TECNOLOGIACIENCIA

Aplicación al fútbol

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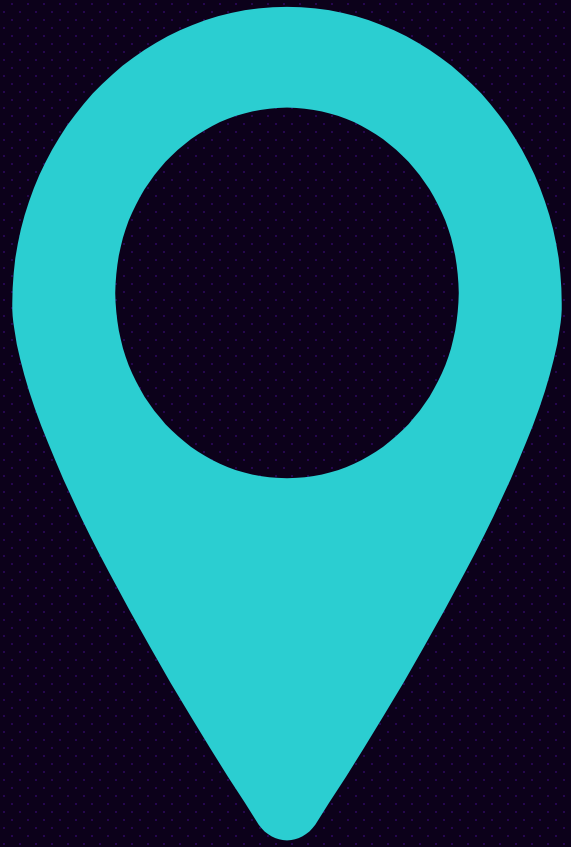
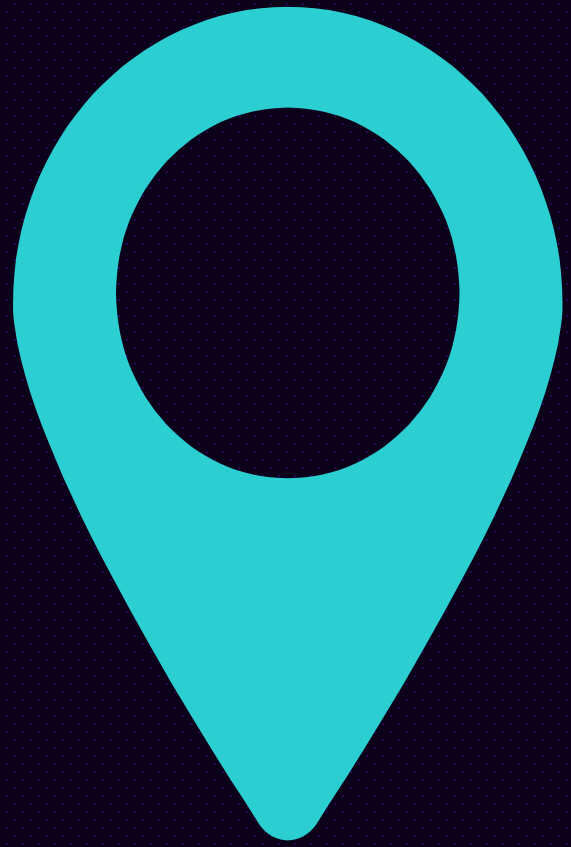
https://orcid.org/0000-0002-9091-0897

Rico González, Markel

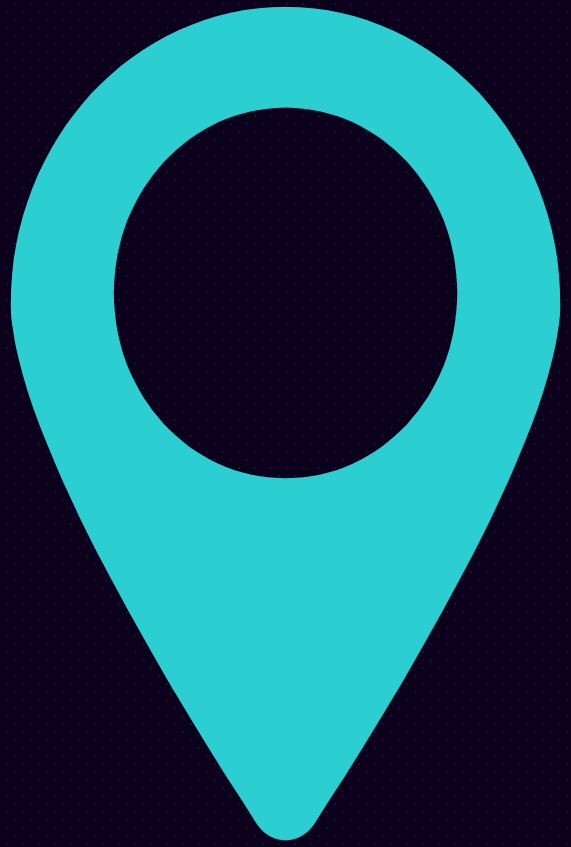
Universidad del País Vasco



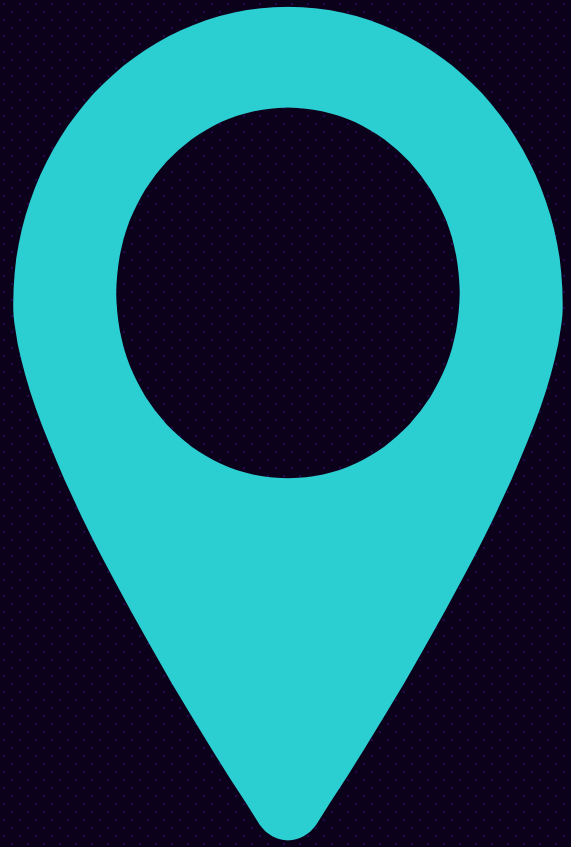
DEFINICIÓN EPTS



PRUEBAS



EVOLUCIÓN



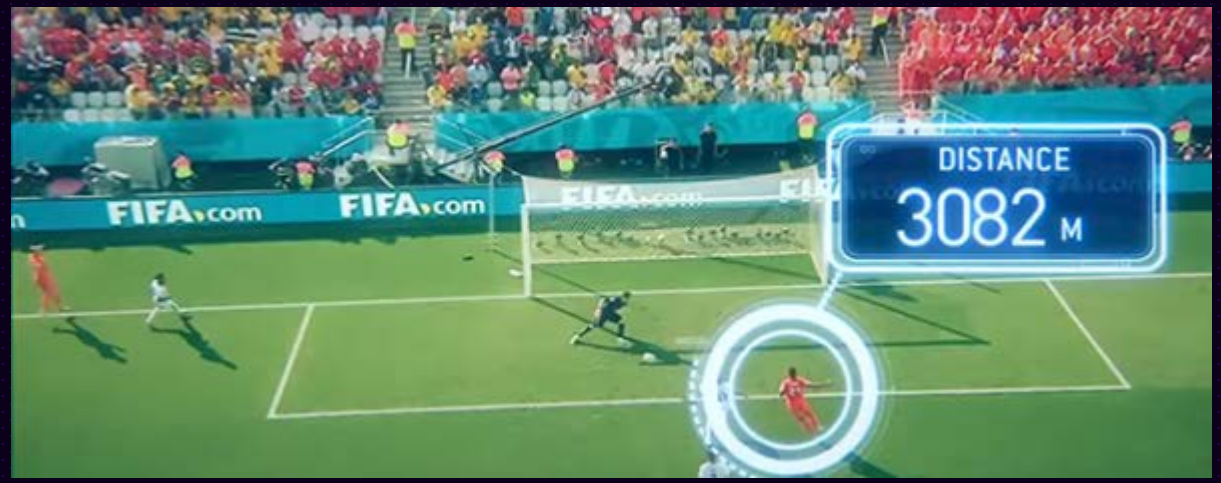
VARIABLES
INDICADORES

ONE

DEFINCIÓNEPTS

TAB TWO | TAB THREE | TAB FOUR | TAB FIVE

La Federación Internacional de Fútbol Asociado (FIFA) introduce el término Dispositivo de Seguimiento Electrónico del Rendimiento (DSER; en inglés, Electronic Performance & Tracking Systems, EPTS)



https://blog.adafruit.com/2018/07/11/how-epts-in-world-cup-2018-is-changing-the-game-of-soccer/

"Una tecnología que permite hacer un seguimiento de jugadores y equipos con el fin de mejorar su actuación en el terreno de juego. Estos sistemas primordialmente hacen un seguimiento de las posiciones de los jugadores, y del balón, aunque también pueden utilizarse junto con instrumentos micro electromecánicos (acelerómetros, giróscopos, etc.) además de otros dispositivos que miden parámetros, neuromusculares, fisiológicos".

Reche, P. (2020). Fútbol y tecnología. Análisis del rendimiento en entrenamiento y competición. Tesis doctoral. Sin publicar.

