



CARDIO CONSULTING CONFERENCE

10th April 2018

Jozef Baker
EMEA Sports Scientist



Why monitor players?

Cardio Consulting Conference



OUR VALUE



Optimise Performance

Plan and deliver training stimuli which are appropriate to the needs of individuals and teams.



Return to Fitness

Map player recovery and rehabilitation to a position of full health and fitness

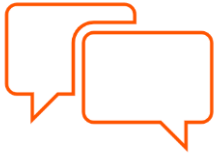


Injury Risk Management

Manage training load to minimise risk of athlete breakdown or performance loss

ADDED VALUE

Start a Dialogue



Challenge Subjectivity



Answer Performance Questions



Enhance Feedback



Inform Youth Development Pathway



Reduced Time Loss to Injury



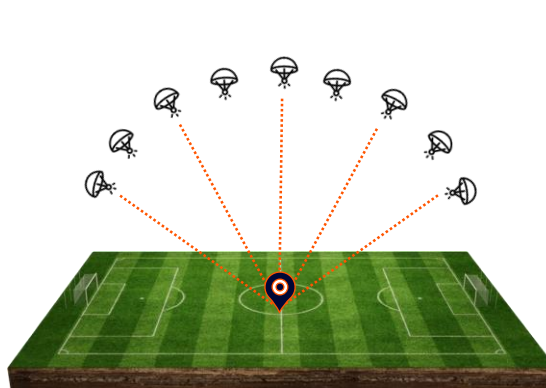
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HARDWARE

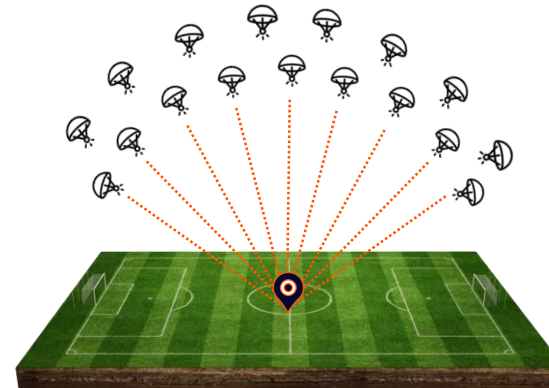


Global Positioning Systems

Hardware



GPS
31 Satellites



GNSS
55 Satellites



OPTIMEYE S5

POSITIONAL & INERTIAL

The S5 is the most widely used athlete tracking technology in elite sport.

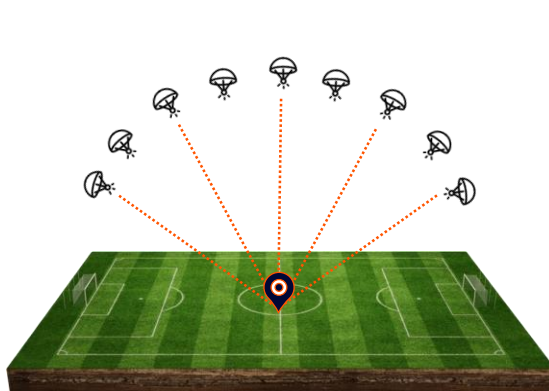
High quality GNSS movement data coupled with unique inertial sensor metrics gives practitioners valuable insights into athlete performance.

- Precision in outdoor environments
- Live and post-event analytics
- Sports-specific insights
- Chose and validated

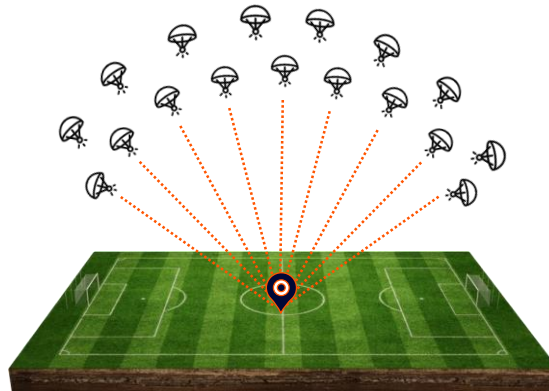


Local Positioning Systems

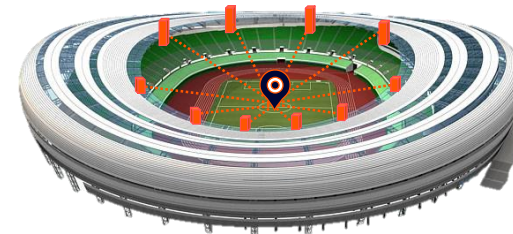
Hardware



GPS
31 Satellites



GNSS
55 Satellites



LPS
15+ Nodes



ClearSky T6

Hardware

Device componentry

- Almost 70% smaller and lighter than OptimEye S5
- Smart button surrounded by multi-use LED that signifies battery life, connectivity and heart rate integration
- **Heart Rate Polar compatible pickup:** Polar T31 Coded pickup compatibility.
- Smart vest compatible, smart sensors built into special garments
- **Memory:** 60 Hours of data storage
- **Battery:** Five hours
- High Speed USB connectivity when using multi-charger case. Charge and upload 28 devices at once.
- **NFC / Bluetooth connectivity**
- Two-pickup electrocardiogram recording (identify PQRTS wave)
- Auto player identification with integration of smart garment



Positional Tracking

- **Tracking Engine:** Up to 20 Hz LPS variable update rate
- **Wireless:** Bluetooth connectivity for ingesting external wireless device connectivity
- **Real-time data:** Using license free ultra wideband up to 100 players simultaneous @ 10Hz
- **ClearSky** uses ultra wideband (UWB), a very low energy level for short-range, high-bandwidth communications over a large portion of the radio spectrum

Inertial Sensors

- A market-leading Microelectromechanical (MEMS) device when not used with anchor nodes, enabling full inertial sensor data with no installation
- **Accelerometers:** 3D, +/-2,4,8 or 16g range (selectable), up to 1000Hz sample rate. 100Hz default
- **Gyroscopes 3D:** Up to 4000deg/sec upto 1000Hz sample rate. 100Hz default.
- **Magnetometers 3D:** Up to 1200 uT. Sample rate upto 100Hz. Default 100Hz.

PROVEN

VALIDATED BY RESEARCH, TRUSTED BY TEAMS

ClearSky has been independently validated by the world's leading research institutes. It is proven in match situations across multiple sports including Football, Australian Rules, Rugby Union, American Football and Basketball.



25

Professional competitions
tracked by ClearSky

13

Sports using ClearSky

19

Stadiums with
ClearSky installations



“From our experience with ClearSky, we are very **impressed by the accuracy of the positional data and portability of the system.**

ClearSky is ideal for use in both indoor and outdoor team sport.”

MATT SPENCER

Associate Professor, Norwegian School of Sport Sciences

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PRECISE

REAL-TIME POSITIONAL ACCURACY

The combination of real-time positional, inertial and event data makes ClearSky a platform which will add value to key performance decisions.



NRL STATE OF ORIGIN

CLEARSKY ENGAGES AUDIENCES WITH INNOVATIVE METRICS

In conjunction with the NRL, Channel Nine, the QRL, NSWRL and Telstra, the 'Telstra Tracker' used ClearSky during the 2017 State of Origin series to display live data to fans throughout all three games.

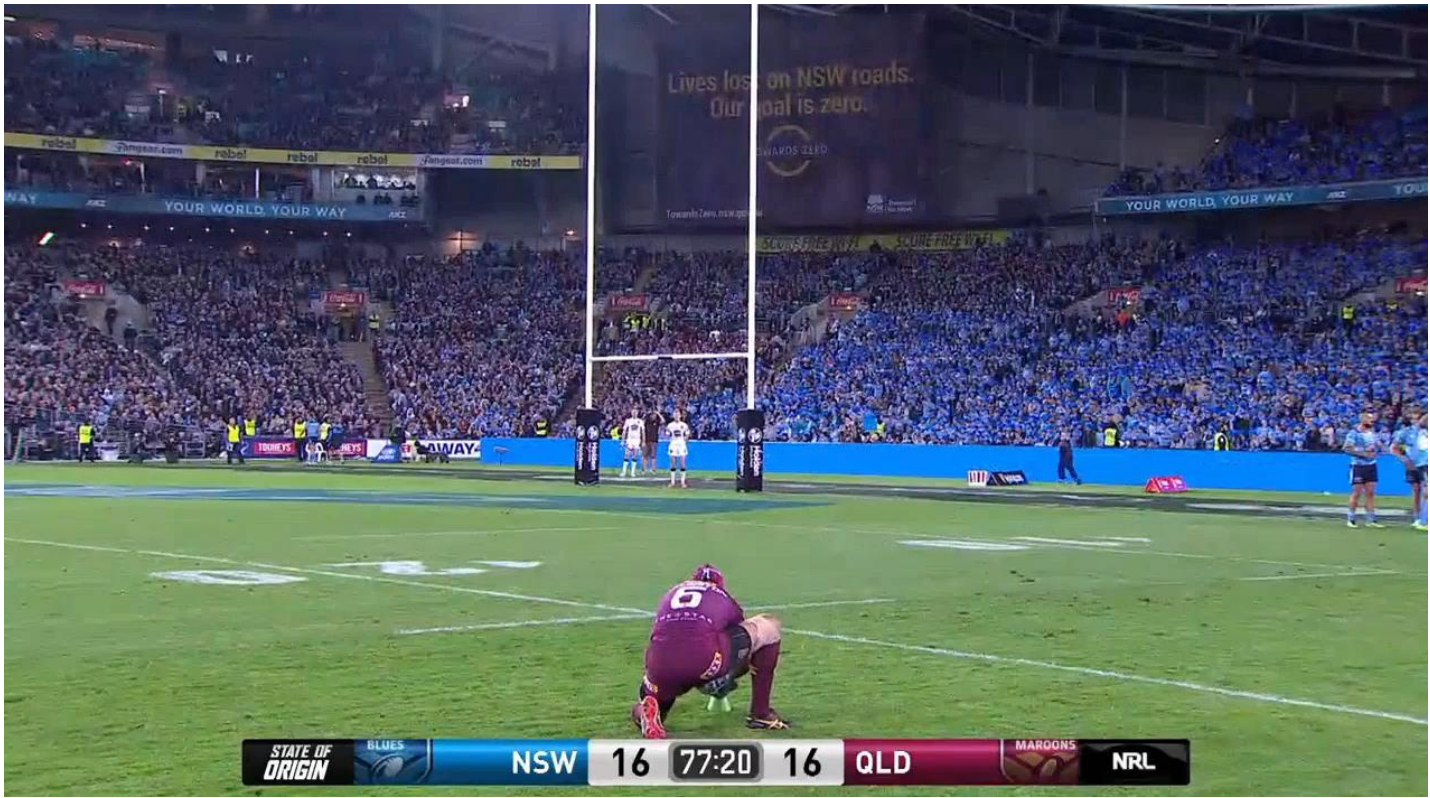


"This is a very exciting initiative for the game which will have significant benefits not only for our fans but for our players as well. With this advanced technology, viewers will be able to access new insights into how the game is played and it will no doubt further highlight the unbelievable athletic qualities of the best of the best in rugby league.

