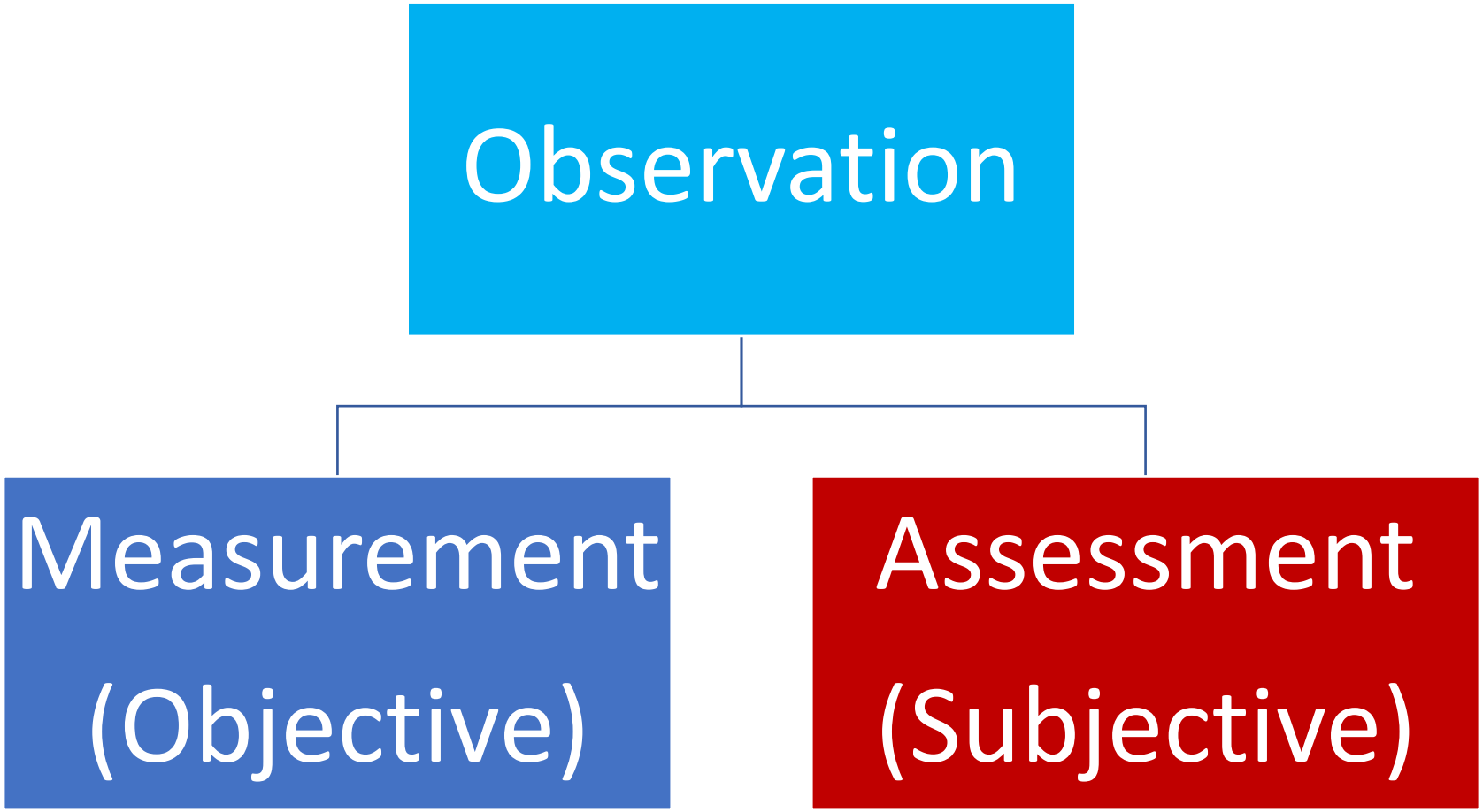
Tactical Technical and Physical Integration (Bradley & Ade 2018)