IFAB

129TH ANNUAL GENERAL MEETING

FEB 2015

MAY 2015

EPTS REGLAS DEL JUEGO 15/16

FIFA

INVITACIÓN A LA INDUSTRIA/FABRICANTES DE EPTS

OCT 2015

JUN 2017

REGLAS DEL JUEGO 17/18 IMS



CONFEDERATIONS CUP RUSSIA 2017

PRUEBA DE LOS SISTEMAS EN COMPETICIÓN COPA CONFEDERACIONES

JUL 2017

OCT 2017



FIFA QUALITY PROGRAMME FOR WEARABLE EPTS DEVICES

FIFA WORLD CUP RUSSIA 2018

FIFA COMUNICA QUE LOS EPTS YA ESTÁN LISTOS PARA SER APLICADOS EN EL MUNDIAL DE RUSIA 2018

MAY 2018

JUN 2018

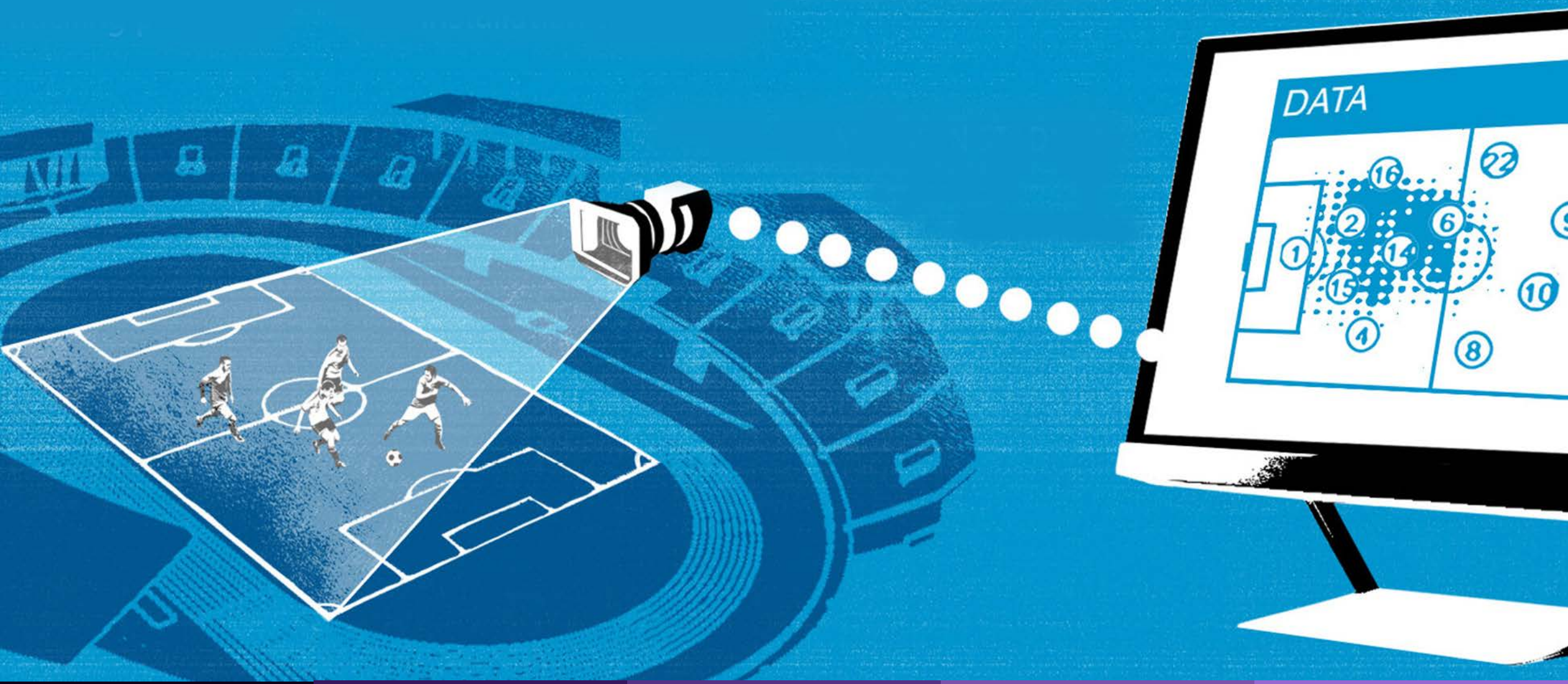
TABLETS EN BANQUILLO FIFA QUALITY



Evolución de las Reglas de Juego en cuanto al uso de *EPTS*.

Reche, P. (2020). Fútbol y tecnología. Análisis del rendimiento en entrenamiento y competición. Tesis doctoral. Sin publicar.

https://football-technology.fifa.com/en/media-tiles/epts-1/



PROZONE http://prozonesports.stats.com/es/

SPORTS UNIVERSAL (AMISCO) http://www.amisco.com/en/home.aspx

INSTAT http://www.instatfootball.com/

SPORTSTEC http://sportstec.com/products

VIS.TRACK http://www.bundesliga-datenbank.de/en/home/

BAGADUS http://chyronhego.com/sports-data/zxy

TRACAB (http://tracab.hegogroup.com/)

SPORTVISION http://www.sportvision.com/soccer

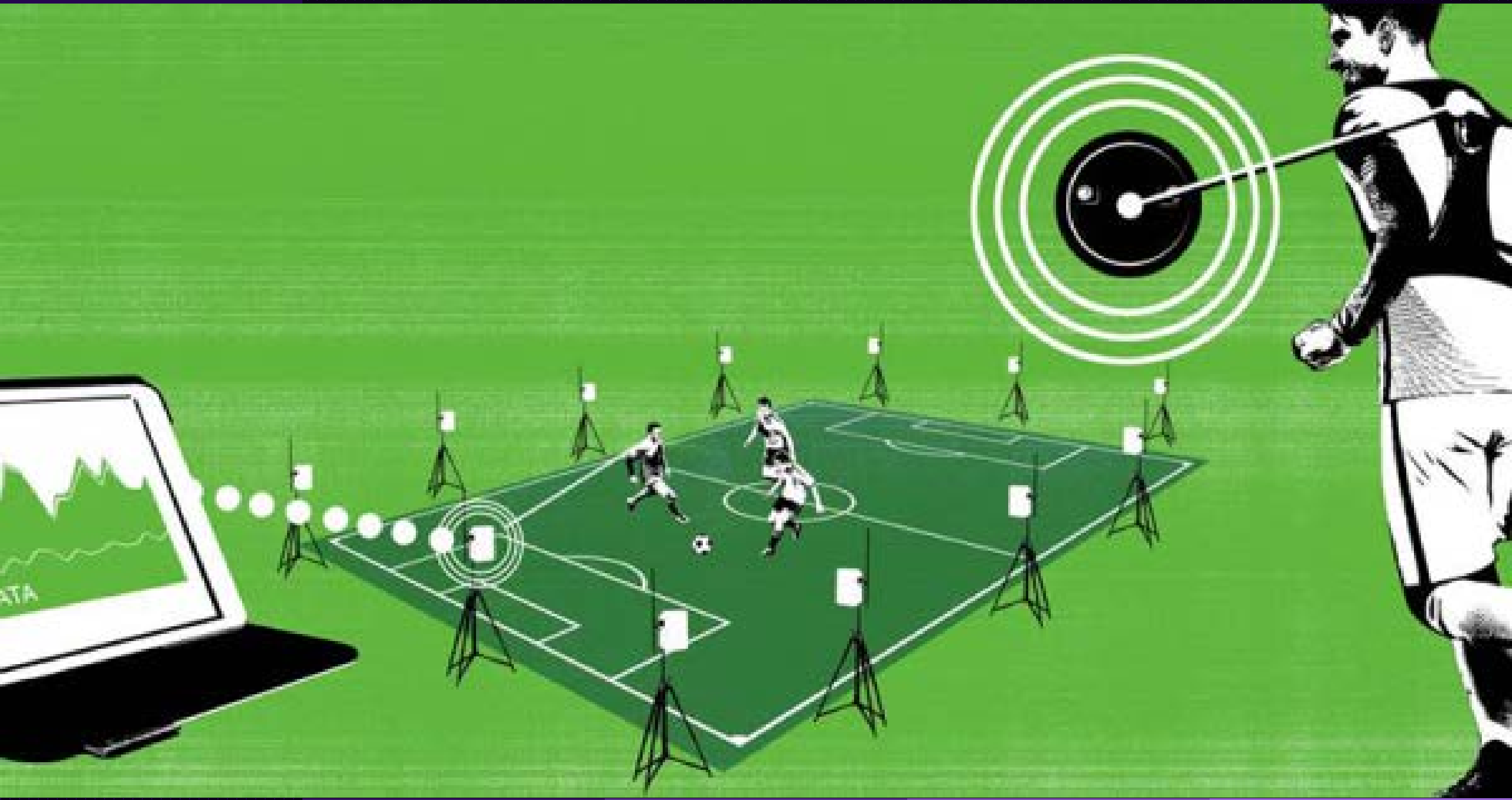
TRAKUS http://www.trakus.com/

MEDIAPRO (WTVISION) http://www.wtvision.com/

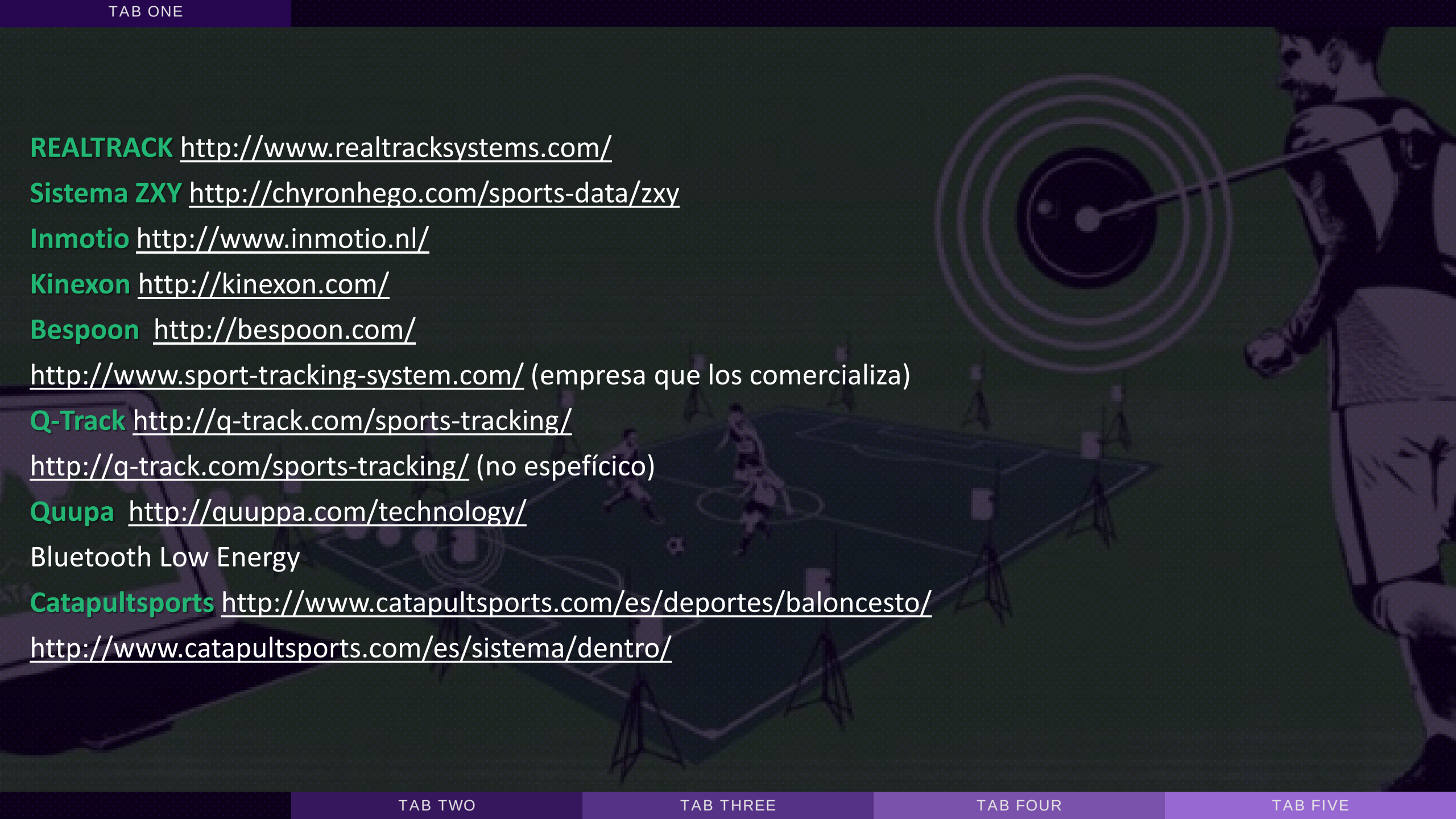
AZSPORTECH http://www.azsportech.com/



TAB ONE



TAB TWO TAB THREE TAB FOUR TAB FIVE



REALTRACK http://www.realtracksystems.com/

Sistema ZXY http://chyronhego.com/sports-data/zxy

Inmotio http://www.inmotio.nl/

Kinexon http://kinexon.com/

Bespoon http://bespoon.com/

http://www.sport-tracking-system.com/ (empresa que los comercializa)

Q-Track http://q-track.com/sports-tracking/

http://q-track.com/sports-tracking/ (no espefícico)