DAVID SILVERTON ,
Head of Strategy, National Rugby League

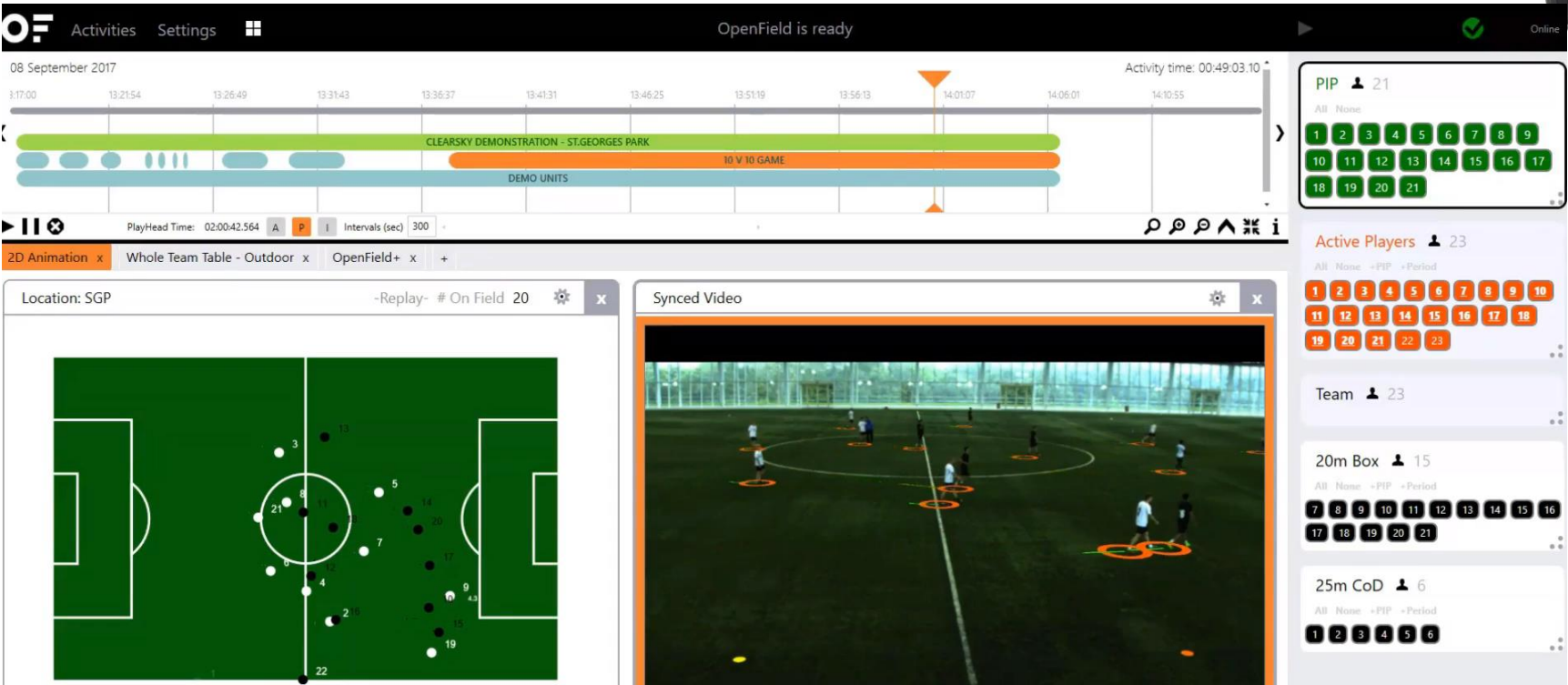


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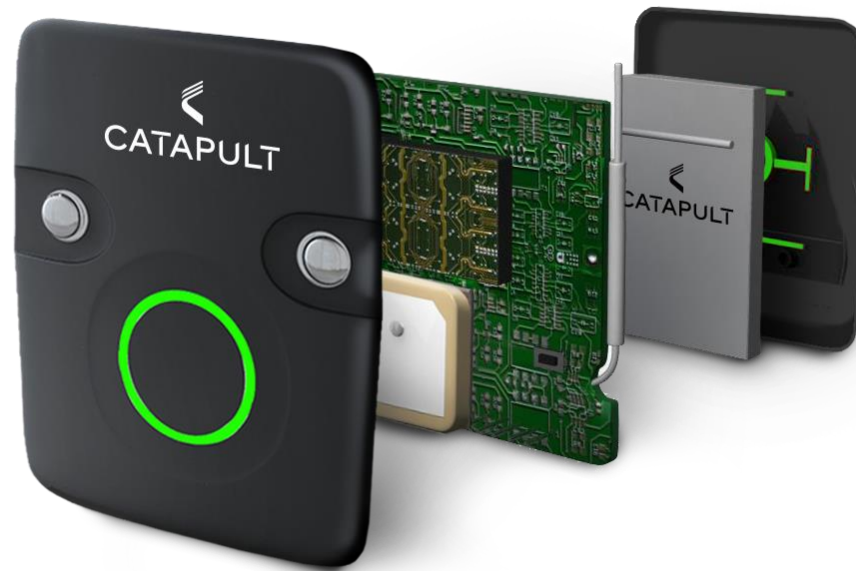
ClearSky T6

Hardware



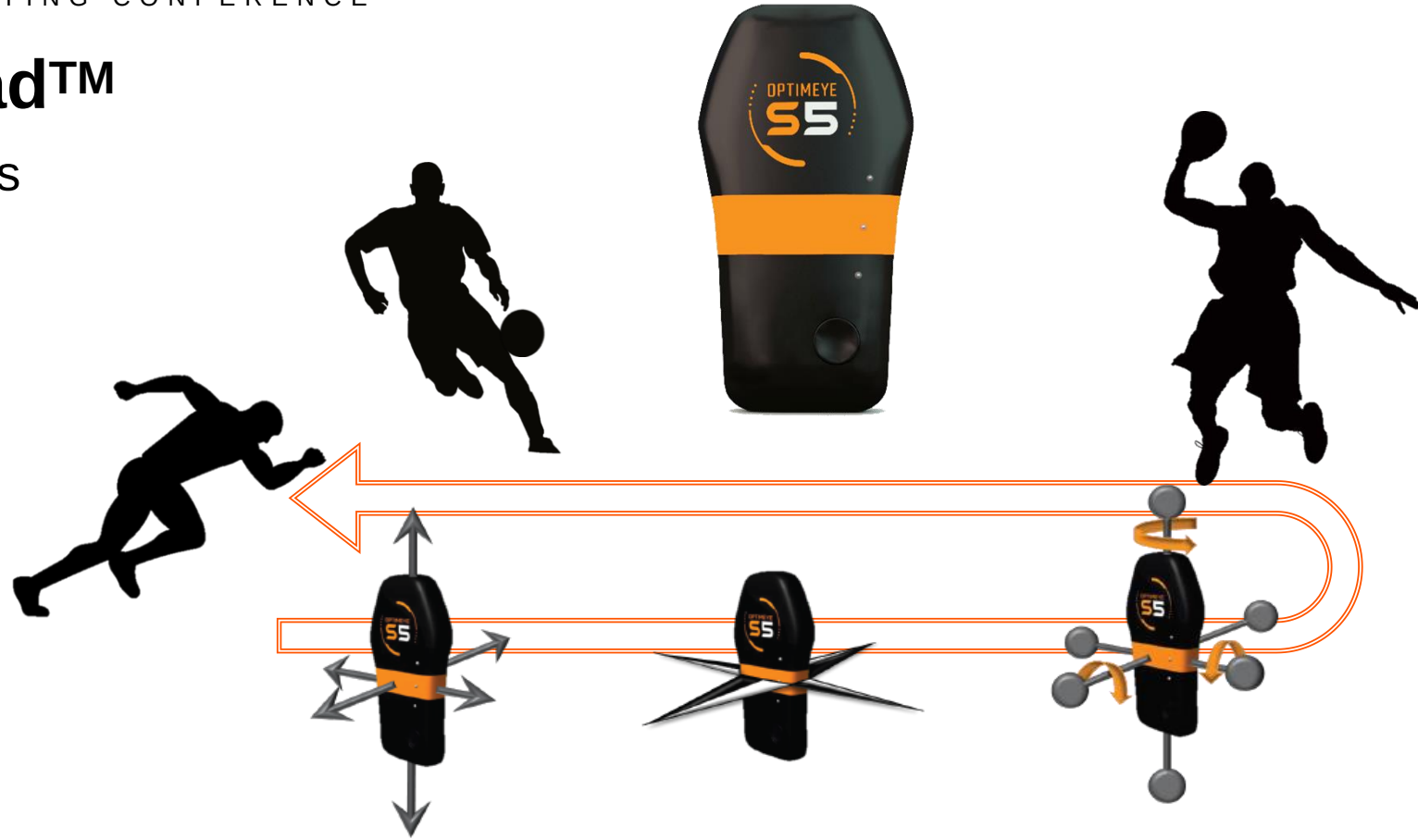
Inertial Sensors

Hardware



PlayerLoad™

Inertial Sensors



“LOAD”