Mindset
Skills
Life performance
Physical performance
Health

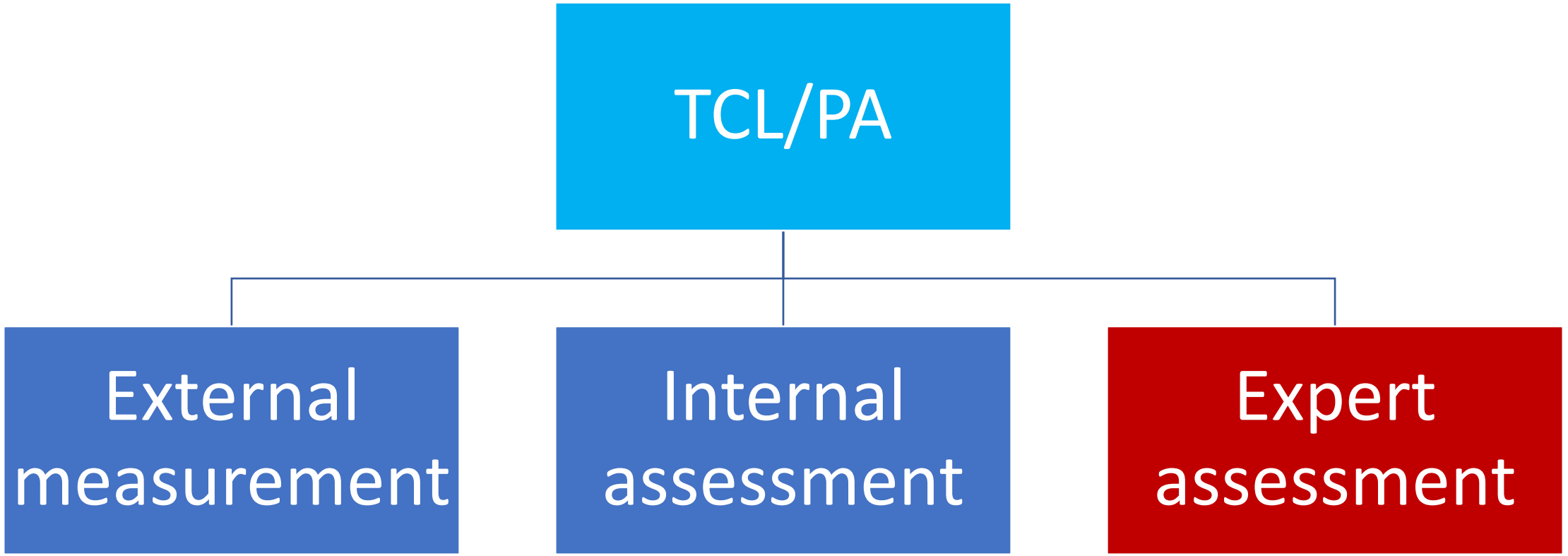
Load/=Performance confrontation…



Load and performance observation



Training and competition load assesment (TCLA)

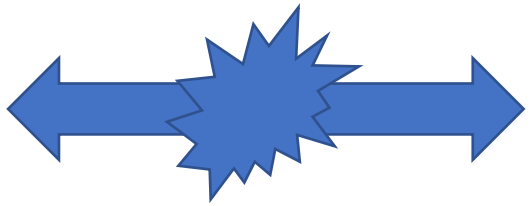


Measurement/Assessment individual approach

- NO same procedures for all players
- Logical/make sense
- MA content (tests/measures/parameters)
- MA frequency

Confrontation…

GENERALIZATION



INDIVIDUALIZATION

Individual approach…

	Player X (football)	Player Y (football)	Player Z (basketball)
WQ	sleep	mood	soreness
RPE	x	x	x
GPS	HIR, VHIR	TD, PL	ACC, DEC
BIOCHEMICAL	CK	Feritin	Vitamin D
FMS	Hip mobility	Lumbar stability	Knee stability
STRENGTH	LP	Pull-ups, SLsquat	DL, BP
POWER	CMJ, SqJ	SLJ	DJ
ENERGETIC	Lactate tresholds	IFT	VO2
MENTAL	Focus	Motivation	Emotional control
LIFE PERFORMANCE	Sleep management	Food management	Communication skills