Quupa http://quuppa.com/technology/

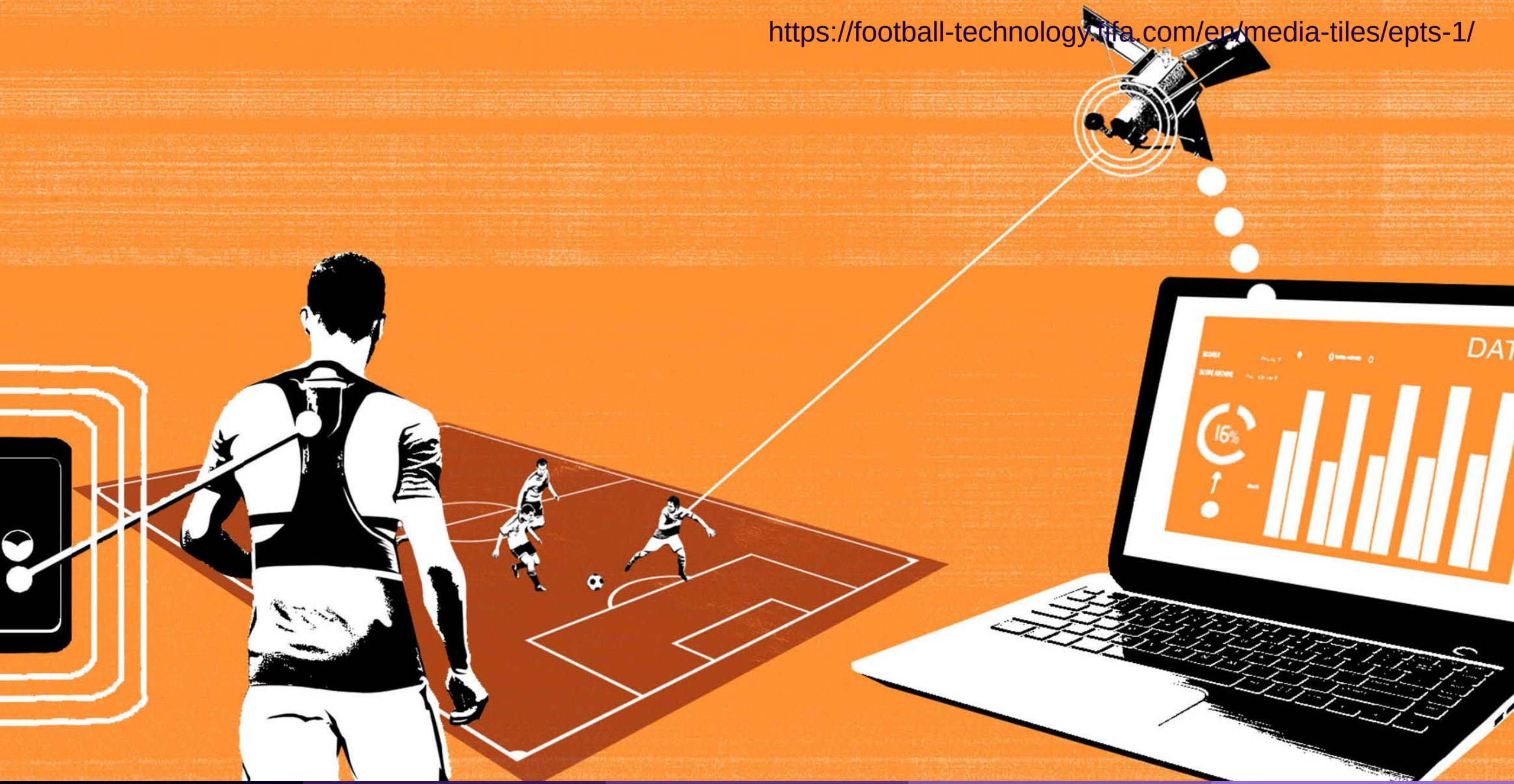
Bluetooth Low Energy

Catapultsports http://www.catapultsports.com/es/deportes/baloncesto/

http://www.catapultsports.com/es/sistema/dentro/

TAB ONE

https://football-technology.fifa.com/en/media-tiles/epts-1/



TAB TWO TAB THREE TAB FOUR TAB FIVE

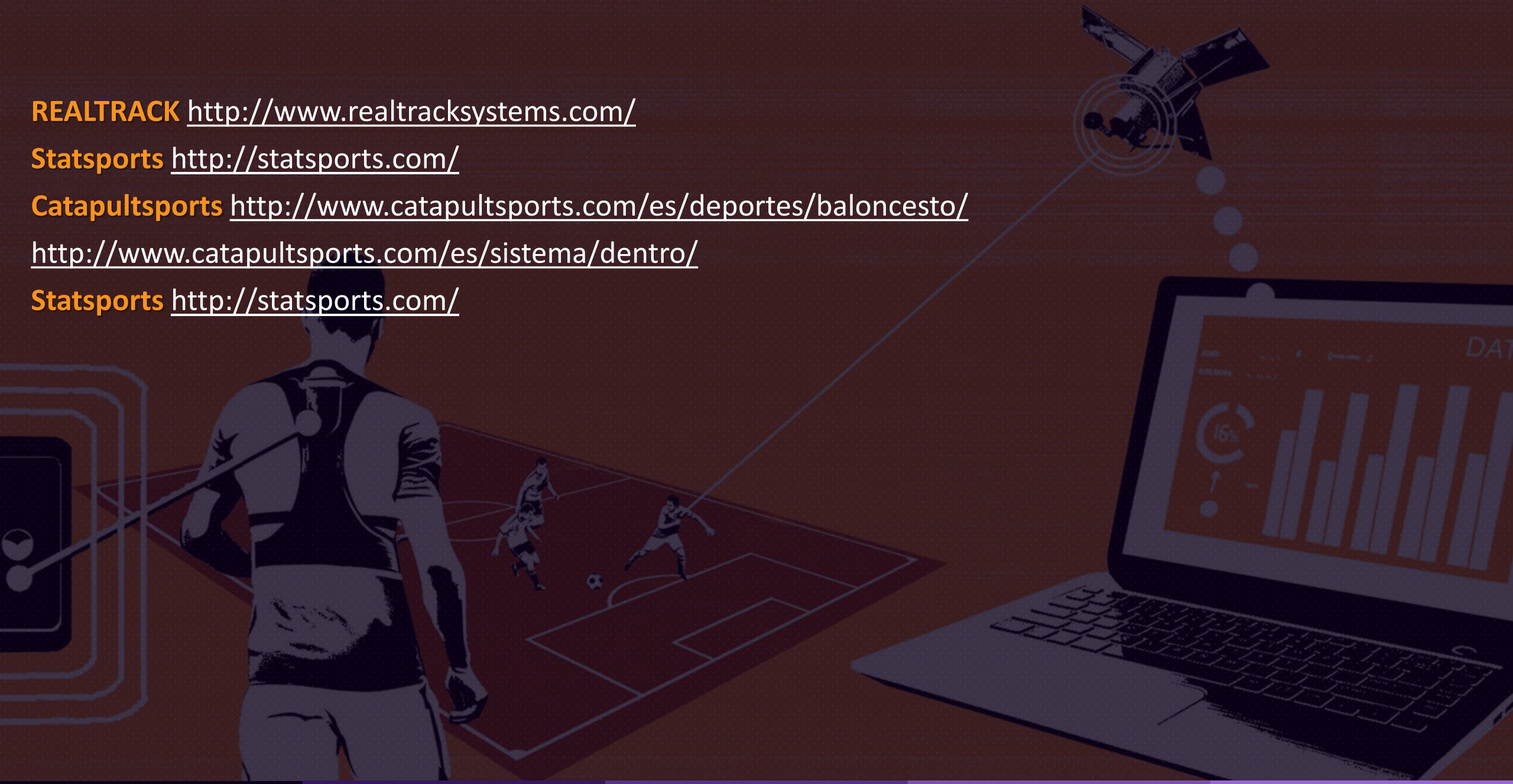
REALTRACK http://www.realtracksystems.com/

Statsports http://statsports.com/

Catapultsports http://www.catapultsports.com/es/deportes/baloncesto/

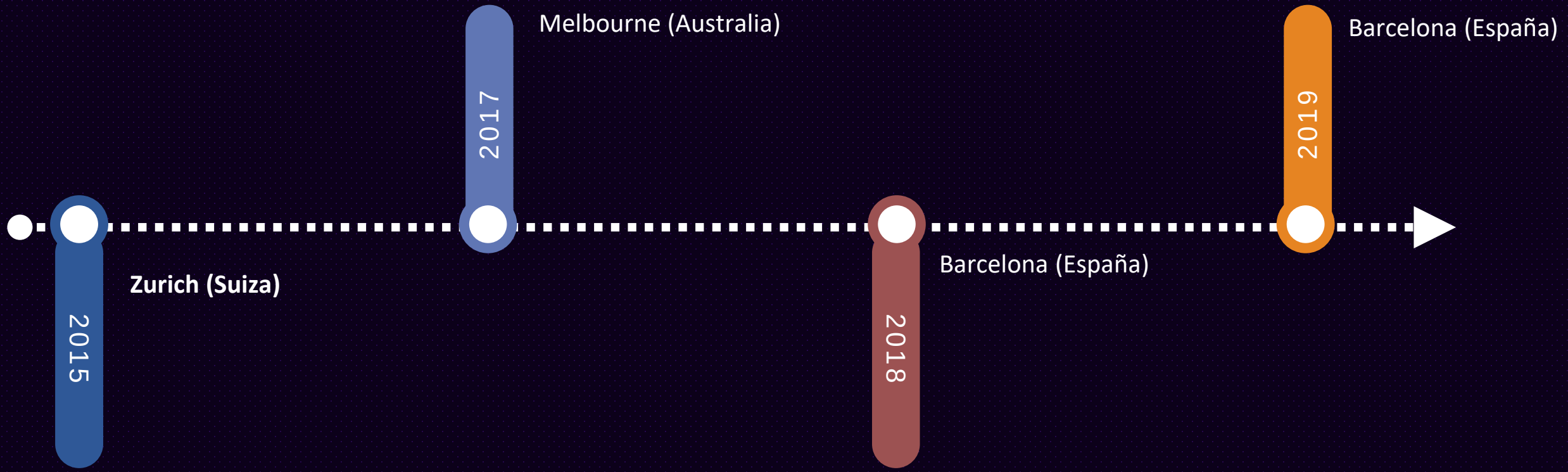
http://www.catapultsports.com/es/sistema/dentro/

Statsports http://statsports.com/



TIMELINE

Pruebas EPTS realizadas por la FIFA



TAB TWO



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TAB TWO



TAB ONE

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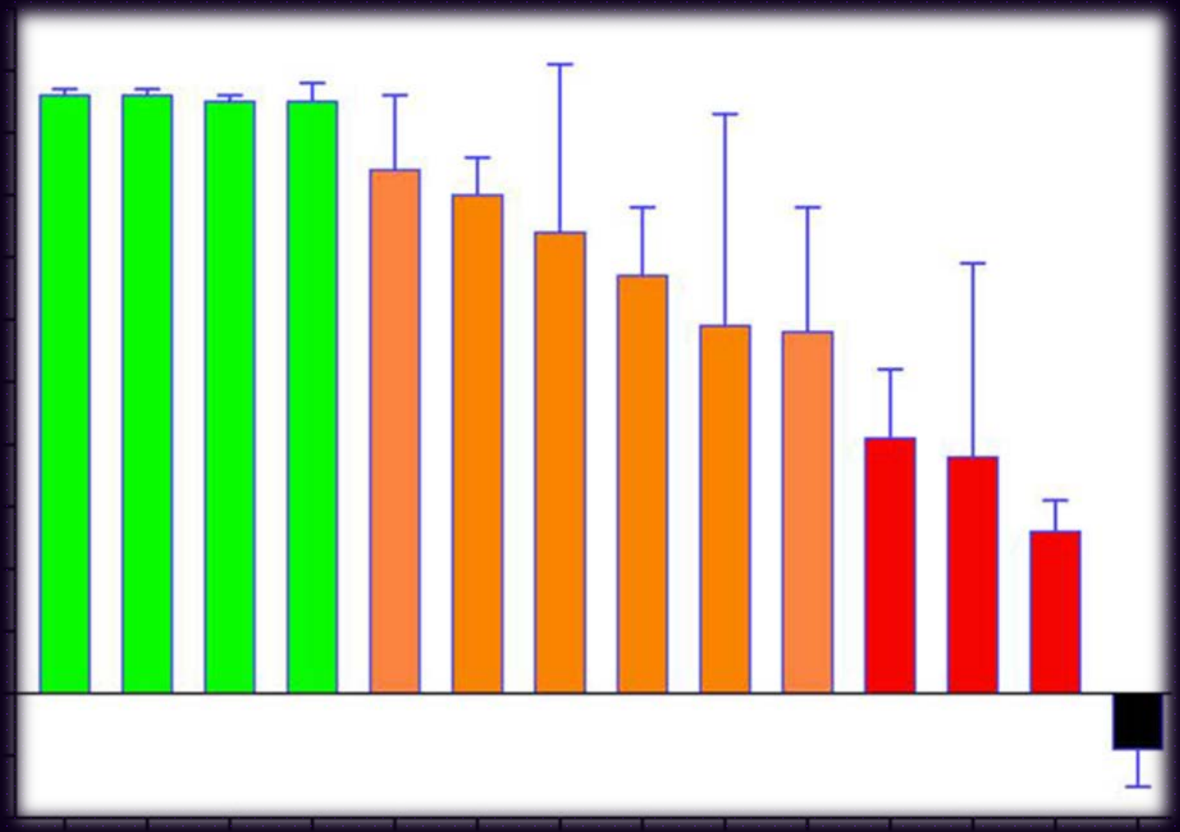
TAB FIVE