Distance: 100 m
Avg Velocity: 14 km/h

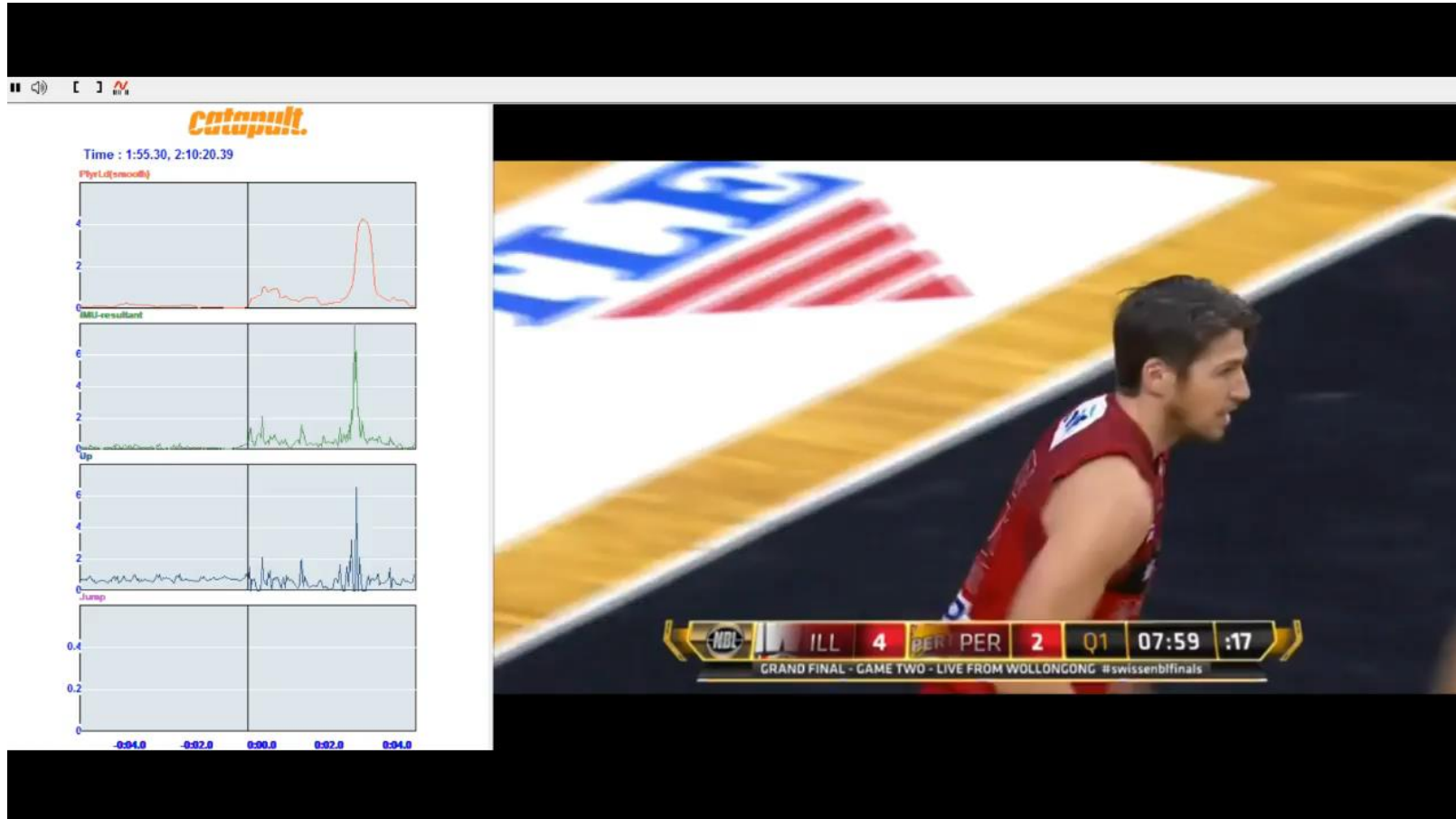


X
XXX



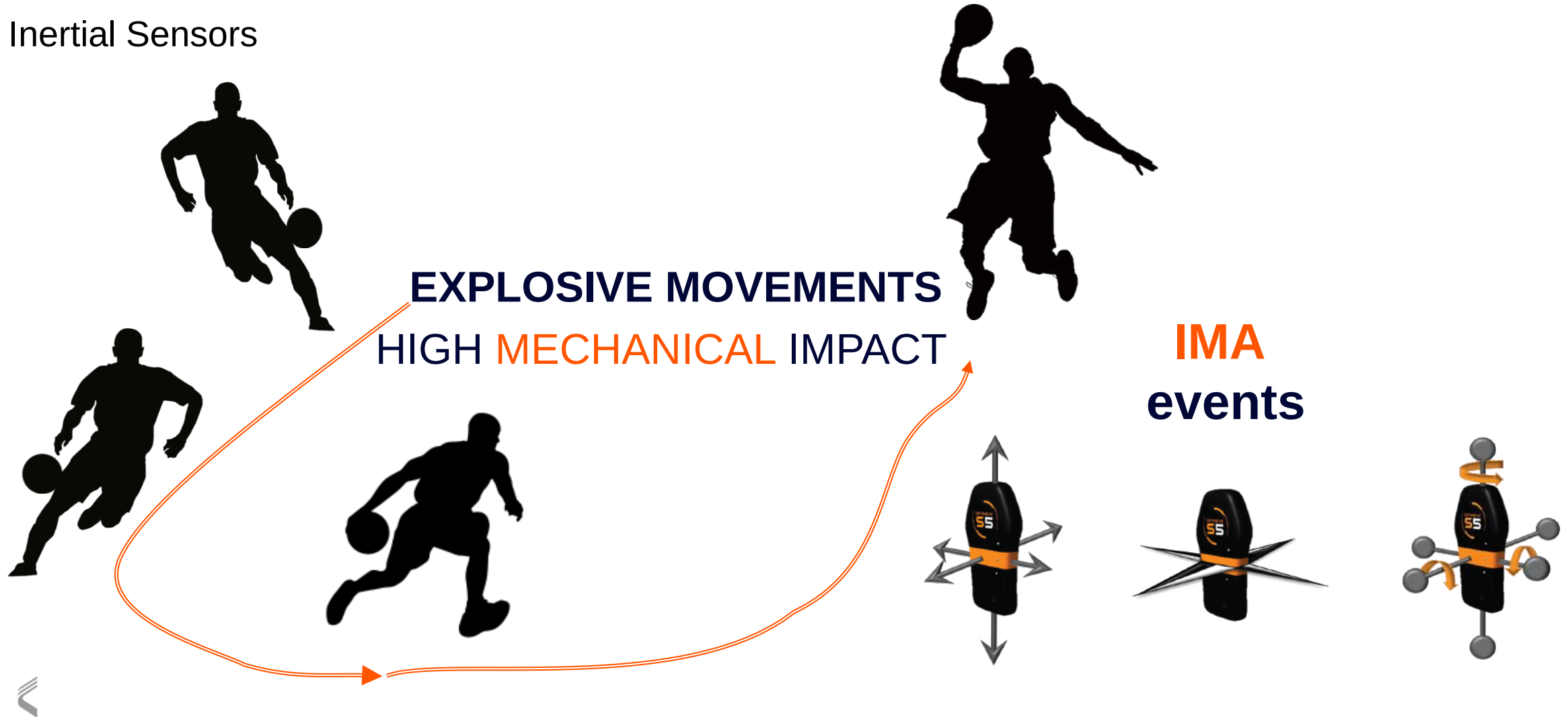
Load of Physical Contacts

Inertial Sensors



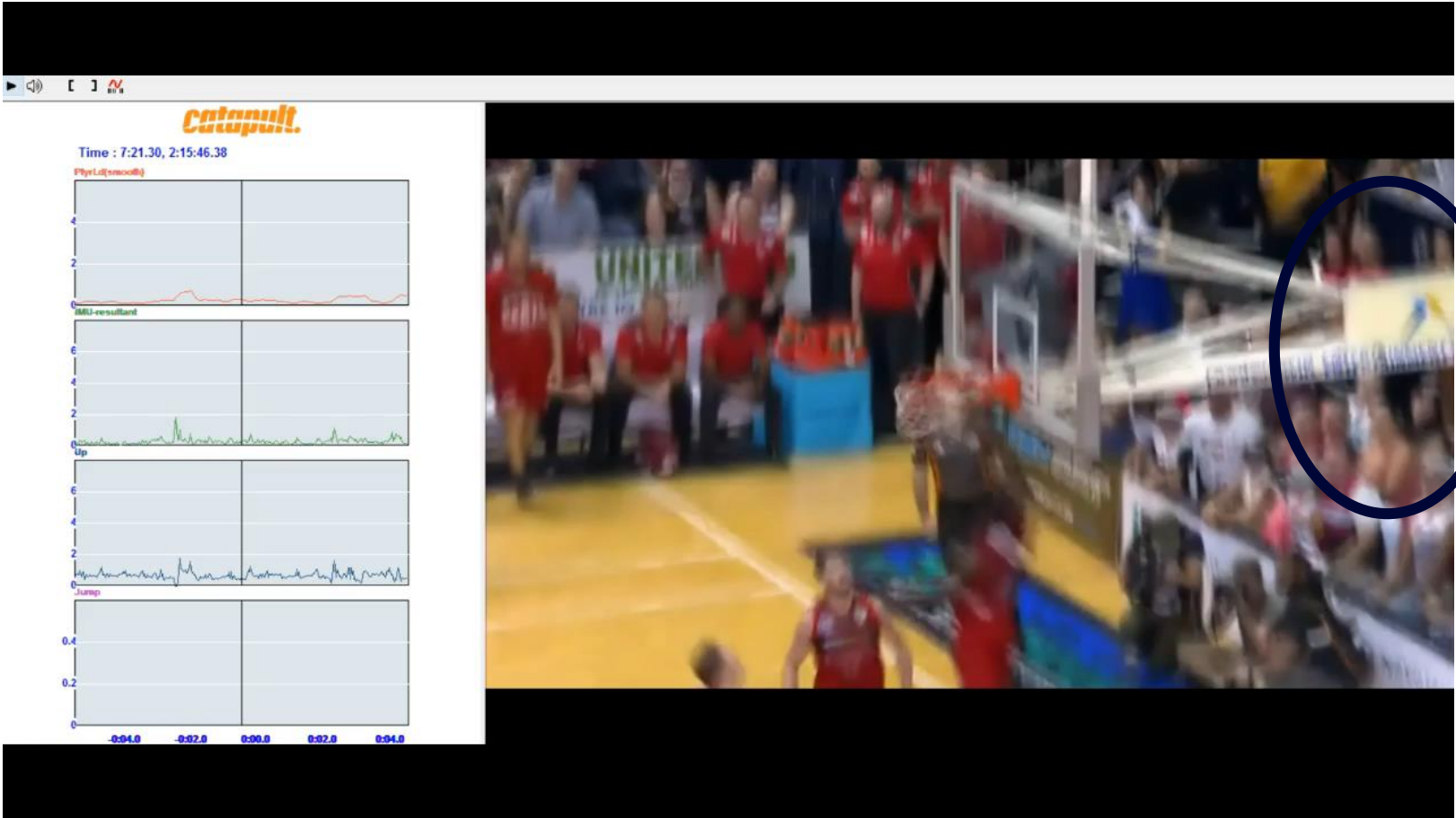
Inertial Movement Analysis

Inertial Sensors



IMA

Inertial Sensors

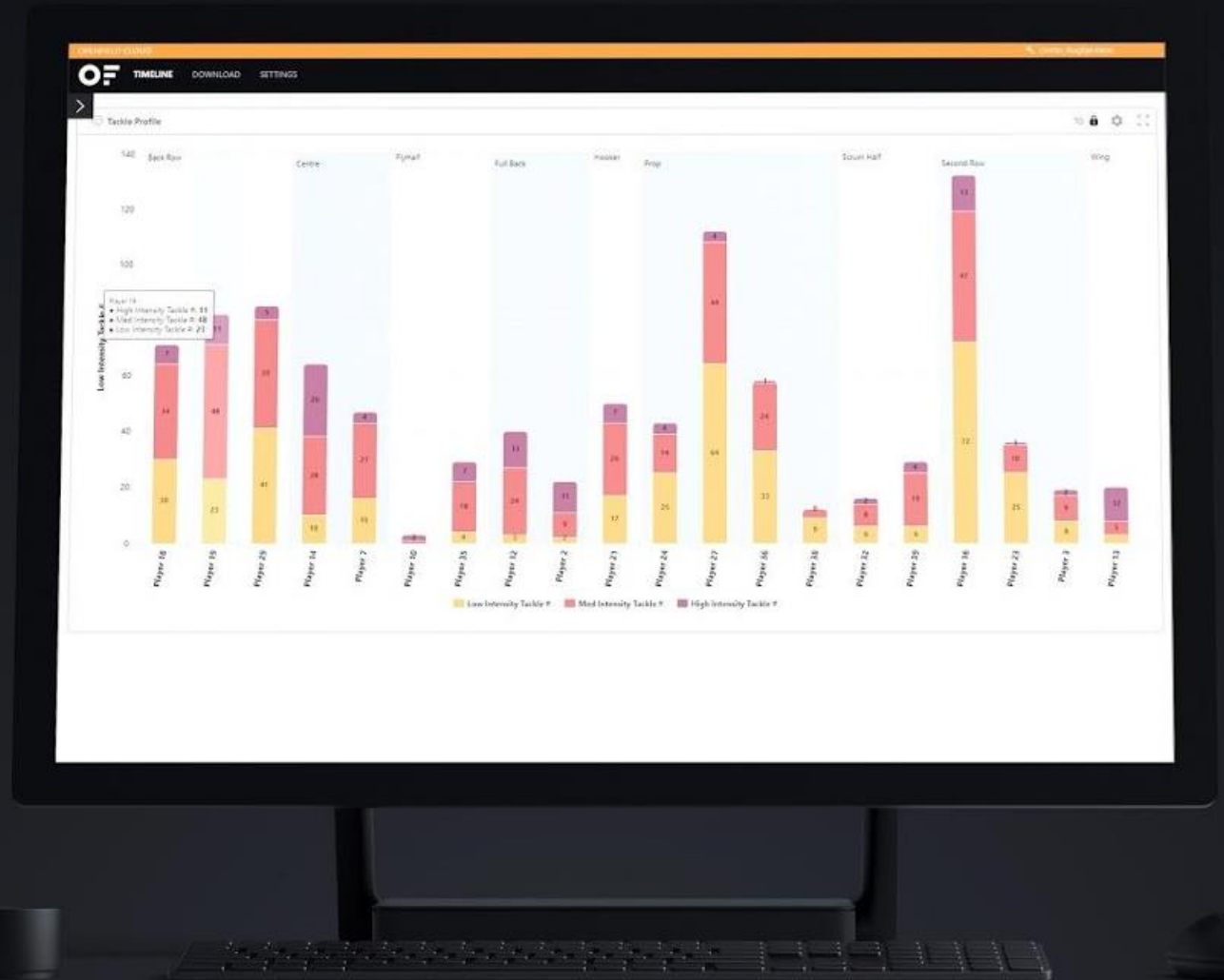


OPENFIELD SOFTWARE



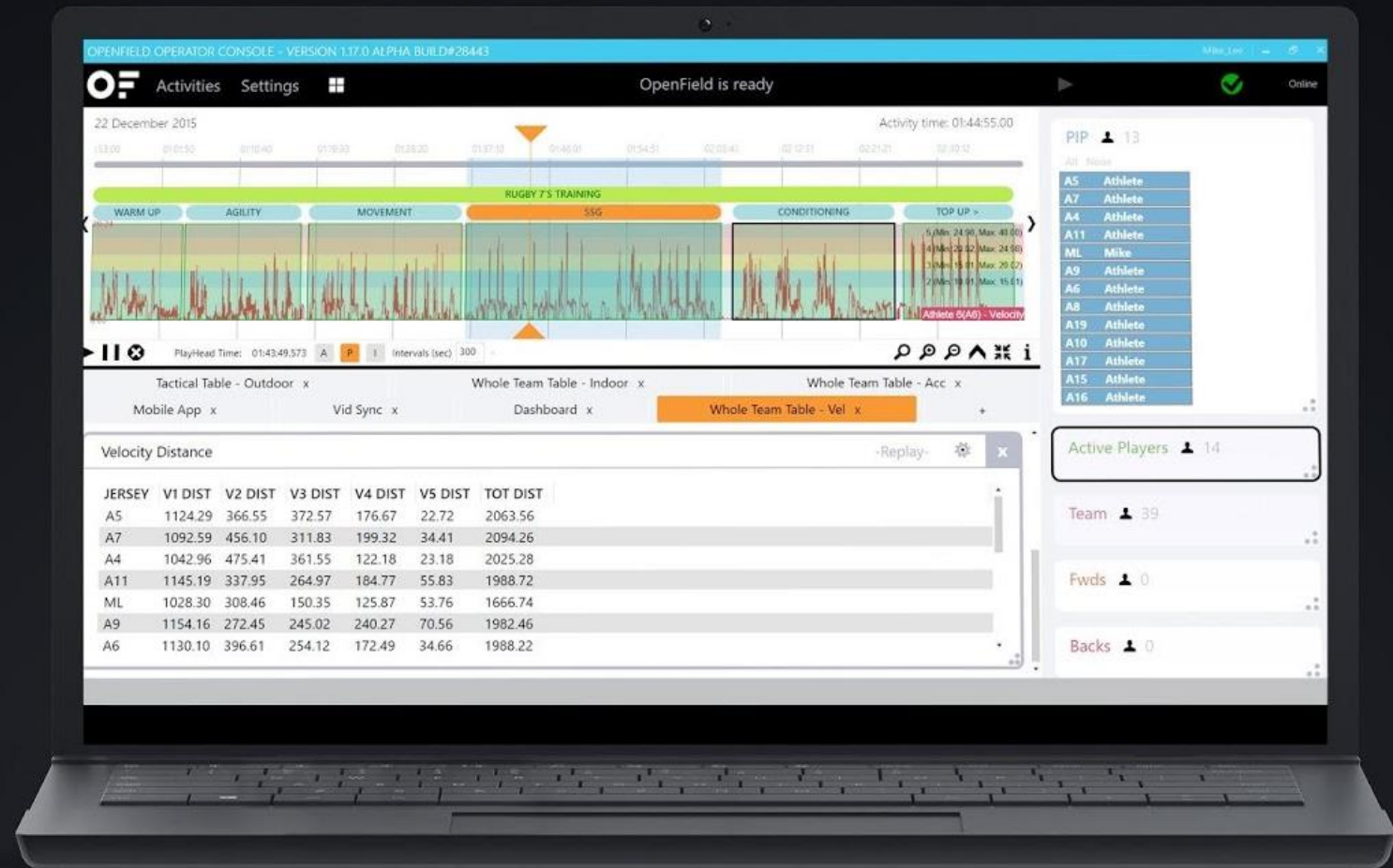
Personalised, Customised

With OpenField you have the option to work on pre-configured dashboards, or customise to create your own. The choice is there to do things your way.



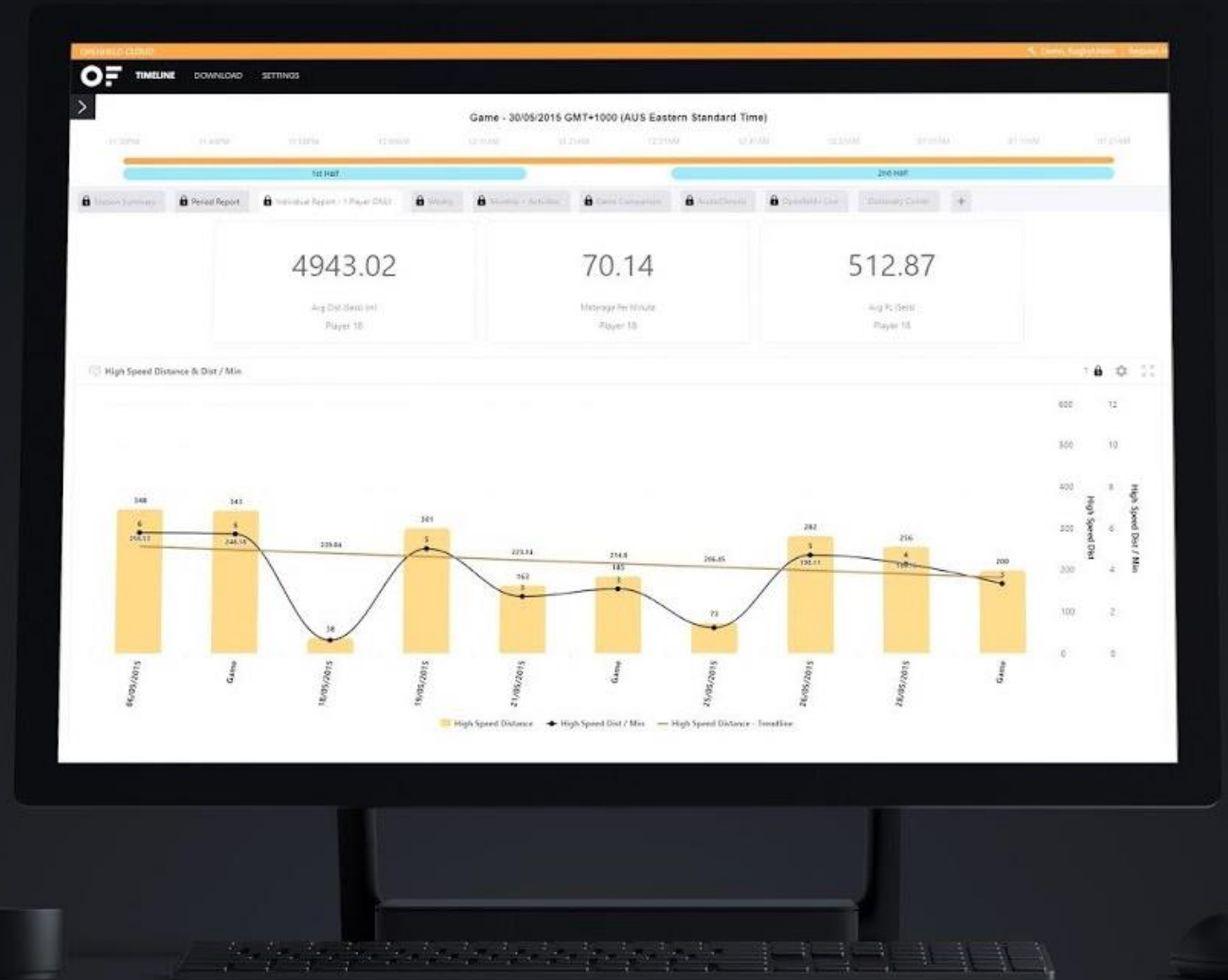
Designed for the Curious

As organisations evolve, so do the questions they ask of their data. OpenField provides a platform to ask more complex questions and create the dashboards which most effectively map athlete performance.



Past, Present & Future

Retrospectively report on what happened, make decisions in real-time, or plan and predict to minimise injury risk. The tagging feature in OpenField ensures the latest performances can easily be mapped against reference norms on an individual and team level.