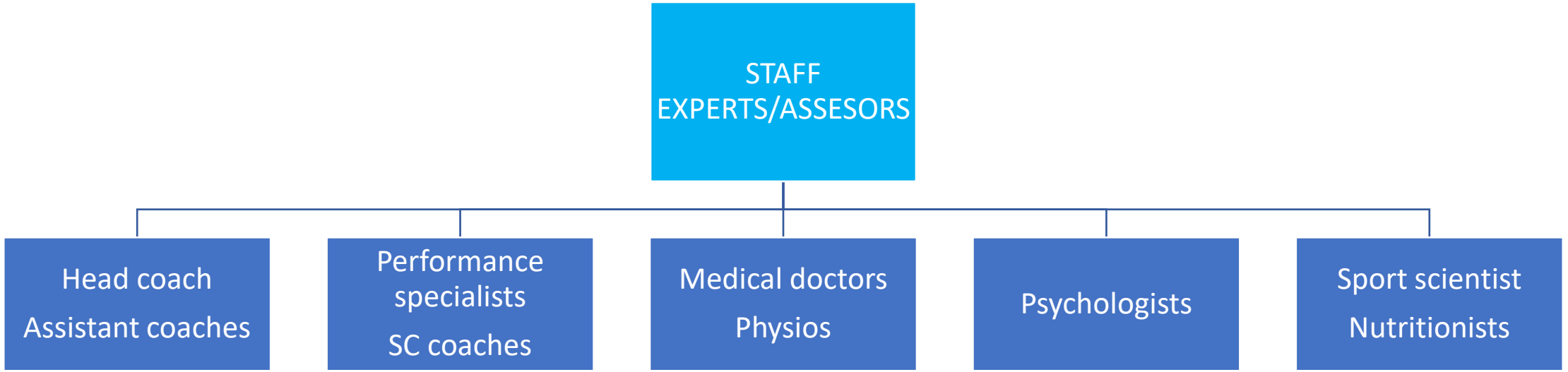
Performance in team sport…

…is an individual discipline!

Integral sport intelligence system

- Based on information about athlete’s load, performance and life status
- Qualitative (descriptive) and quantitative (numeric/questionary) assesment
- Integral approach (multidimensional and multidisciplinary)
- Experts from each performance sector are involved
- Holistic conclusions

Who?


STAFF
EXPERTS/ASSESORS
Head coach
Assistant coaches
Performance specialists
SC coaches
Medical doctors
Physios
Psychologists
Sport scientist
Nutritionists

When?

- Pre game/training/practice
- Game
- Training (physically oriented)
- Practice (skill oriented)
- Post game/training/practice
- Physiotehrapy/recovery
- Meals
- Travel
- Camp free time
- …

What?

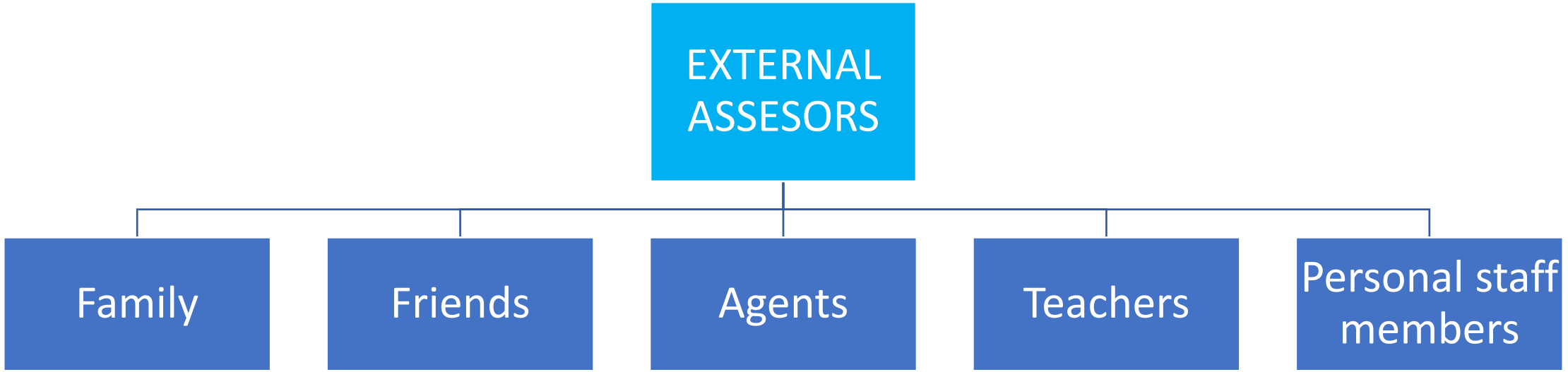
- Readiness
- Mood
- Reaction
- Muscle tension
- Mental sharpness
- Focus
- Agility
- Body language
- Discomfort tolerance
- …

Player history

How?