- Ejemplo de correlación entre el sistema de referencia (VisionKit) y los dispositivos (Por una métrica: velocidad)
- 3 ópticos, 6 GPS, 5 LPS
- Grandes diferencias entre los sistemas – buenas y malas sorpresas



Fuente: Grupo de investigación EPTS (FIFA)

TAB TWO



TAB ONE

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TAB FOUR

TAB FIVE



Gold Standard

https://www.youtube.com/watch?v=4h8GDYrUX4A

TAB TWO



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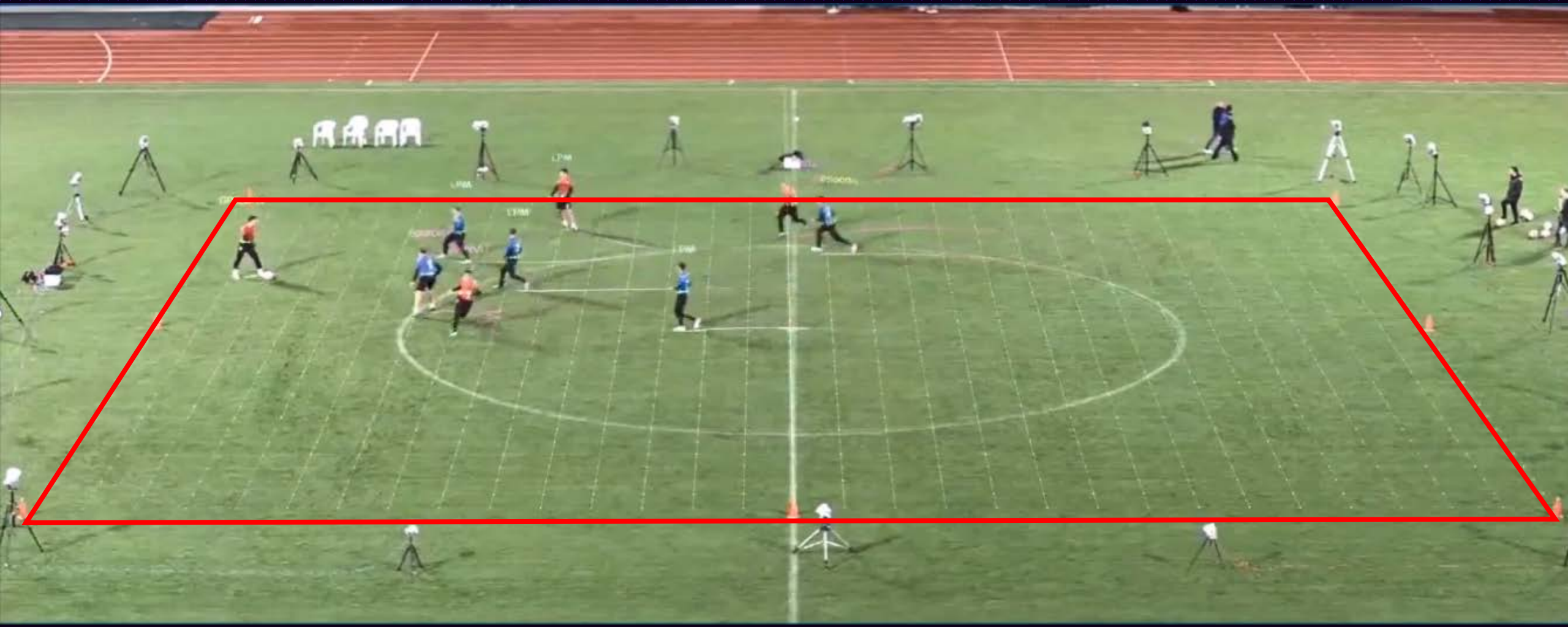
TAB TWO



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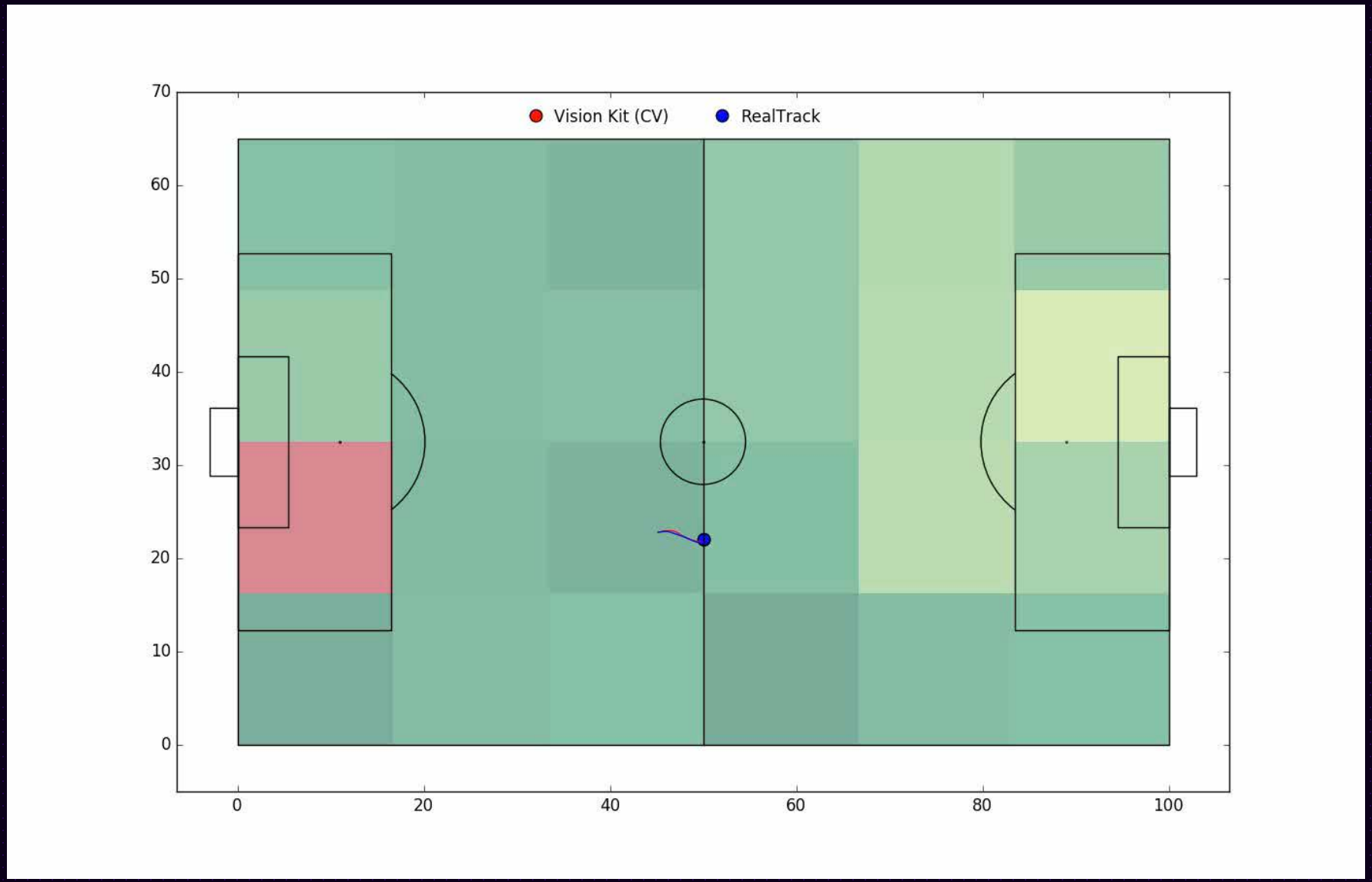
TAB TWO



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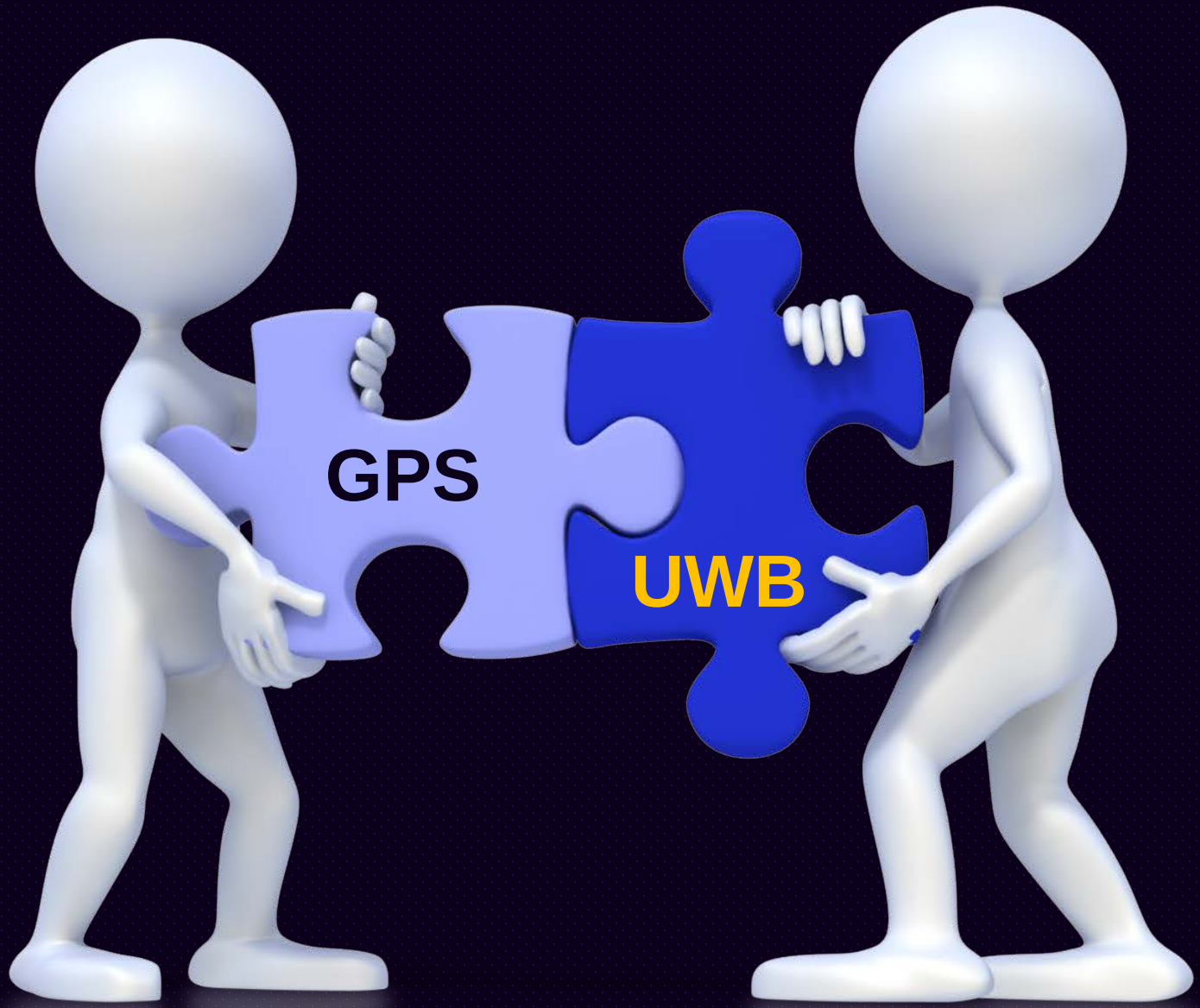
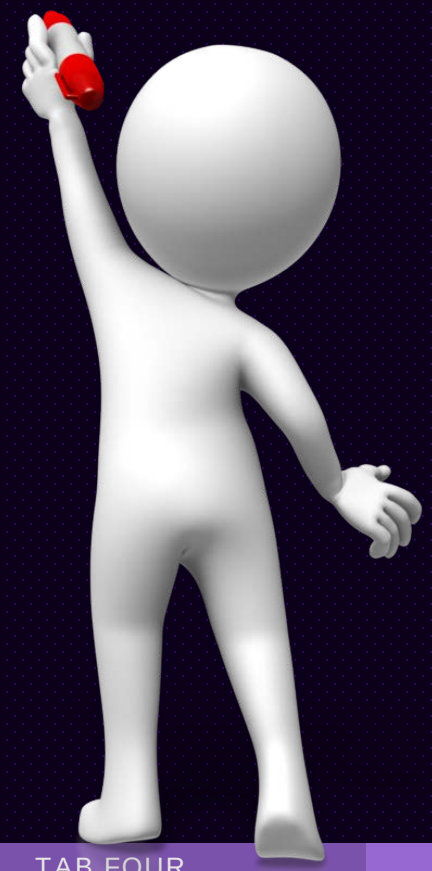
TAB THREE