Openfield+

Live iPad App

Available on the App Store, OpenField+ Live allows you to create drill periods, view performance and make decisions in real-time via your iPad.



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Openfield+

Live iPhone App

OpenField+ gives you the ability to create activities and periods on your mobile in real-time. Spend more time with your athletes and avoid post-session maintenance by conducting analysis on the go.



SERVICES

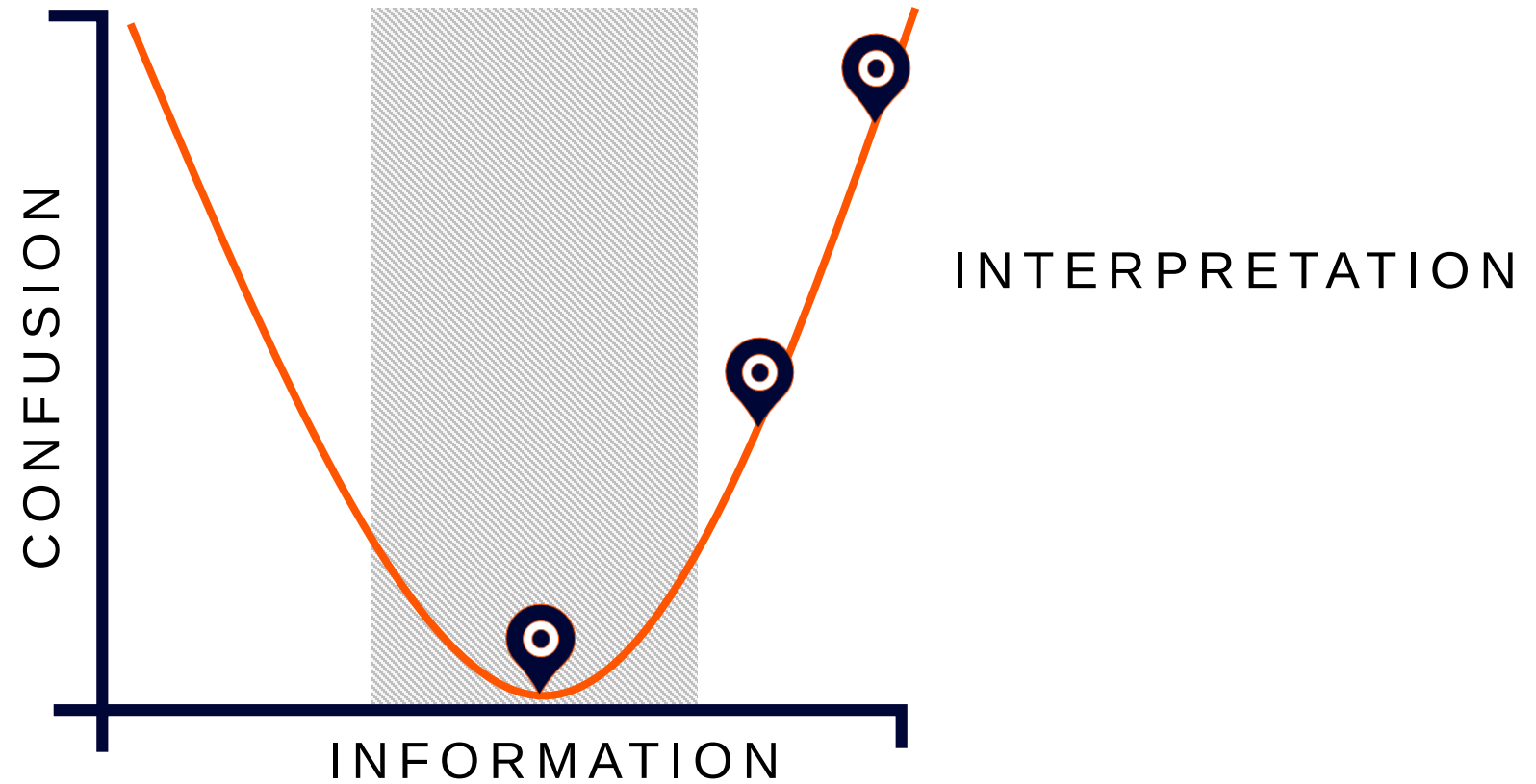
Better Information Better Decisions

Coaches are typically judged on the quality of decisions. These are often dependent on the information they receive and process.

For a coach to do this successfully information must be presented in the correct format.



Information Under/Overload



Player Monitoring

Cardio Consulting Conference



Optimise Performance

Plan and deliver training stimuli which are appropriate to the needs of individuals and teams.