- Description (behaviour, body language…)
- Numeric rating (1-10) for certain characteristics (mood, focus, mental sharpness…)
- Video analysis (rections, agility…)
- Audio analysis (voice volume, intonation…)

Who?


EXTERNAL ASSESORS
Family
Friends
Agents
Teachers
Personal staff members

When?

- Home behaviour
- Private travel
- Fun
- Hobies
- Difficulties
- Money management
- Personal training
- Meals
- …

What?

- Mood
- Sleep
- Food
- Body language
- Focus
- Motivation
- Relationships
- …

How?

- Description (behaviour, body language…)
- Audio analysis (voice volume, intonation…)

SIS protocol…

Staff/Enviroment

Performance specialist/Intelligence manager

Head coach/Sport director/Owner

INTELLIGENCE MANAGER - HIGH PERFORMANCE SPORT NEW ZEALAND

5 days left

Recruiter
Sportspeople

Location
Auckland, New Zealand

Salary
Salary to attract high quality candidates

Posted
11 Sep 2018

Closes
21 Sep 2018

Sector
Elite Performance & Coaching, Federations & LOCs

Function
Coaching & Sports Development, Technical & Elite Performance, Strategy & Research, Planning & Strategy

Contract Type
Permanent

Hours
Full Time

Intelligence manager - job description…

- Reporting to the General Manager - Strategy, Intelligence and Networks, the **Intelligence Manager** will work to increase data capability, align and leverage existing capabilities, promote and coordinate data linkage across the organisation, and lay the foundation for a **system-wide intelligence model** post-Tokyo 2020.
- The role will also lead the organisation's capability to understand and act on **collective intelligence**, to measure progress against strategic intent and improve data flow between the organisation's staff and stakeholders.

Job description…

- A **strategic thinker** with a desire to create proactive and sustainable change, you must be able to analyse data and statistics in order to diagnose problems and identify operational actions that inform business objectives. You will be experienced in managing end-to-end analysis projects as well as embedding intelligence and insights as a vital part of an **organisation's 'decision-making toolkit'.**