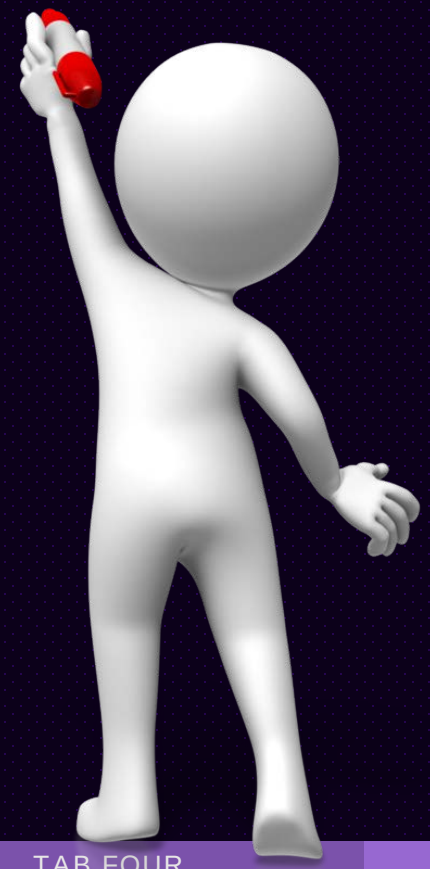
"The validity and reliability of a 5-hz GPS device for quantifying athletes' sprints and movement demands specific to team sports"

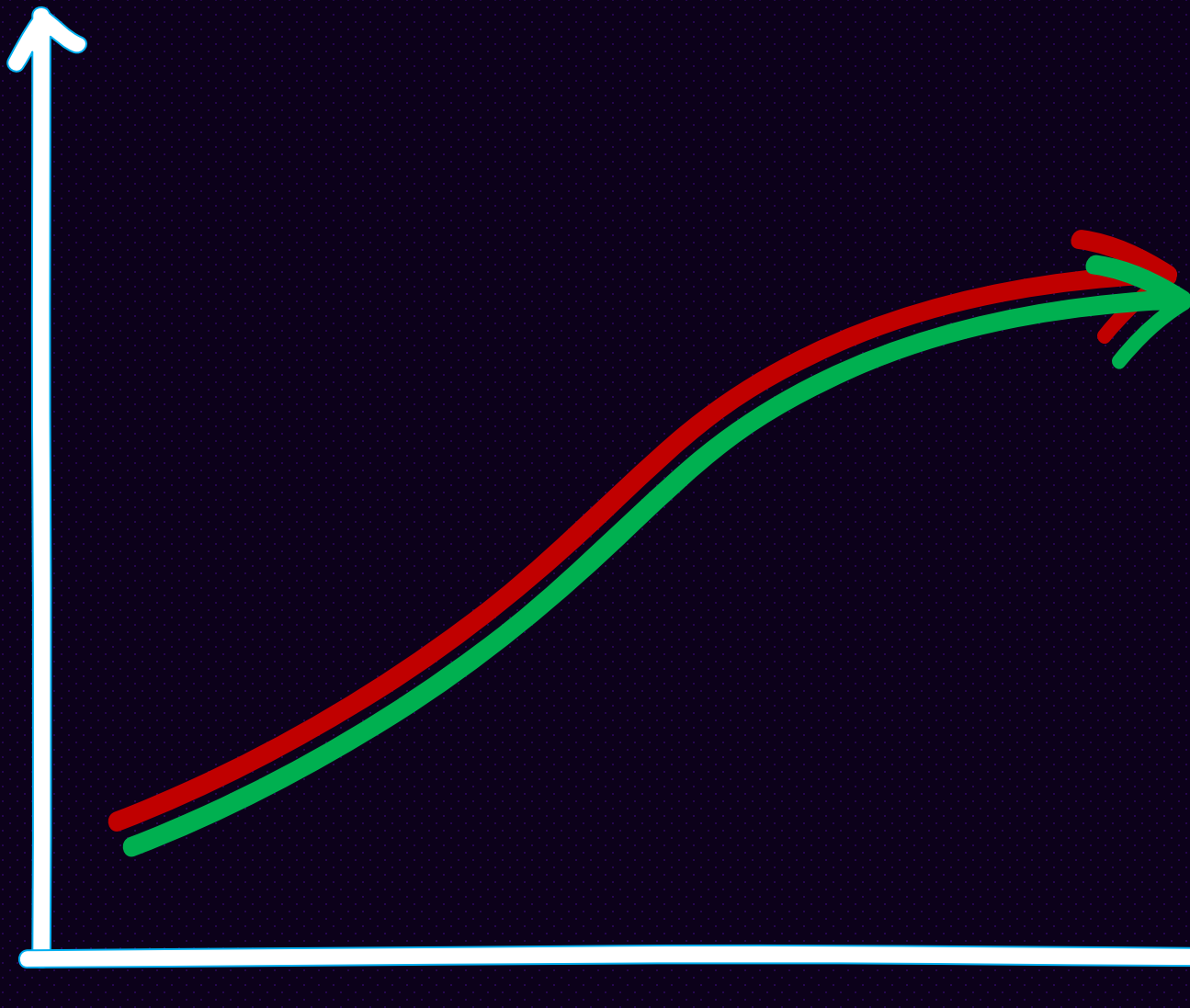
https://www.jhse.ua.es/article/view/9643

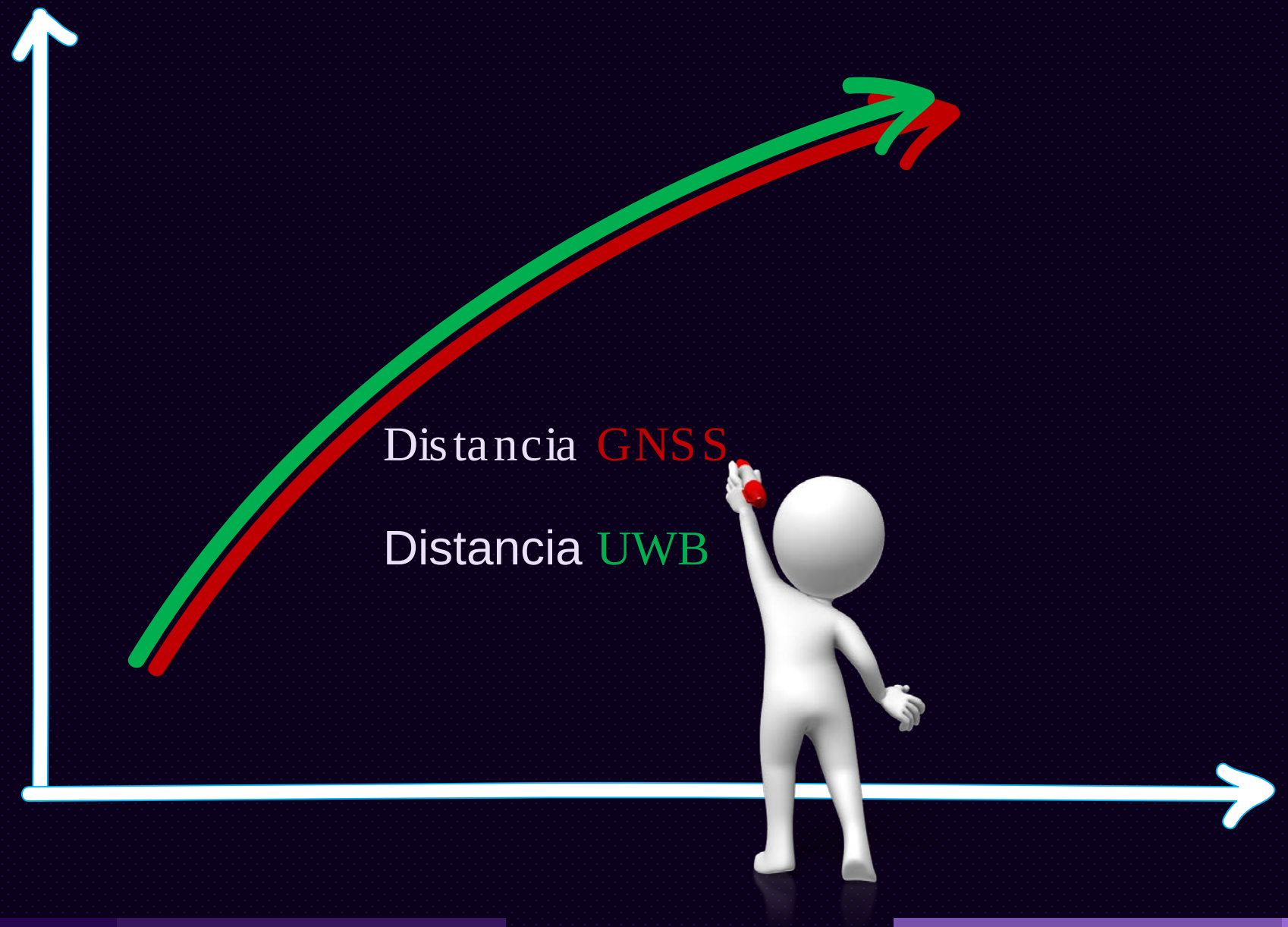


“Accuracy and inter-unit reliability of ultra-waveband (UWB) tracking system (WIMUPRO) in indoor conditions”