Return to Fitness

Map player recovery and rehabilitation to a position of full health and fitness

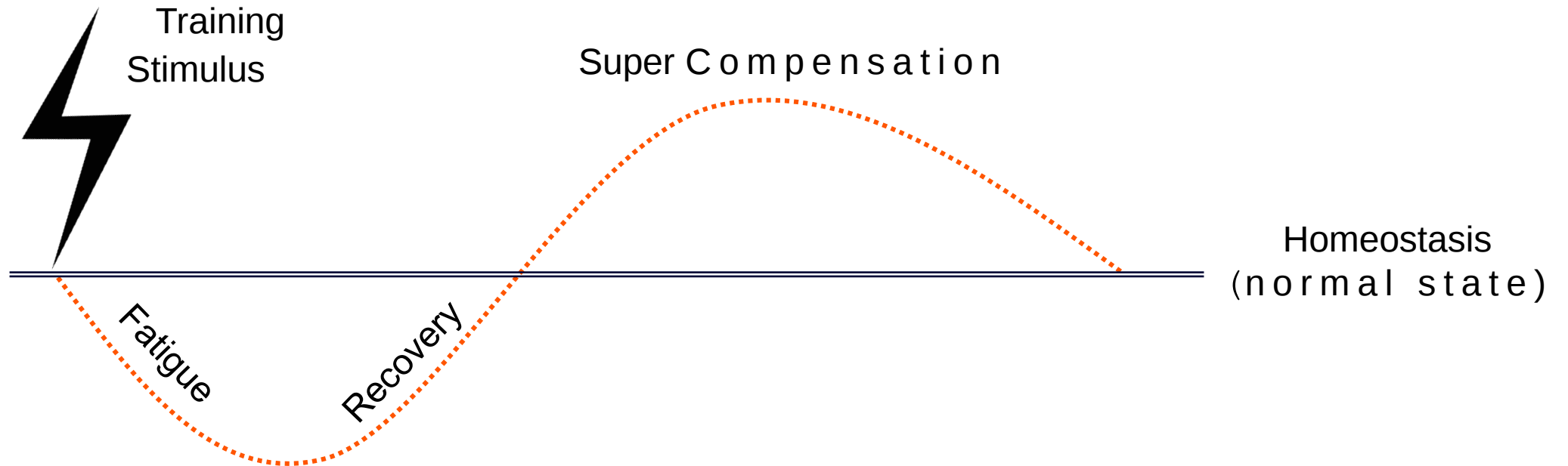


Injury Risk Management

Manage training load to minimise risk of athlete breakdown or performance loss

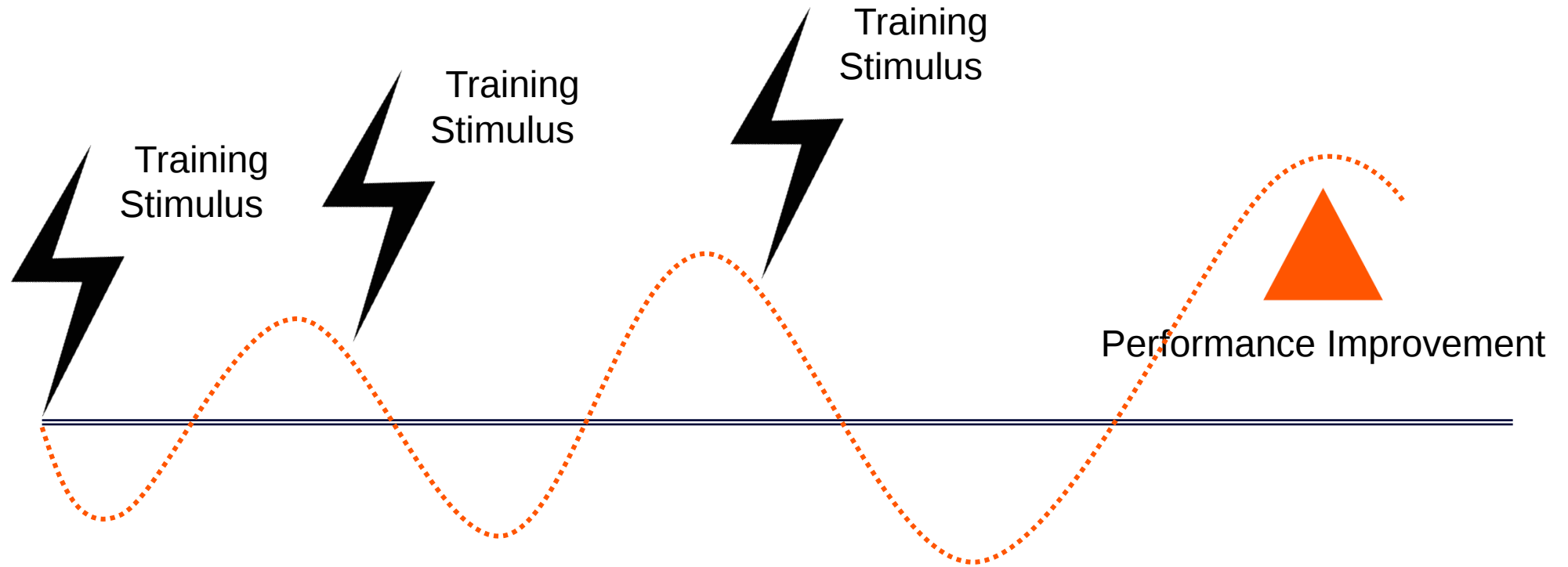
Super Compensation Curve

Optimise Performance



General Adaptation Syndrome

Optimise Performance



Metrics

Optimise Performance

Establishing Key Performance Indicators

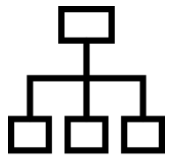


Training Process

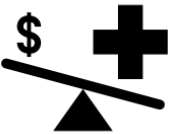
Optimise Performance



Individual
Characteristics



Organisation



Quality
and
Quantity



EXTERNAL
LOAD



INTERNAL
LOAD

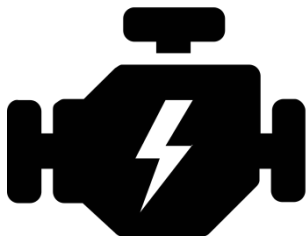


Training Process

Optimise Performance

INTERNAL
LOAD

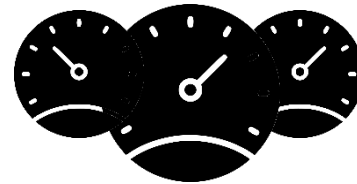
CARDIOVASCULAR



'the engine'

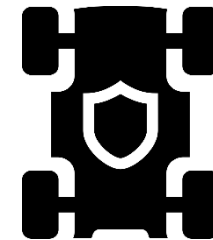
EXTERNAL
LOAD

LOCOMOTIVE



'the dashboard'

MECHANICAL



'the chassis'



Defining Work

Optimise Performance

How much work have I done?

VOLUME

At what rate have I produced the work?

INTENSITY

How well have I produced the work?

EFFICIENCY



Metrics

Optimise Performance

	VOLUME	INTENSITY
CARDIOVASCULAR	Heart Rate Exertion	Time >85% HRmax
LOCOMOTIVE	Total Distance	High Intensity Running
MECHANICAL	Player Load™	PL/min