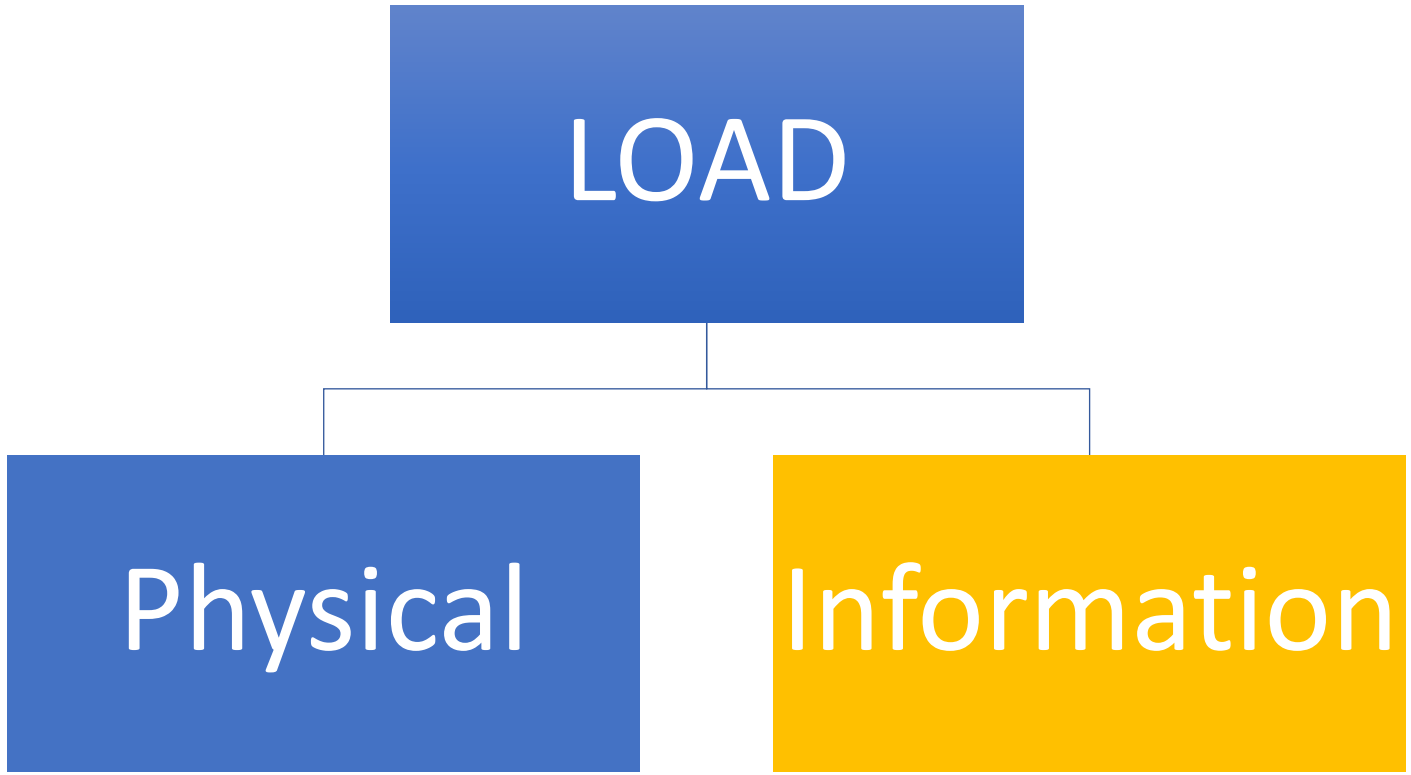
Job desription…

- A high standard of communication and interpersonal skills is required, with the capability to listen, build consensus, and consider diverse inputs. You will excel at **using data to ‘tell a story’** to both technical and non-technical audiences, identifying user requirements, engaging with external vendors, and implementing new systems and platforms.