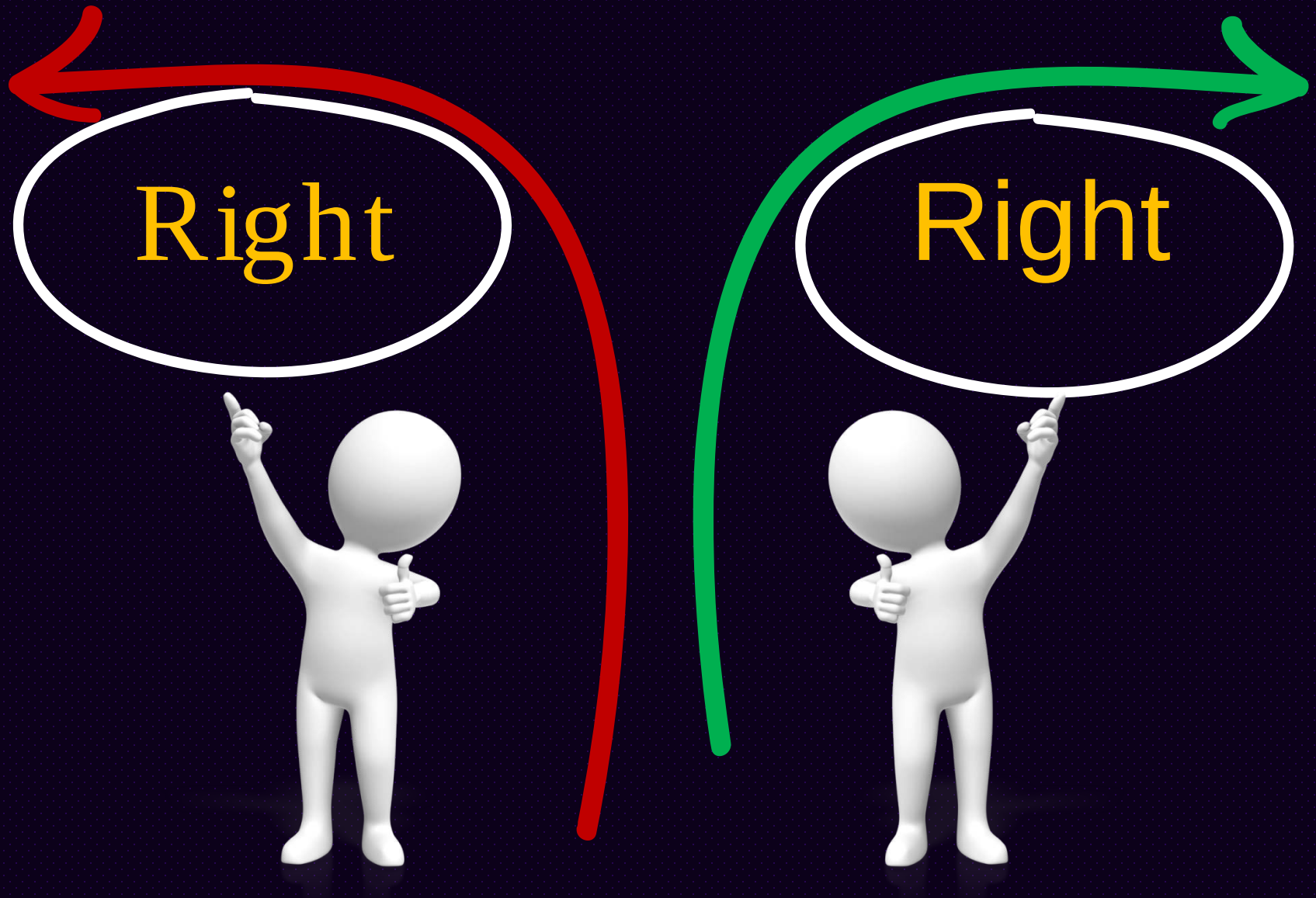
https://www.mdpi.com/2076-3417/9/5/939/htm




Velocidad media GNSS
Velocidad media UWB


Distancia GNSS
Distancia UWB

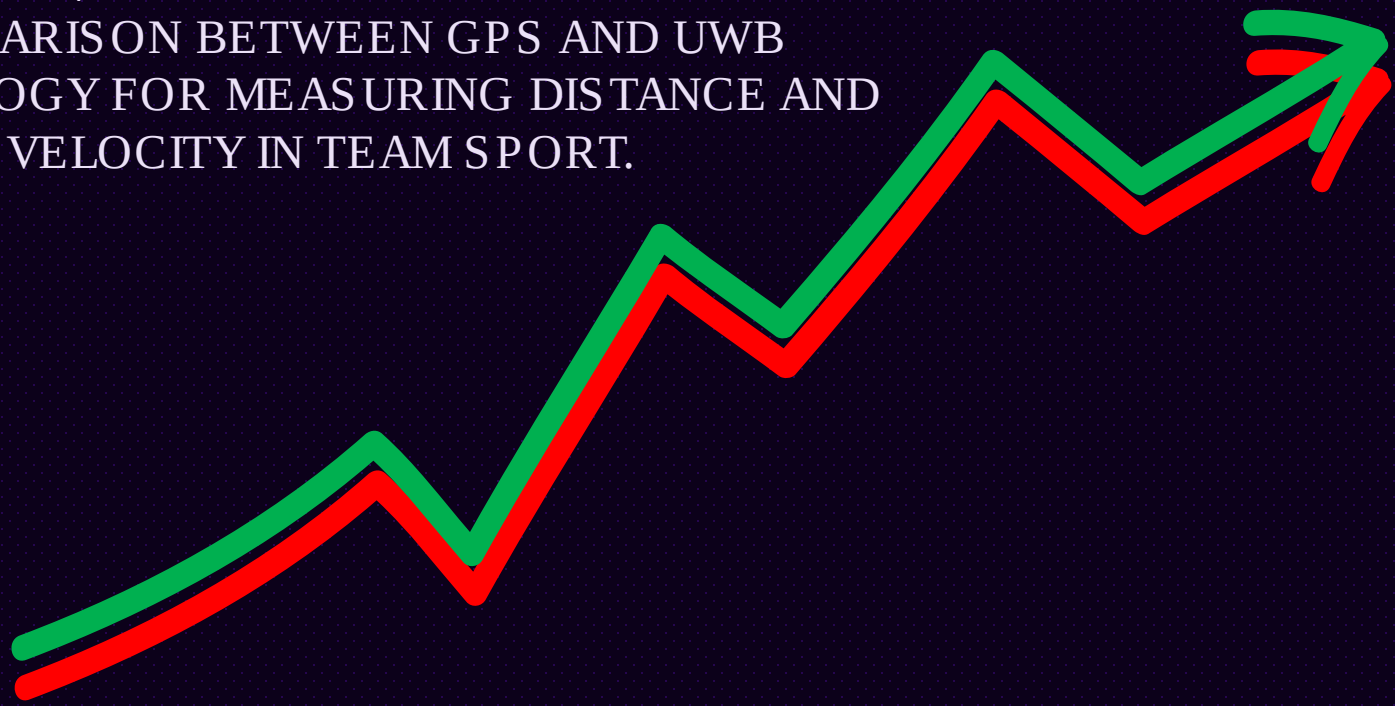
TAB THREE



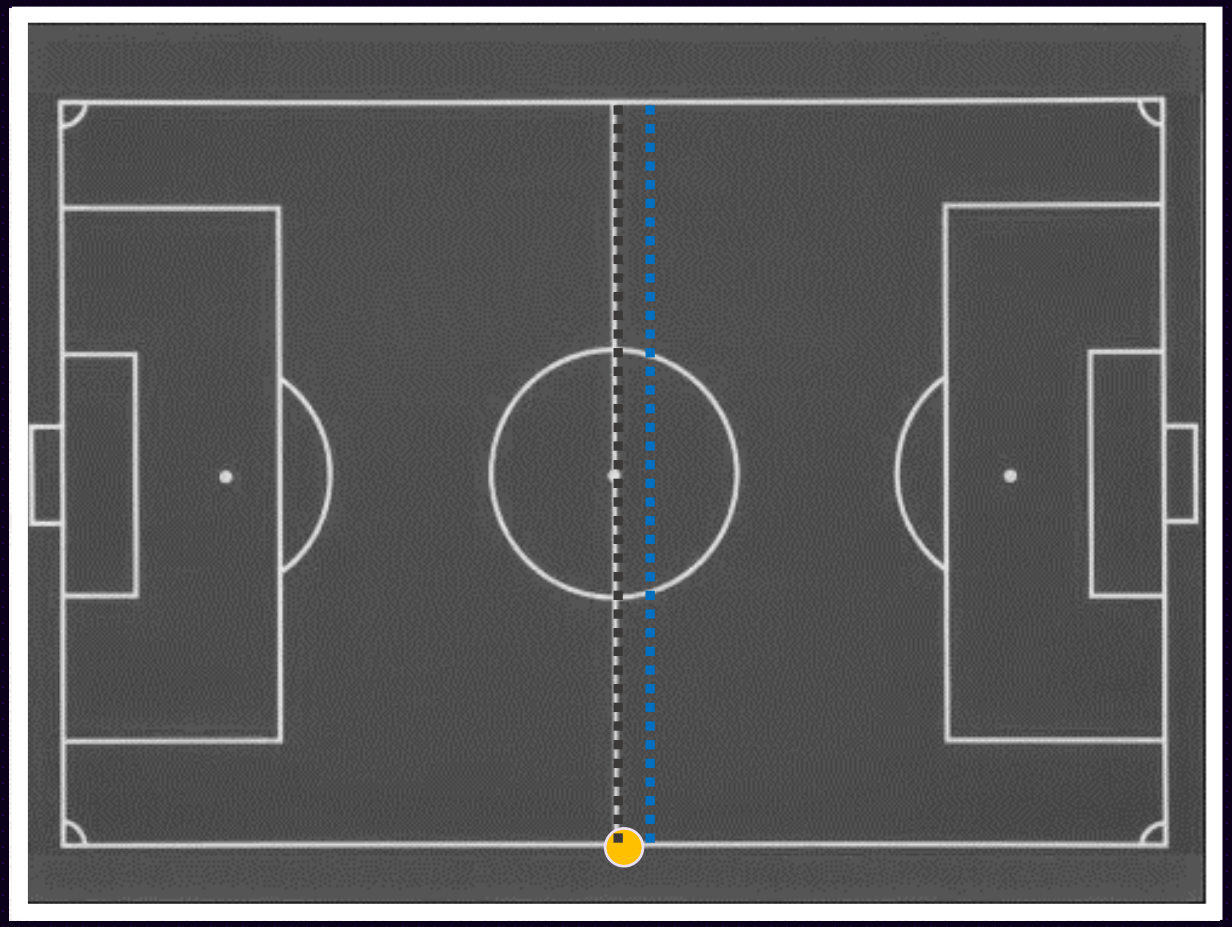
TAB ONE TAB TWO TAB FOUR TAB FIVE

validos
Tecnologia GNSS-UWB

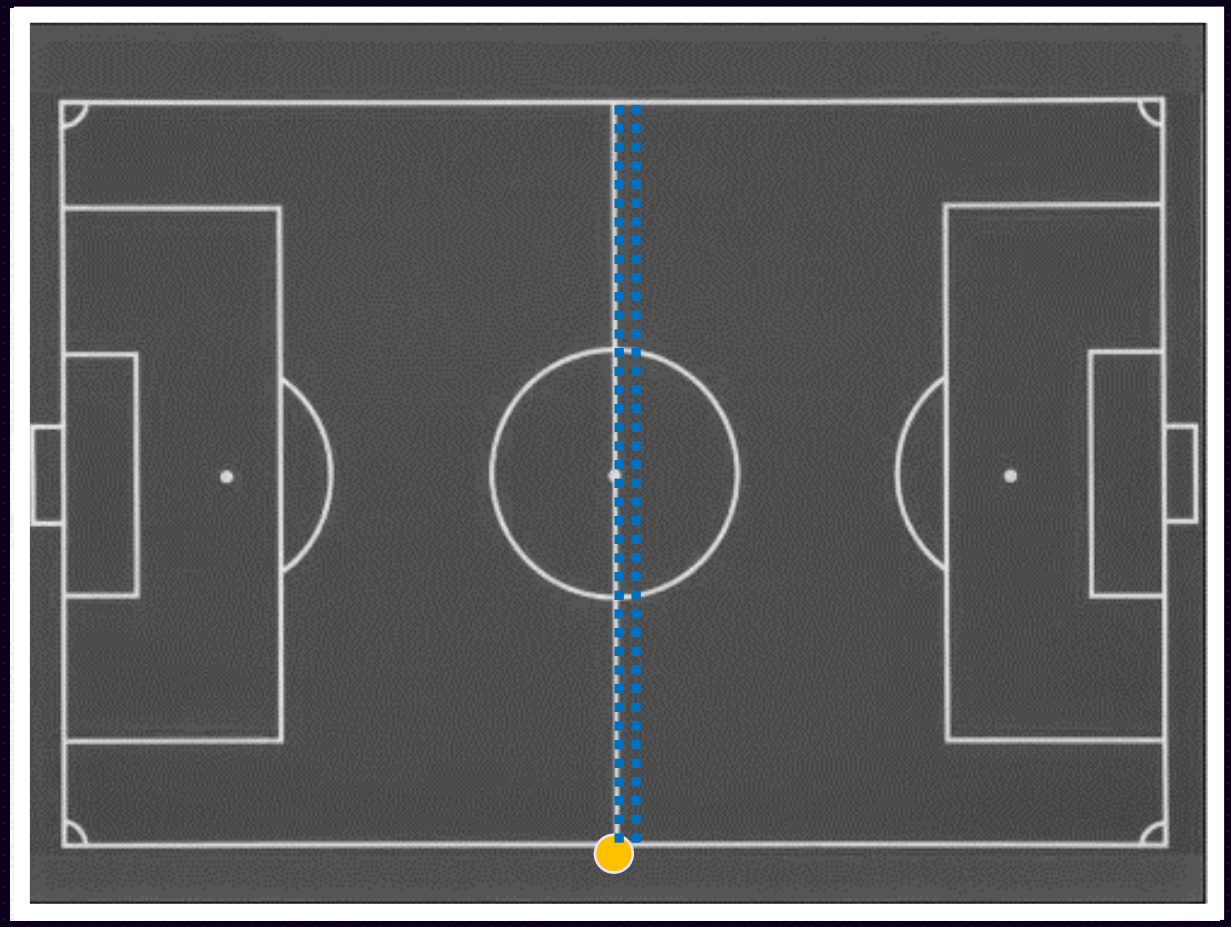
ACCURACY, TEST-RETEST RELIABILITY AND COMPARISON BETWEEN GPS AND UWB TECHNOLOGY FOR MEASURING DISTANCE AND VELOCITY IN TEAM SPORT.