Types of Load

Optimise Performance

Intensive to induce
training effect

Promotes recovery
processes

EXCESSIVE LOAD

TRAINABLE LOAD

MAINTAINING LOAD

RESTITUTION LOAD

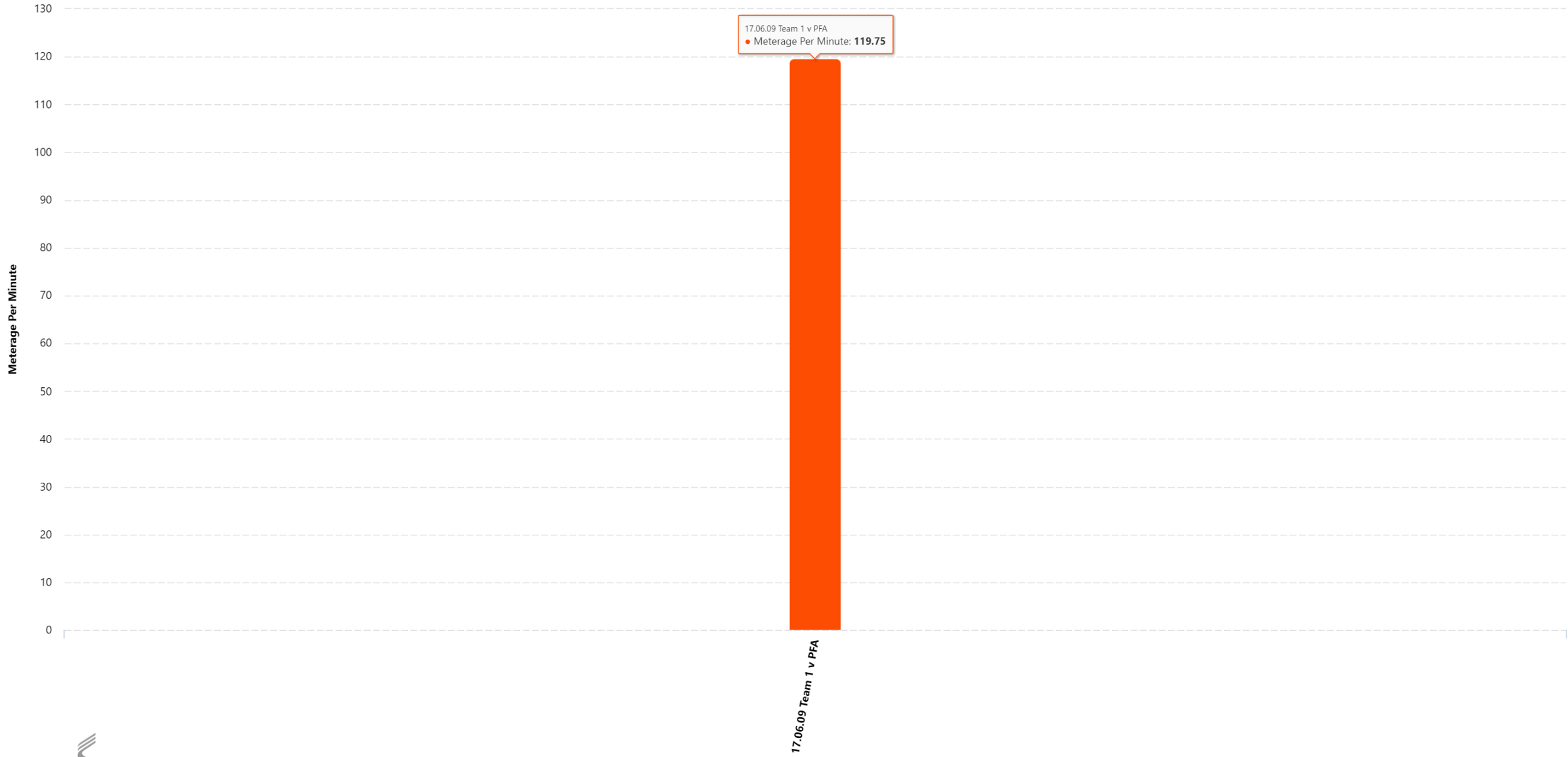
USELESS LOAD

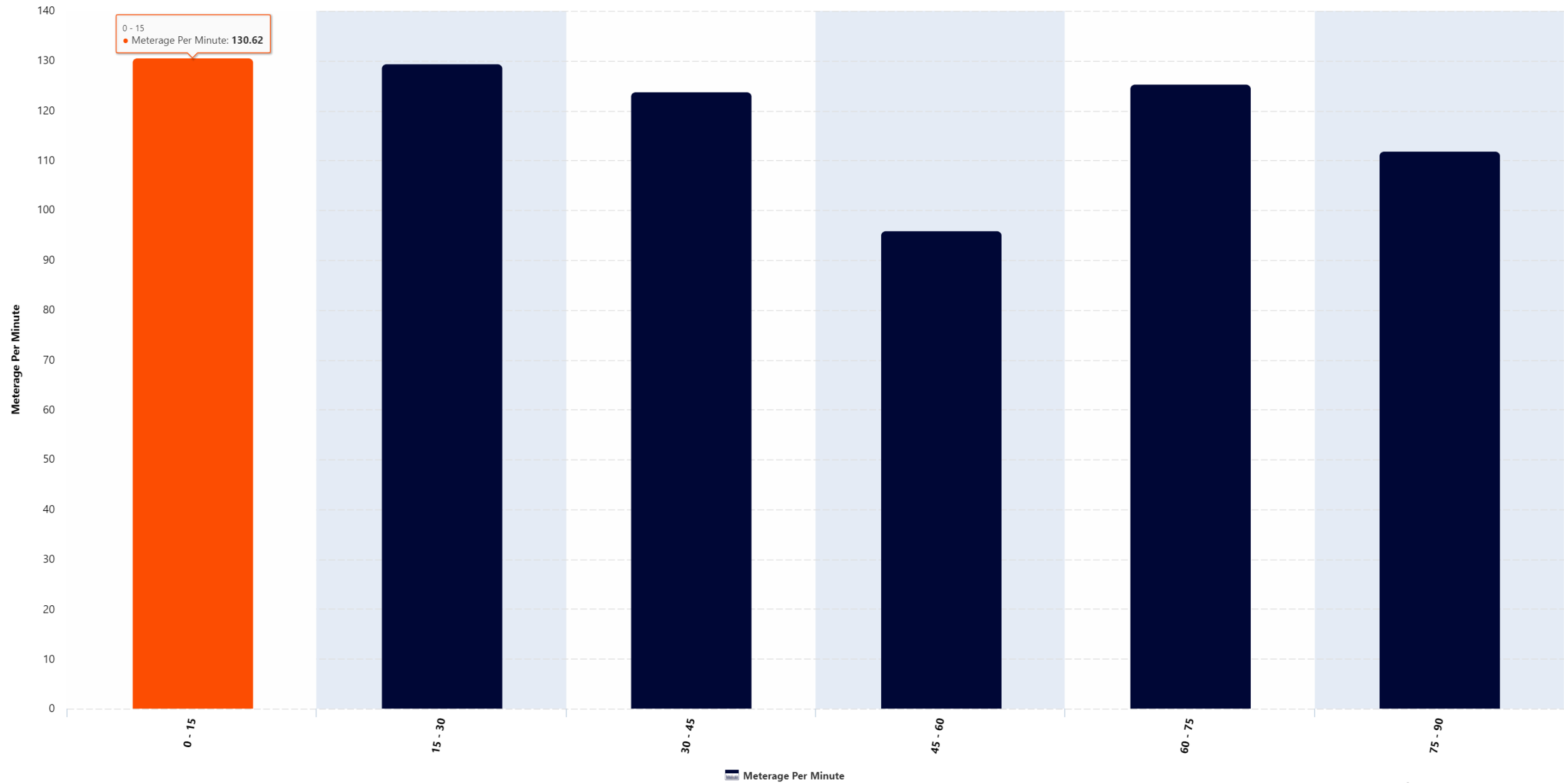
Surpassing the body's
adaptivity

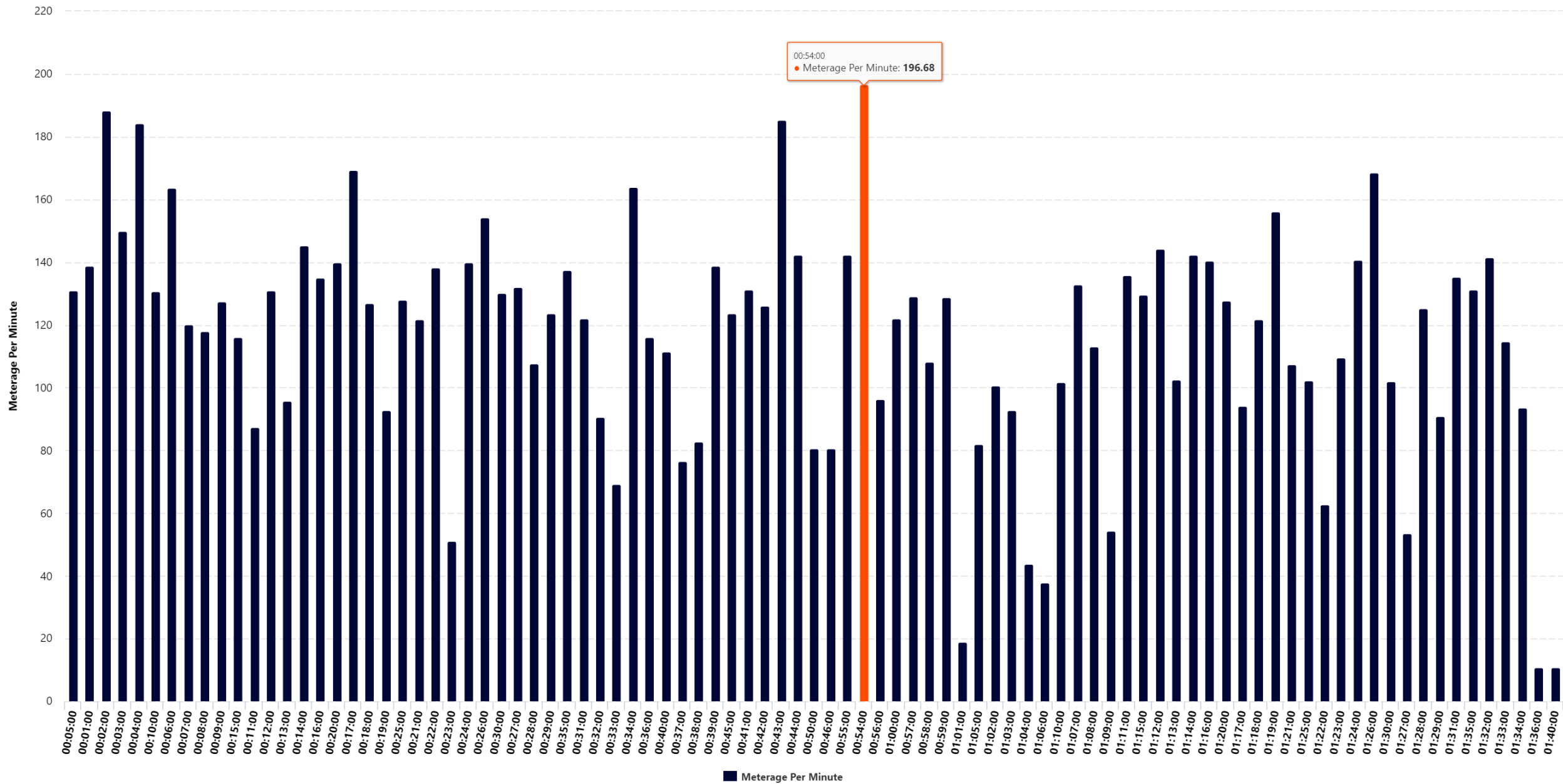
Sufficient to avoid
detraining

Sub-optimal for
adaptation/recovery









00:54:00
● Meterage Per Minute: 196.68

■ Meterage Per Minute



Types of Load

Optimise Performance

15min – 1min
Breakdown?

40 – 50%

EXCESSIVE LOAD

>196 m/min?

TRAINABLE LOAD

MAINTAINING LOAD

Match Average?

RESTITUTION LOAD

USELESS LOAD

<20% <30%?



Volume & Intensity Metrics

Optimise Performance

Name

Percentage Volume

Calculation

```
((($total_distance/11000)+(($velocity_band5_total_distance+$velocity_band6_total_distance)/1000)+(($acceleration_band1_total_effort_count+$acceleration_band2_total_effort_count+$acceleration_band3_total_effort_count)/30)+(($acceleration_band6_total_effort_count+$acceleration_band7_total_effort_count+$acceleration_band8_total_effort_count)/45)+($total_player_load/950))/5)*100
```

Add Parameter

Pi

Add Function to Calculation

Add Parameter

Acceleration Band 1 Average Distance

Add Parameter to Calculation



Volume & Intensity Metrics

Optimise Performance

Name

Percentage Intensity

Calculation

$$\begin{aligned} & (((((\$total_distance)/(\$total_duration/60))/ (11000/90)) + (((\$velocity_band5_total_distance + \$velocity_band6_total_distance)/(\$total_duration/60))/ (1000/90)) + (((\$acceleration_band1_total_effort_count + \$acceleration_band2_total_effort_count + \$acceleration_band3_total_effort_count)/(\$total_duration/60))/ (35/90)) + (((\$acceleration_band6_total_effort_count + \$acceleration_band7_total_effort_count + \$acceleration_band8_total_effort_count)/(\$total_duration/60))/ (45/90)) + (((\$total_player_load)/(\$total_duration/60))/ (950/90)) + (((\$ima_band2_accel_count + \$ima_band3_accel_count + \$ima_band3_decel_count + \$ima_band2_decel_count + \$ima_band3_left_count + \$ima_band2_left_count + \$ima_band3_right_count + \$ima_band2_right_count + \$ima_band2_jump_count + \$ima_band3_jump_count)/(\$total_duration/60))/ (150/90))) / 6) * 100 \end{aligned}$$

Add Parameter

Pi

Add Function to Calculation

Add Parameter

Acceleration Band 1 Average Distance

Add Parameter to Calculation



Volume & Intensity – Practical Example

Optimise Performance

	Percentage Volume	Percentage Intensity
	90%	84%
	108%	100%
	99%	95%
	61%	90%
	94%	89%
	108%	102%
	104%	118%
	57%	103%
	85%	79%
	56%	103%
	55%	104%
	50%	92%



When to ‘go hard’

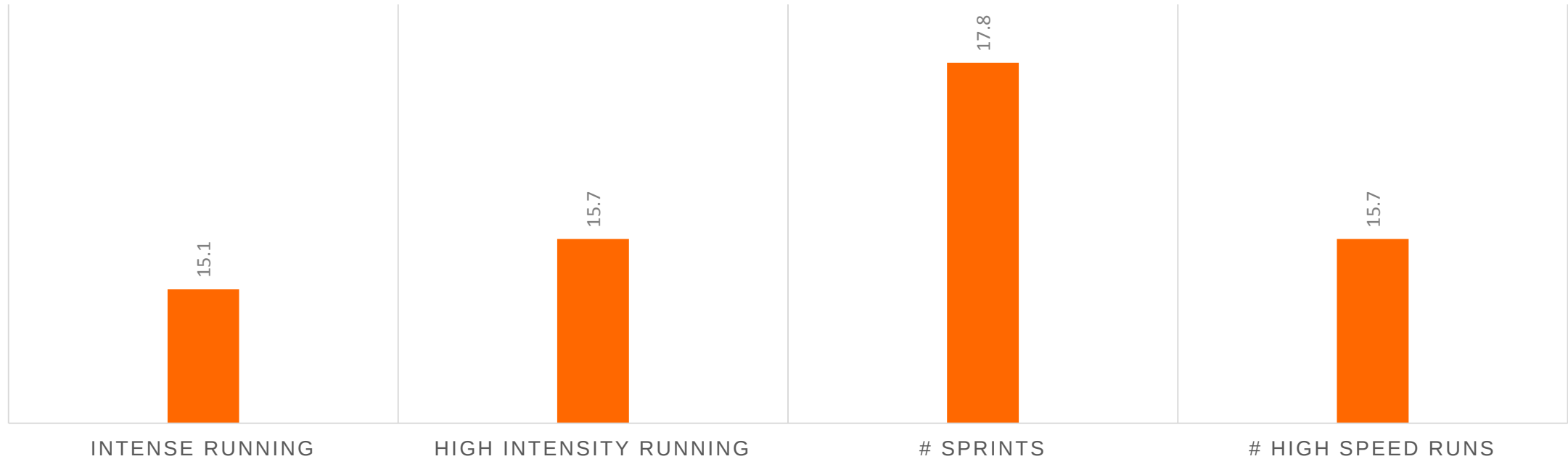
Optimise Performance

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1	MATCH			MATCH	RECOVERY		
2	MATCH	RECOVERY			MATCH	RECOVERY	
3	MATCH	RECOVERY		LOADING?	LOADING?	MAINTENANCE?	
4	MATCH	RECOVERY		LOADING?	MAINTENANCE?		MATCH
5	RECOVERY			MATCH	RECOVERY		MATCH