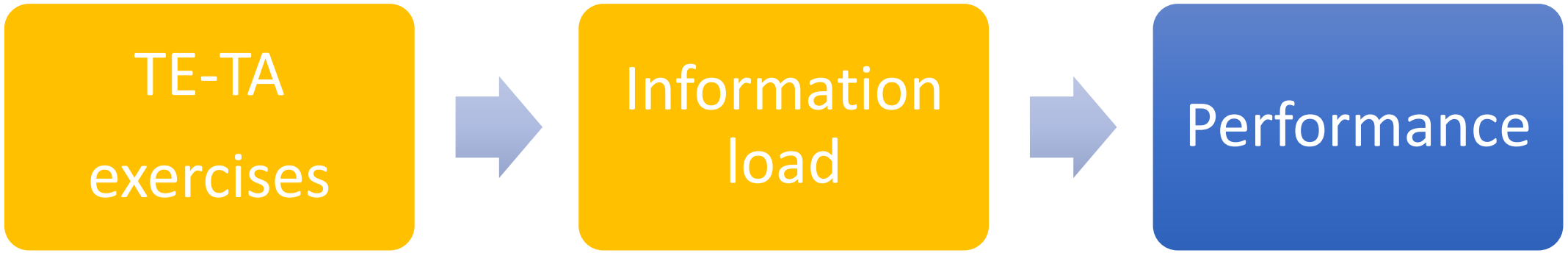
Examples…

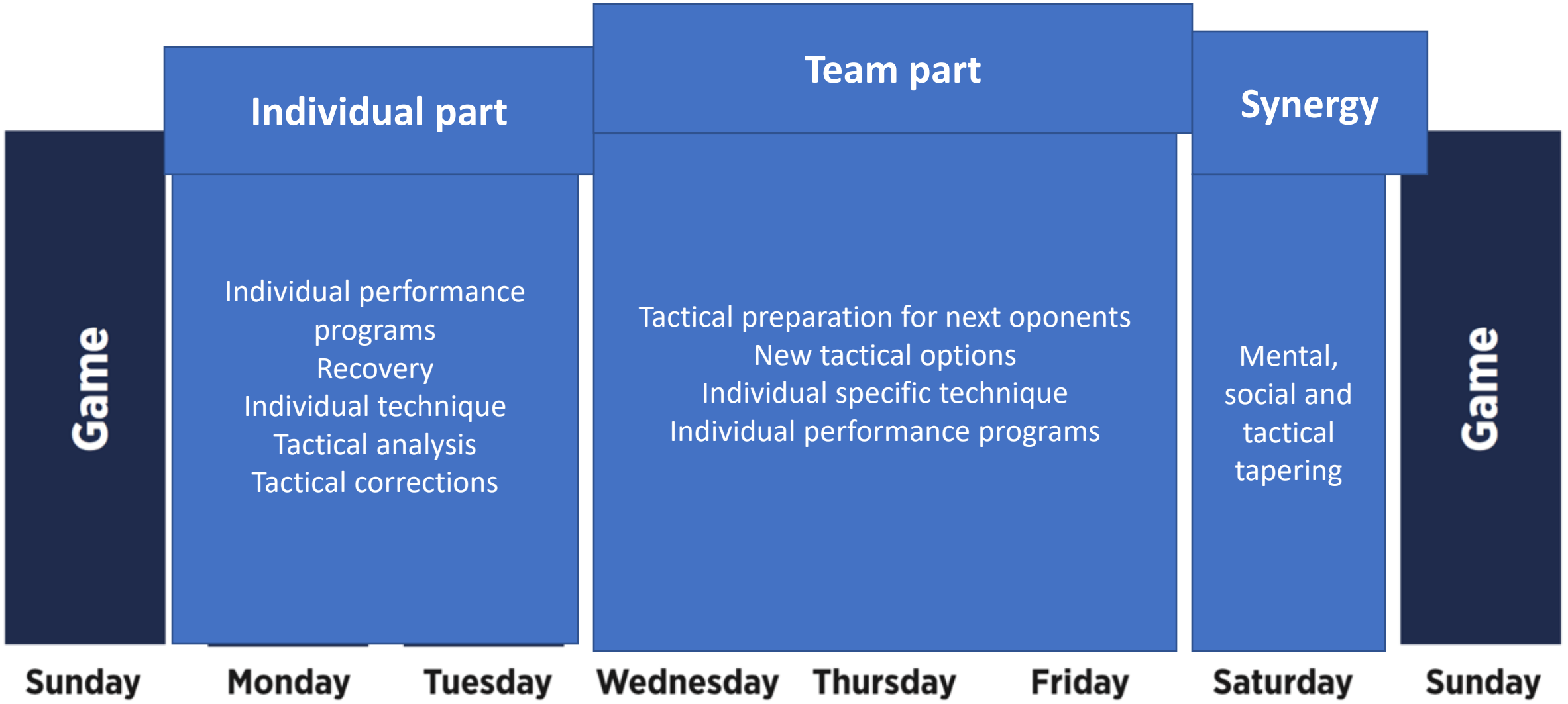
- Tactical periodization
- Travel management