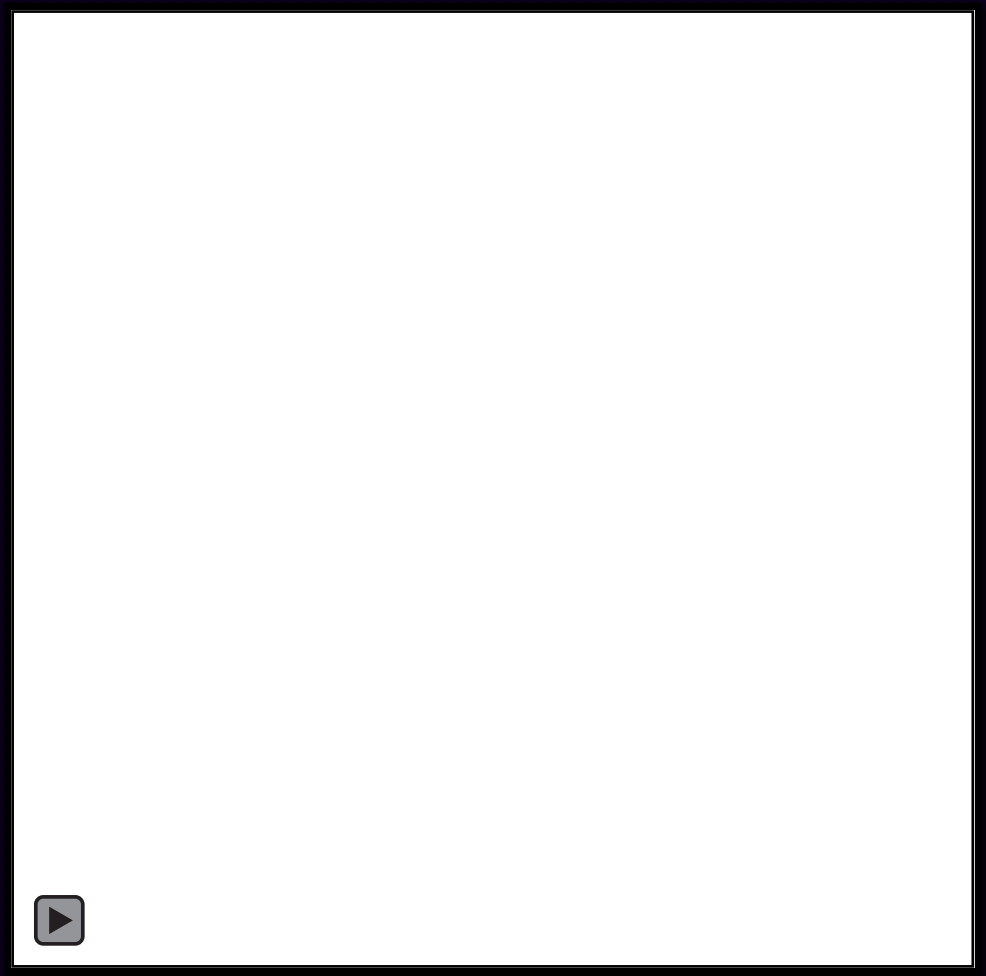
GNSS



UWB



Posicionamiento x-y



	GNSS	UWB
Cinemáticas	✓	✓
Posicionamiento x-y	✓	✓

sensors

MDPI

Article

A Survey to Assess the Quality of the Data Obtained by Radio-Frequency Technologies and Microelectromechanical Systems to Measure External Workload and Collective Behavior Variables in Team Sports

Markel Rico-González [1], Asier Los Arcos [1,*], Daniel Rojas-Valverde [2], Filipe M. Clemente [3,4] and José Pino-Ortega [5,*]

https://www.mdpi.com/1424-8220/20/8/2271



https://twitter.com/hashtag/SouthamptonFC?src=hash

TAB FOUR



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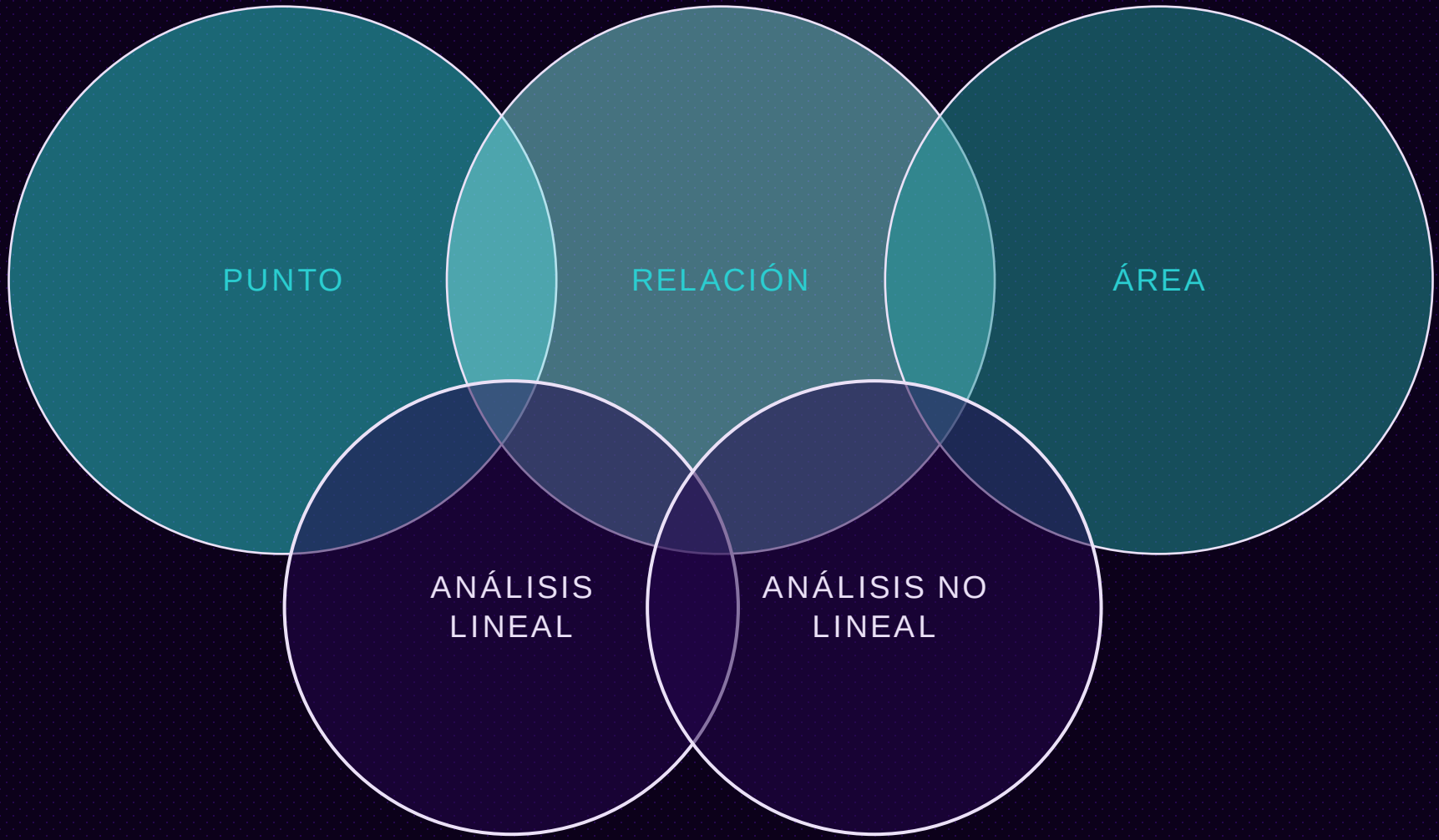
TAB FOUR



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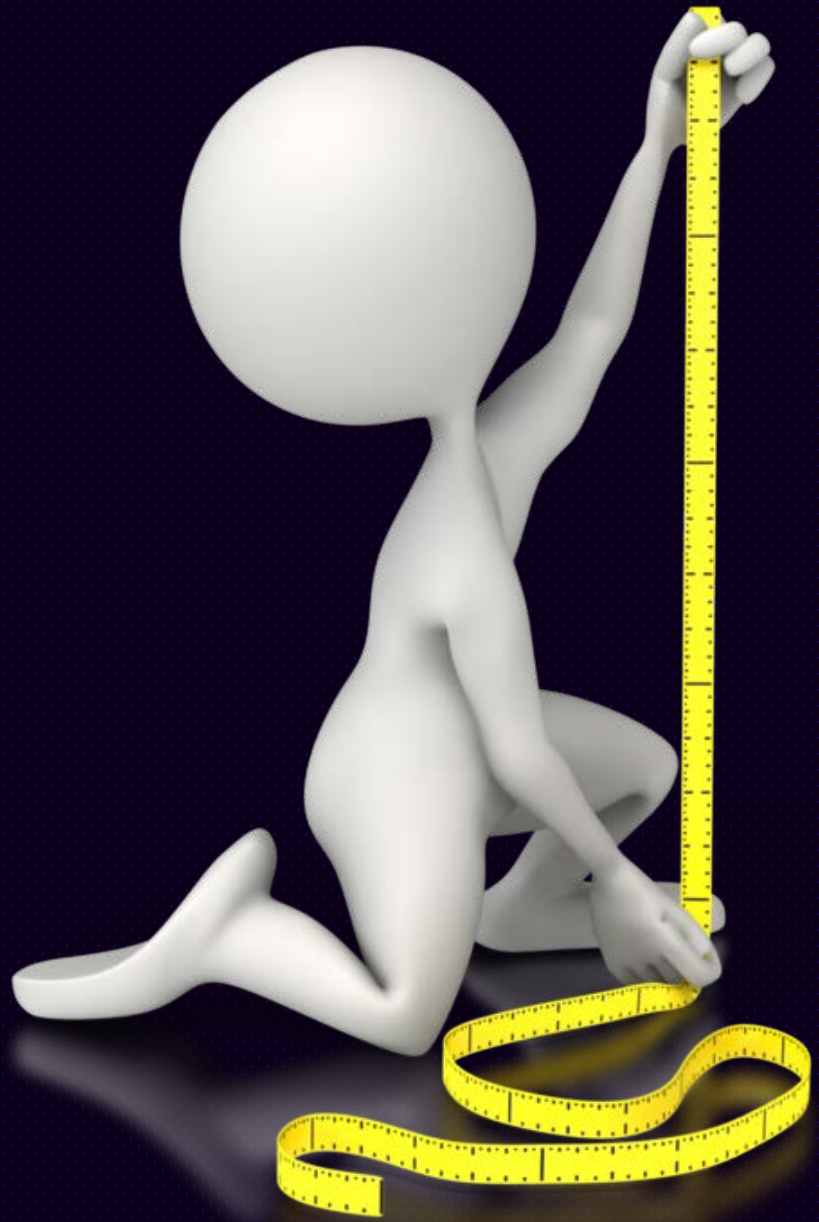