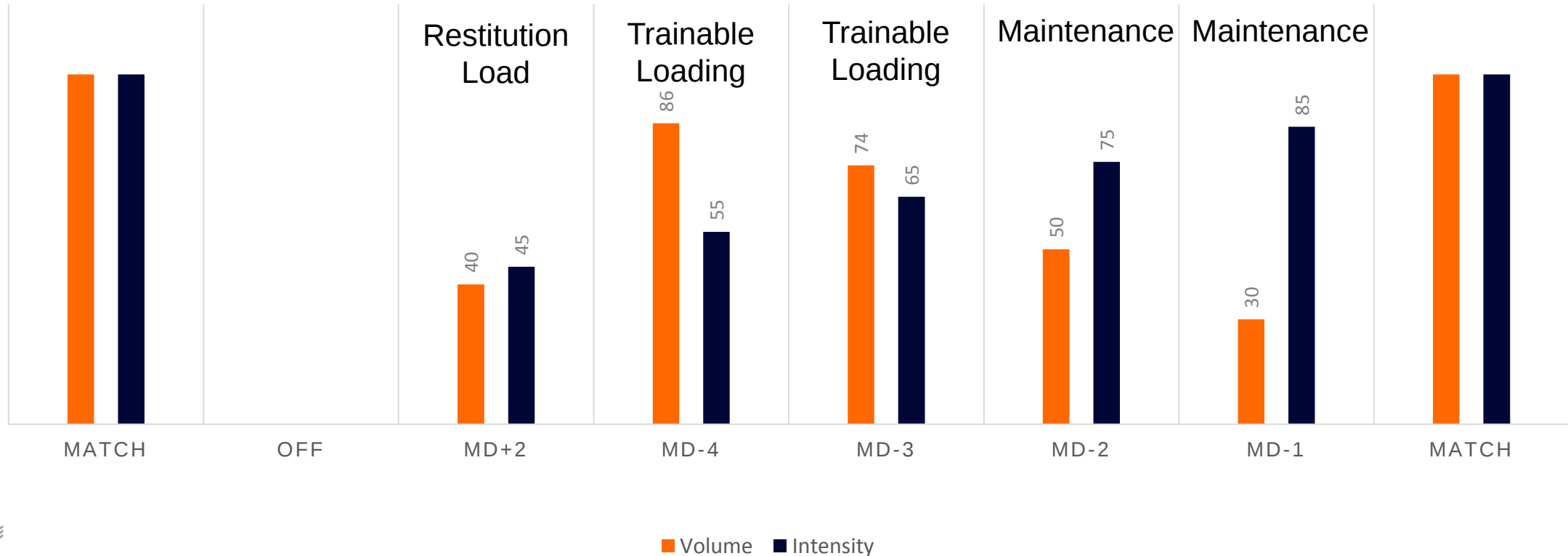
Taper Microcycle Weeks

Optimise Performance



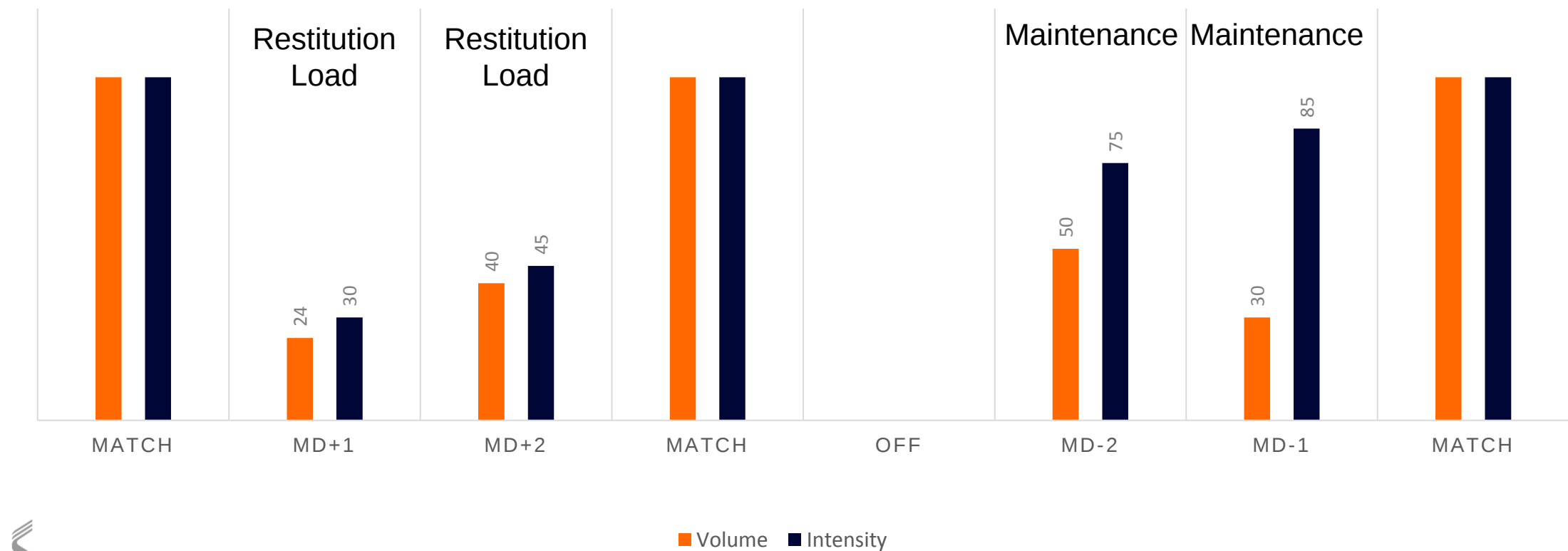
Microcycle – 1 Match Week

Optimise Performance



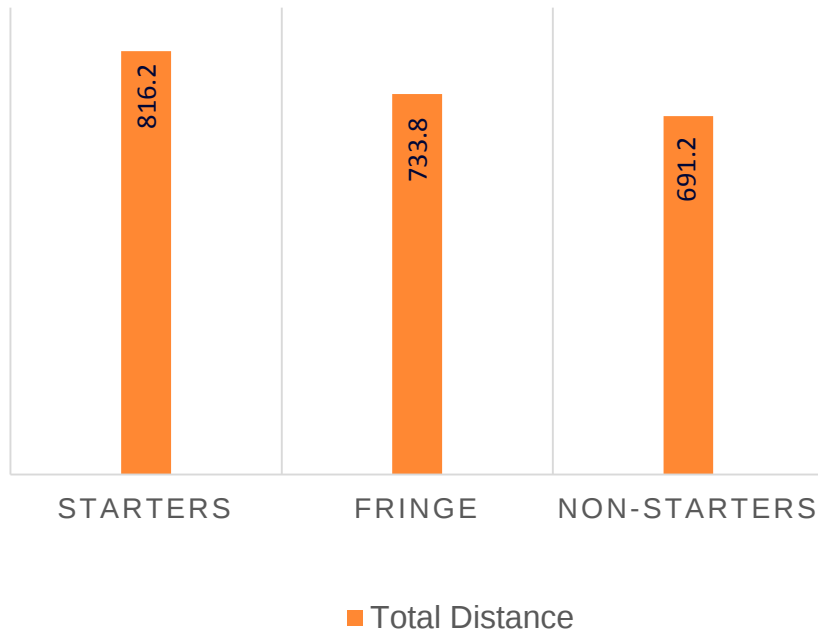
Microcycle – 2 Match Week

Optimise Performance

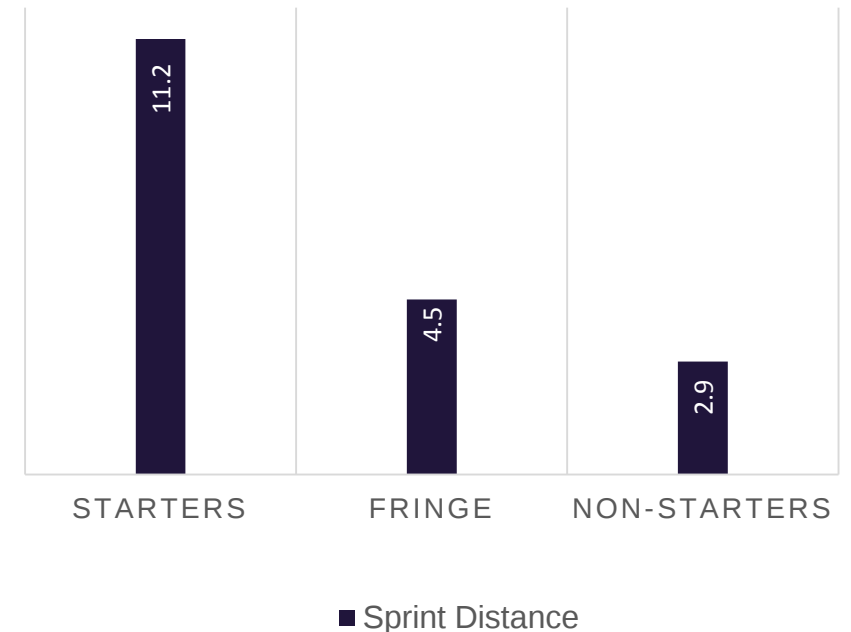


Starters vs. Non Starters

Optimise Performance

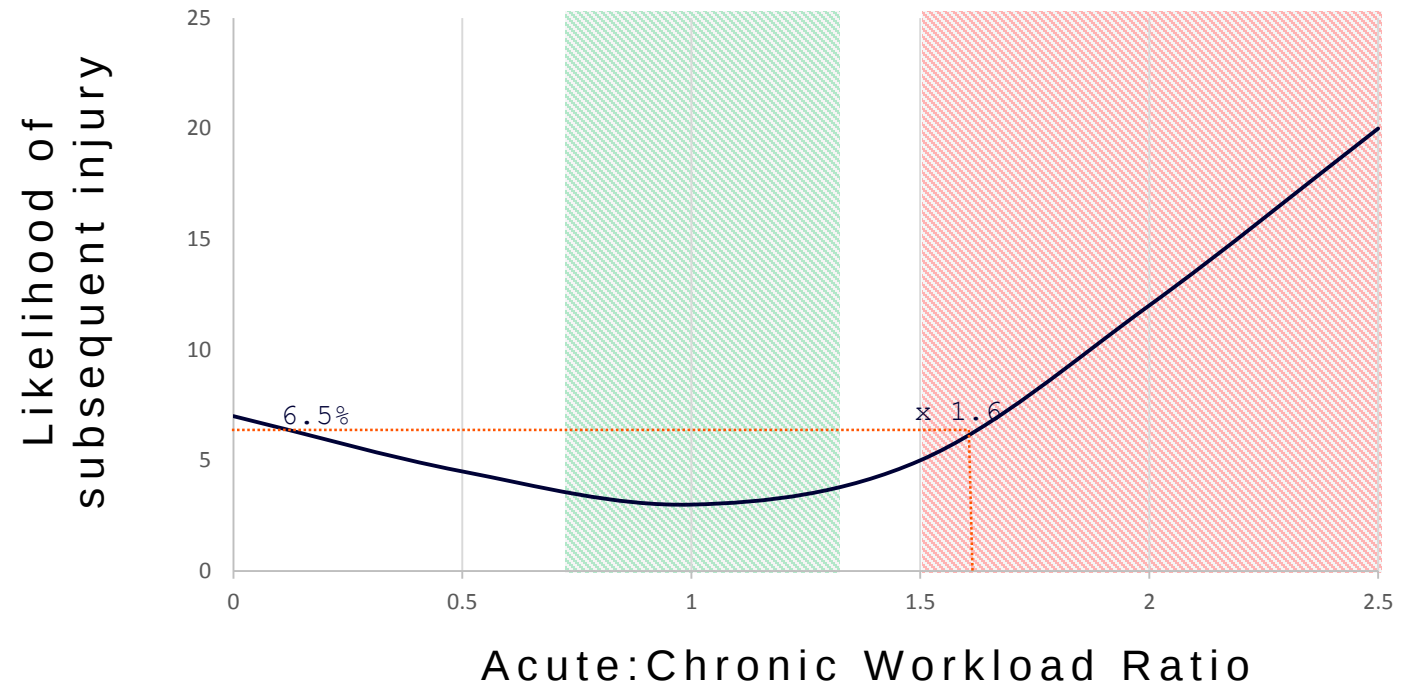


Matches and Training
Starters >60%
Fringe 30-60%
Non-starters <30%



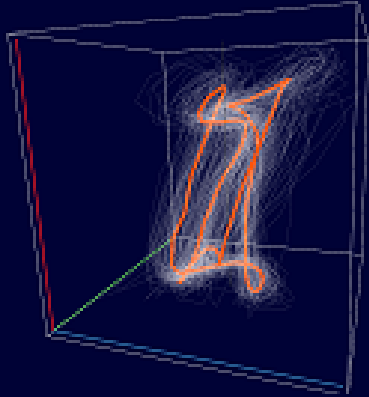
Acute : Chronic Loading Injury Risk Management

The analysis of Acute:Chronic workload ratios is a better predictor of injury risk than the analysis of the acute or chronic workload on their own