Load structure



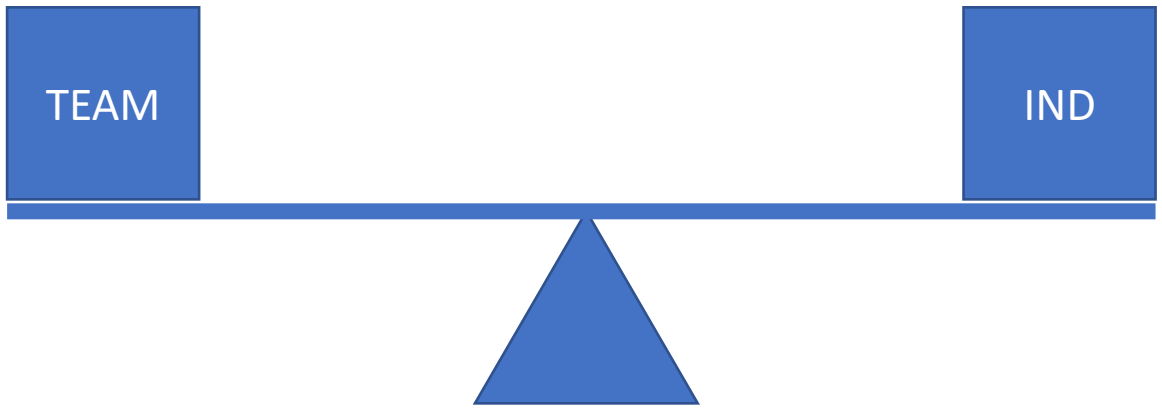
Technical-tactical content of training





Delgado-Bordonau & Mendez-Villanueva, Soccer Journal, May | June

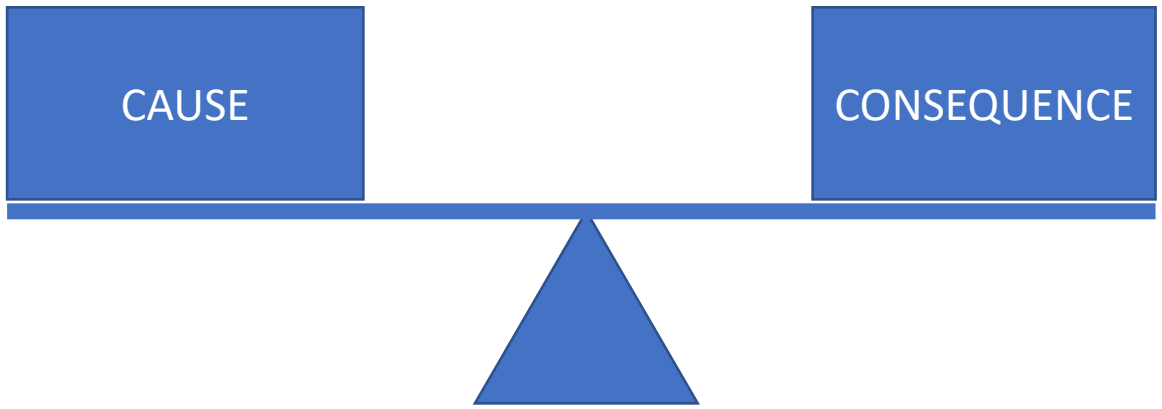
Team/individual needs balance…



Sleep or travel after the game…

FIRST BIOLOGY THAN PSYCHOLOGY

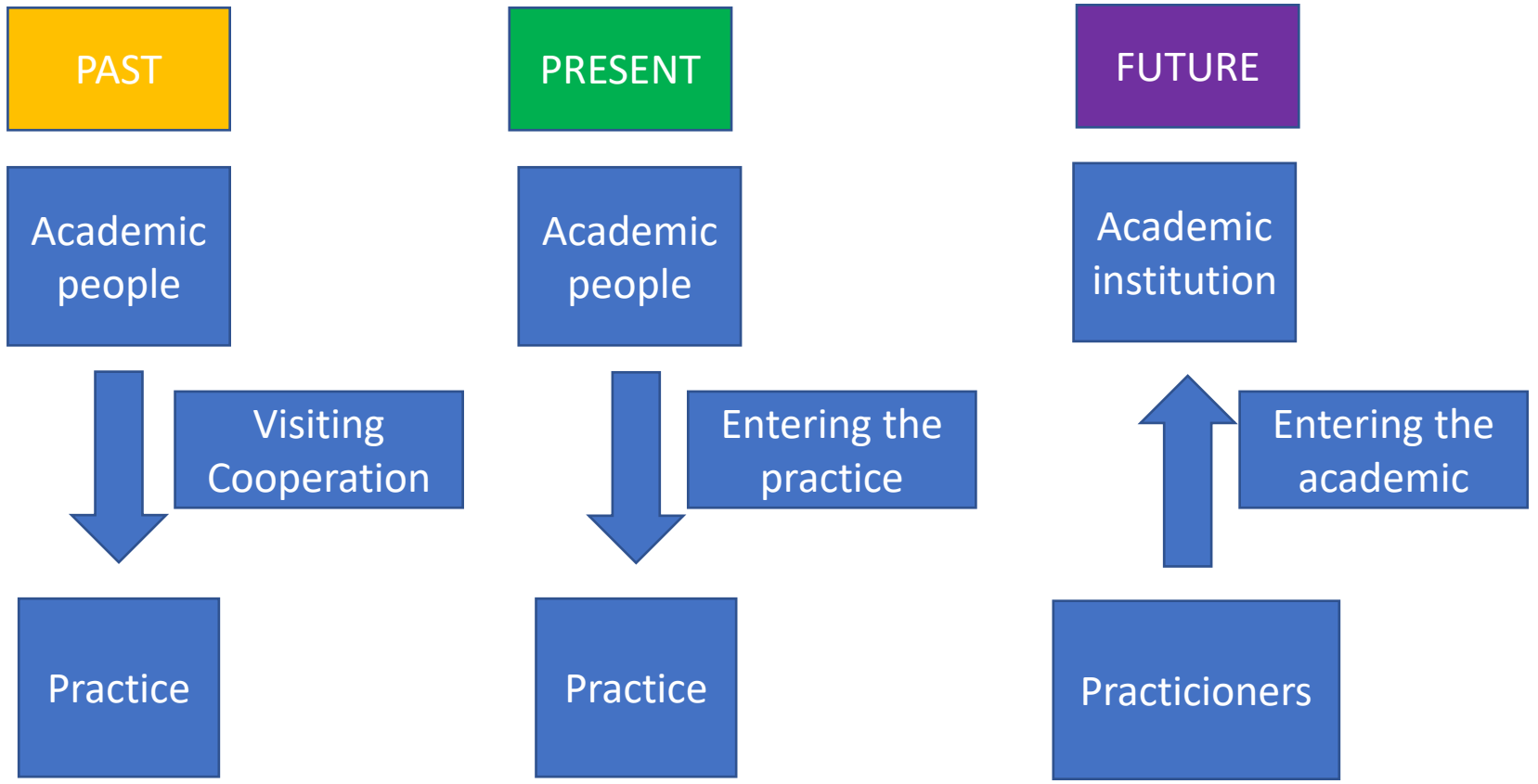
Reason/consequences…



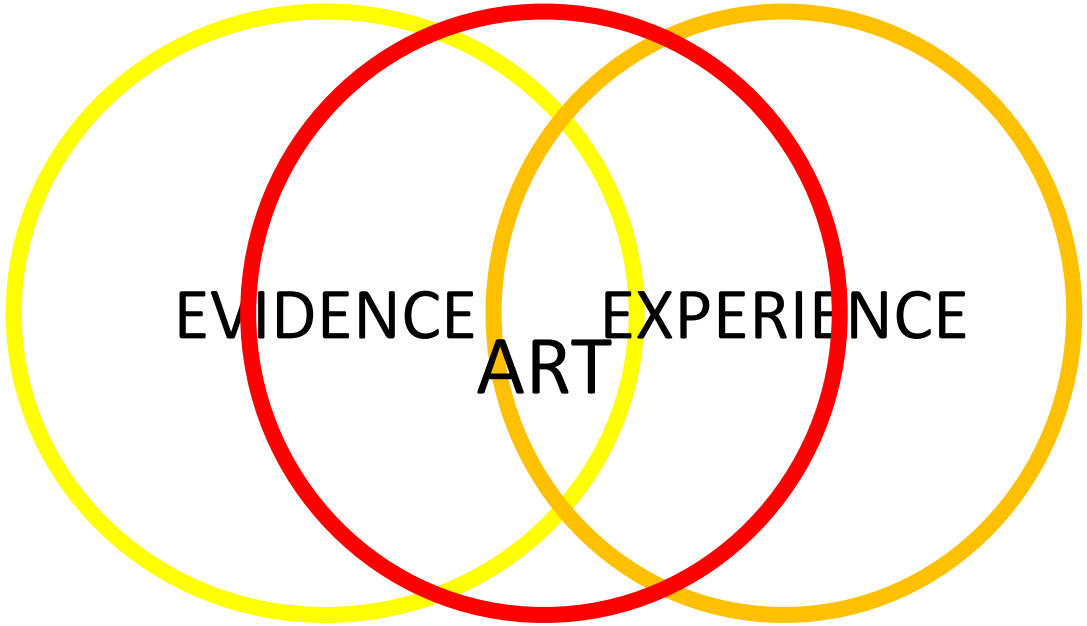
Bridging the gap

- Reverse process (mutual provocation)
- Priorities understanding (who works for who)
- Sport science is a tool. Tool for life/sport is life.
- First intrapersonal and than interpersonal

Scientists in practice



Evidence/experience/art



Marco Aurelius

- Everything we hear is an opinion, not a fact. Everything we see is a perspective, not the truth.