Movement Module

Injury Risk Management



Reliability/Sensitivity

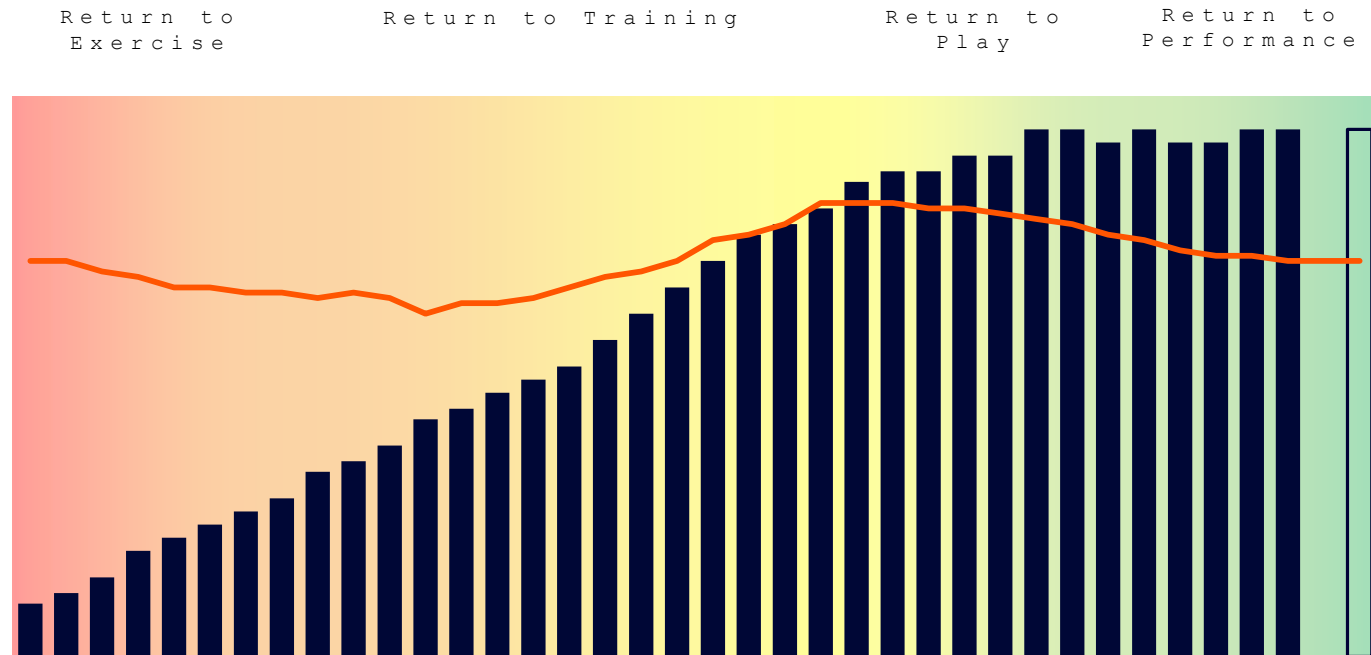


Logistical constraints



Objective return to play

Return to Fitness



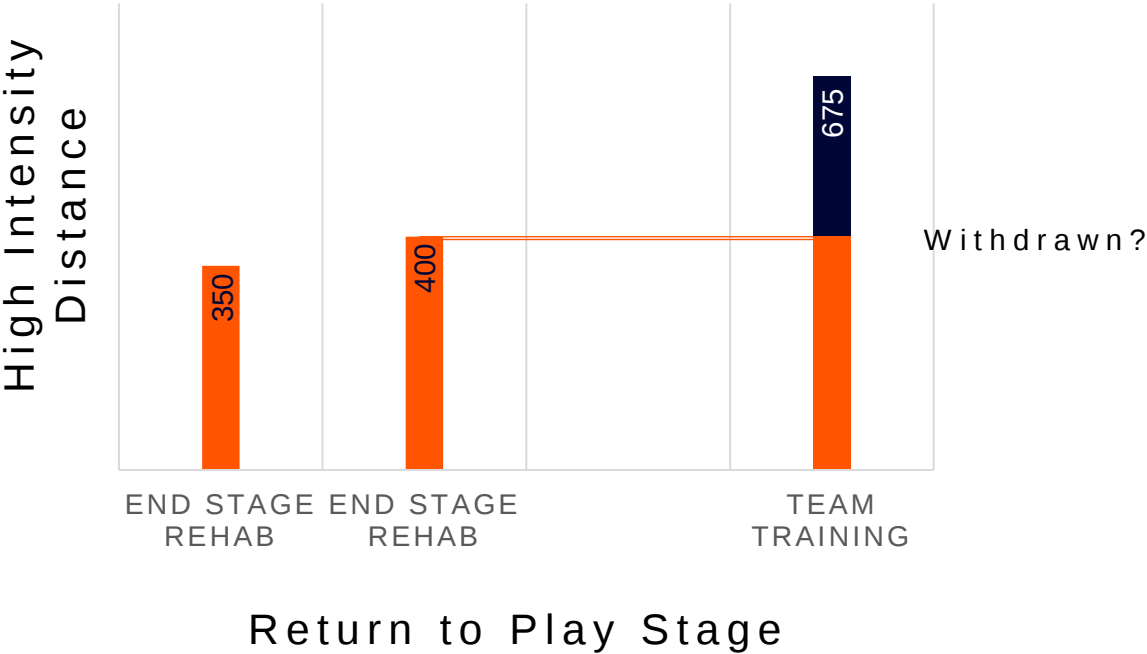
Return to play – Real Time

Return to Fitness

Player returning from injury (hamstring grade 2)

First session back with the team

MD-3 session, hard session planned for the team



Catapult Group Ecosystem

Player Monitoring

AMS

by Catapult

Athlete
Monitoring

Video

Tactical

Future
Integrations



September
2018

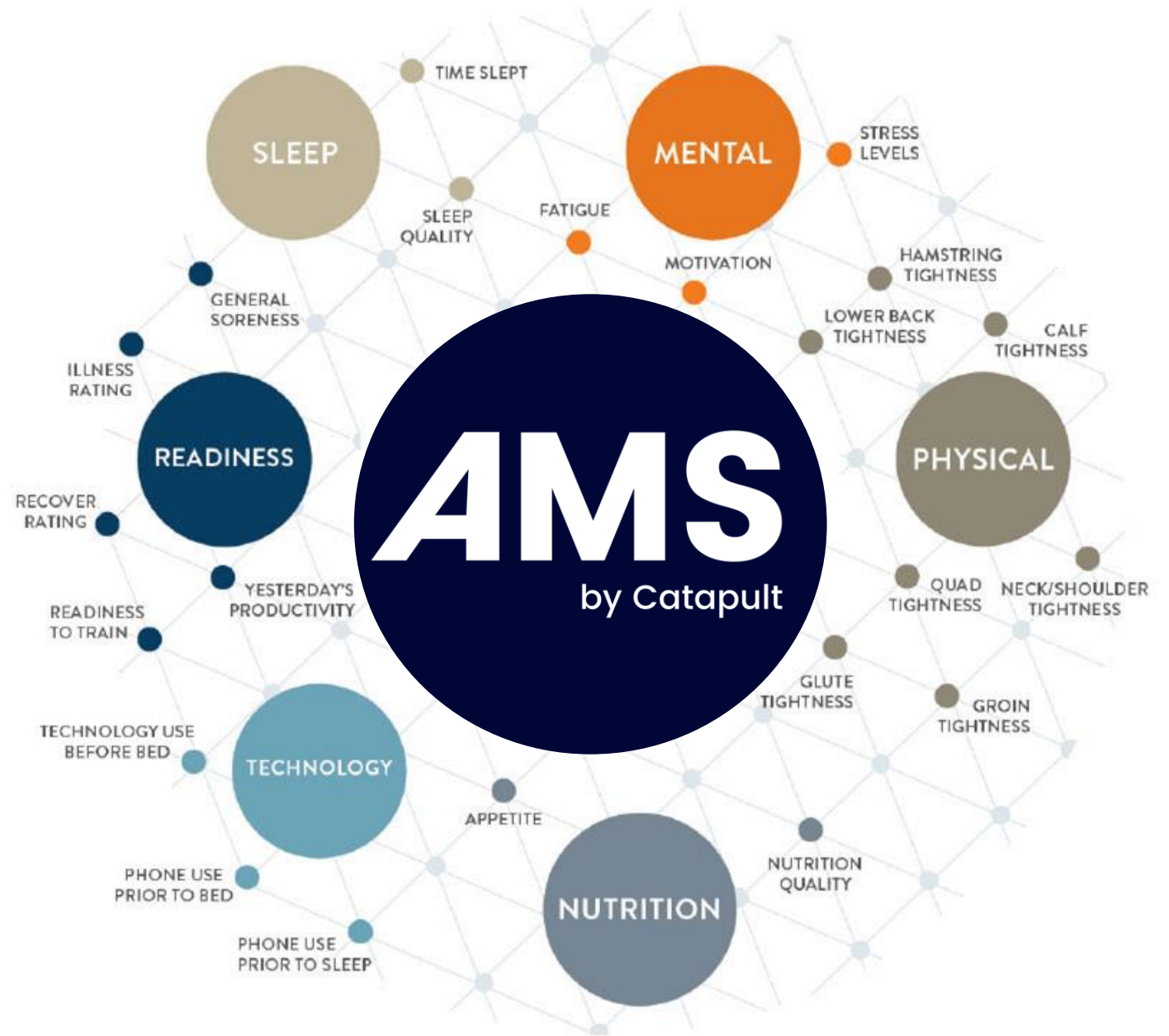
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AMS by Catapult

Catapult Group Ecosystem

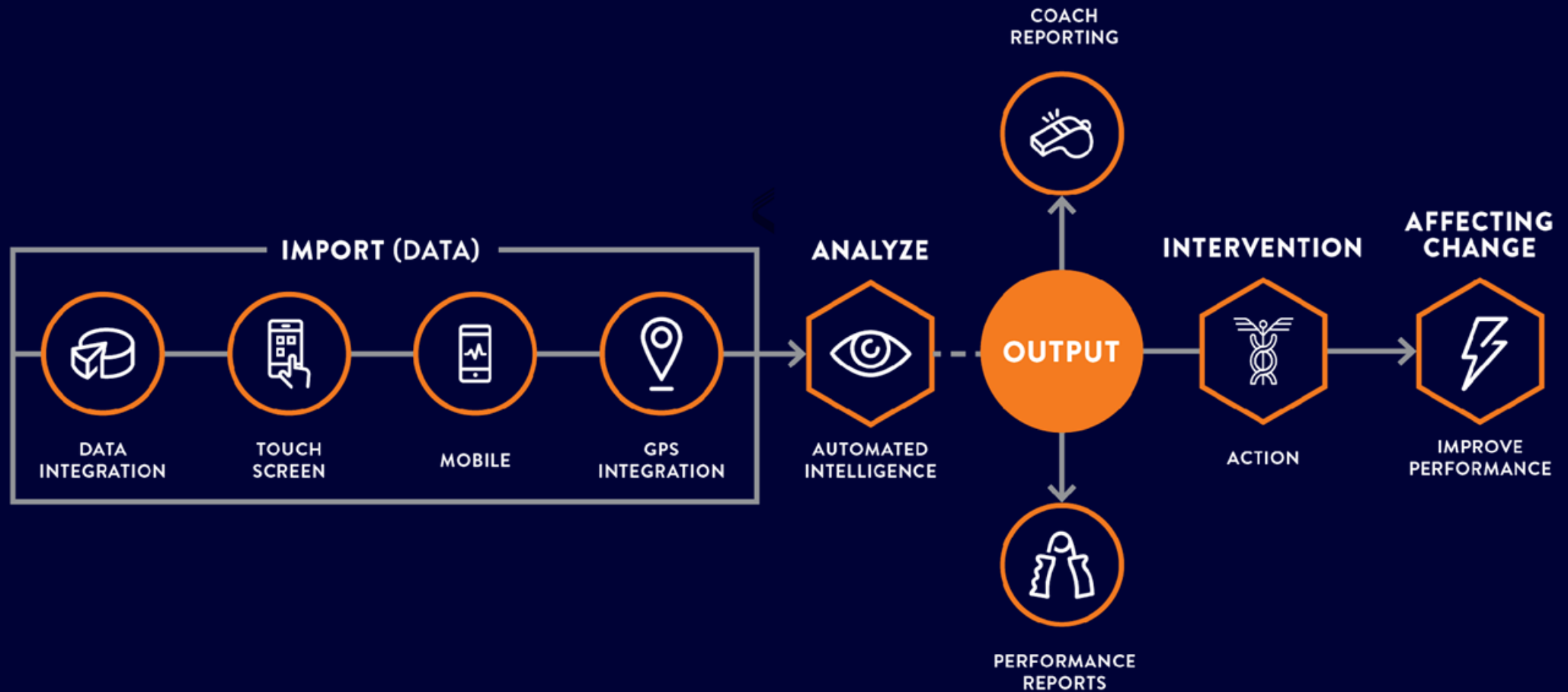
AMS by Catapult is a platform that helps to build and improve the performance of athletes and sporting teams.

One platform that empowers users to affect positive change and protect your greatest assets.



Training Intervention

AMS by Catapult





THANK YOU.

PLAY SMART. DEFY LIMITS