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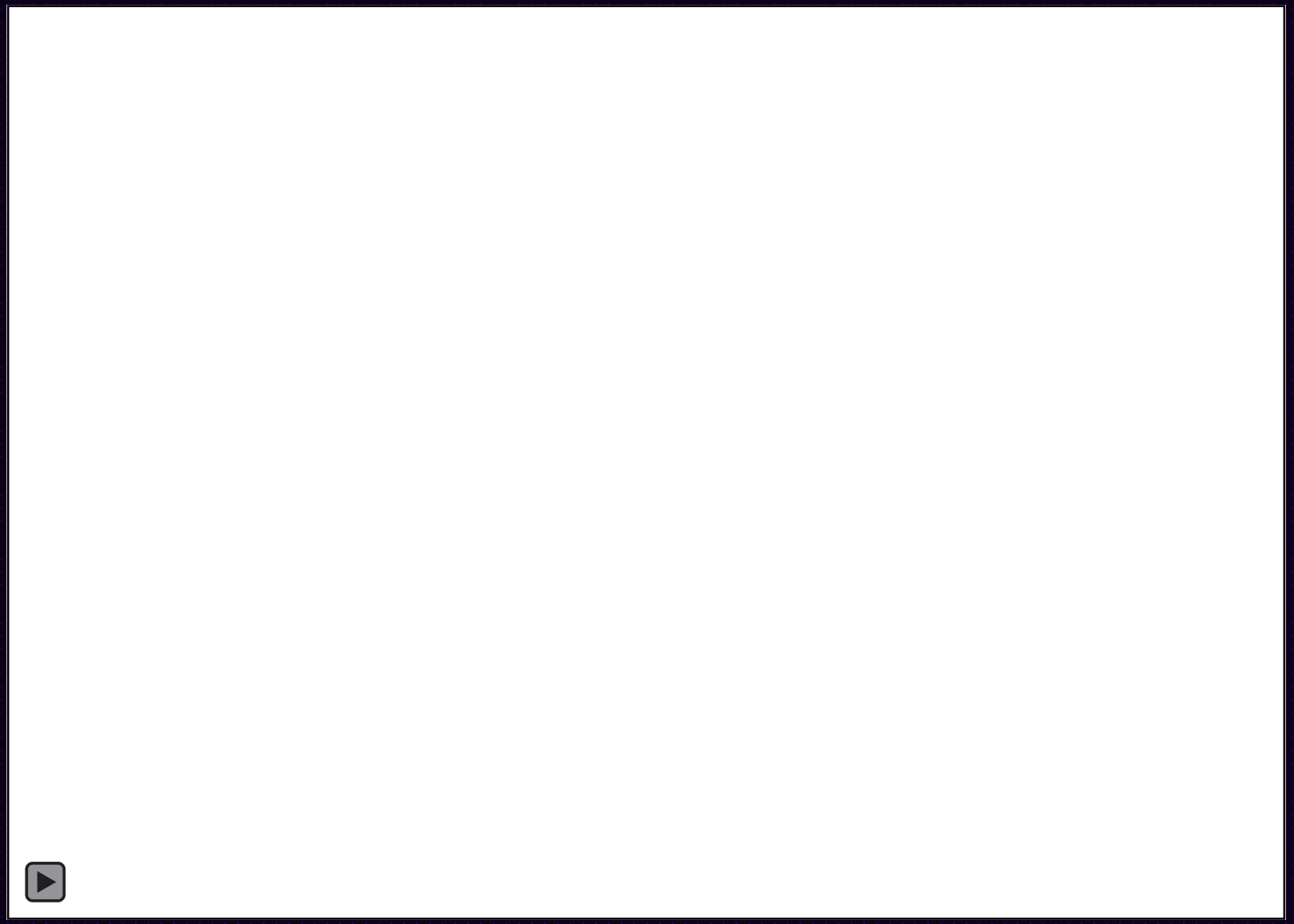


TAB ONE | TAB TWO | TAB THREE | TAB FIVE

TAB FOUR



TAB ONE | TAB TWO | TAB THREE | TAB FIVE

TAB FOUR



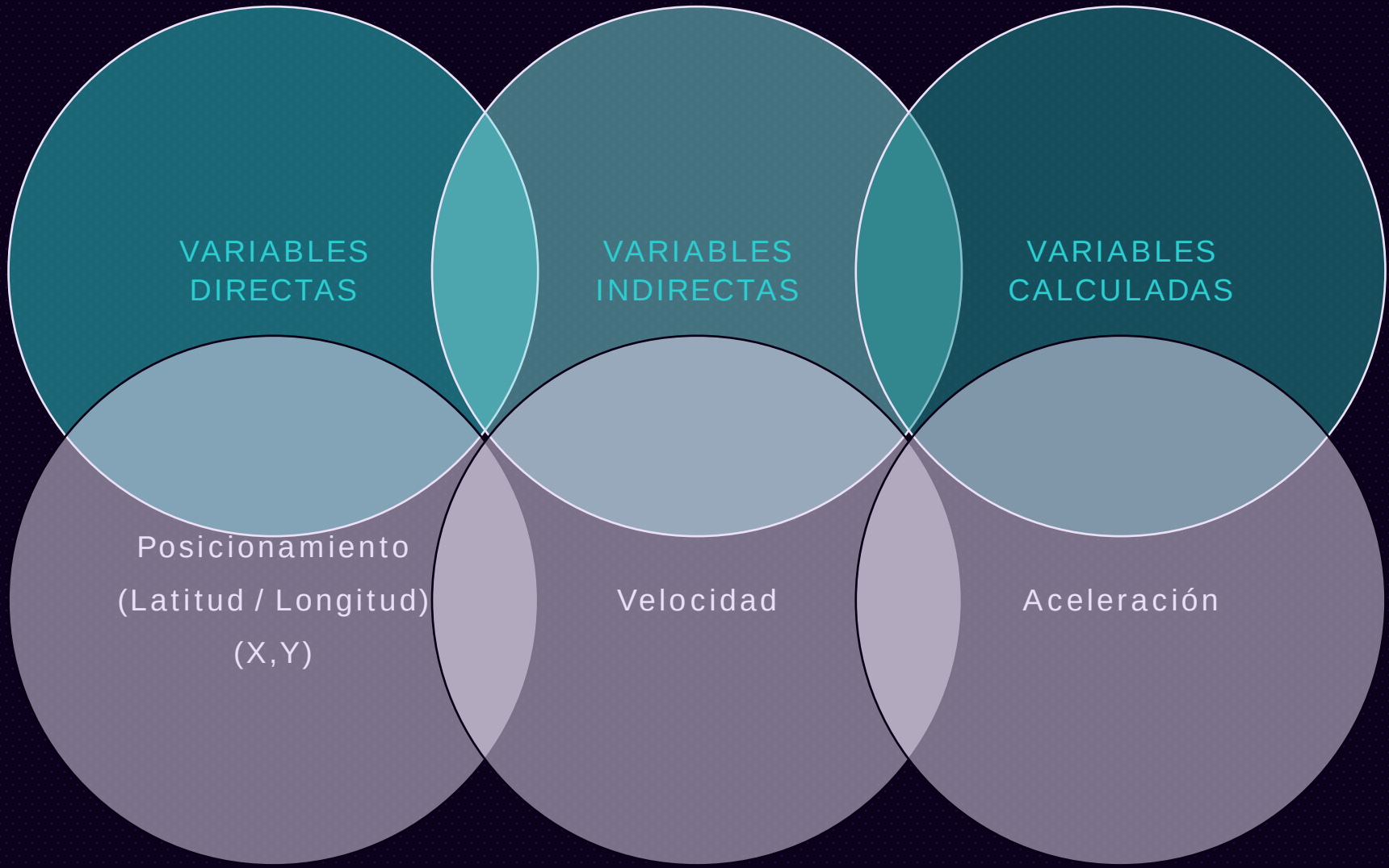
TAB ONE | TAB TWO | TAB THREE | TAB FIVE

VariablesCARGA

TAB FIVE

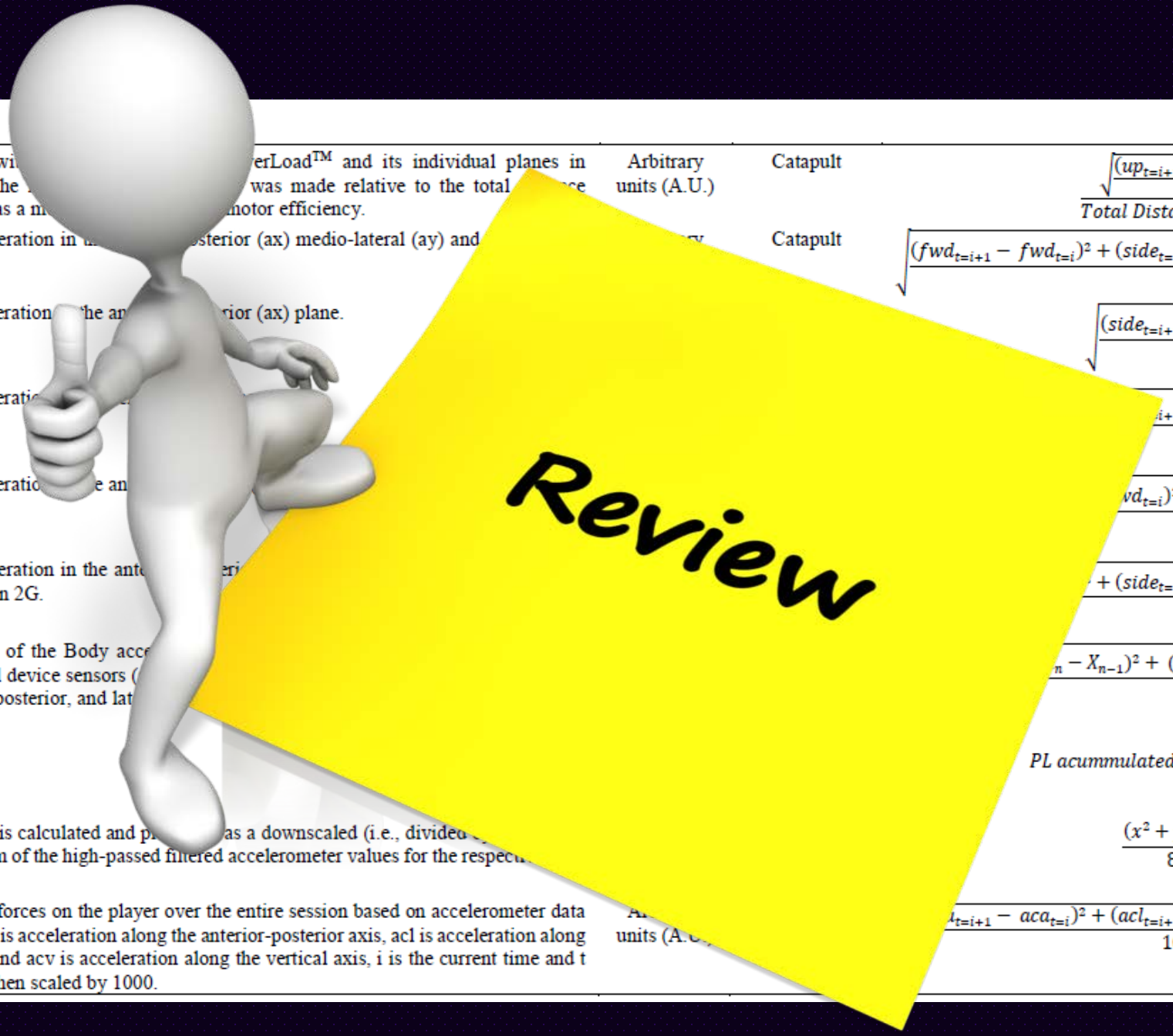


TAB ONE | TAB TWO | TAB THREE | TAB FOUR


VARIABLES DIRECTAS
VARIABLES INDIRECTAS
VARIABLES CALCULADAS
Posicionamiento
(Latitud / Longitud)
(X,Y)
Velocidad
Aceleración

TAB FIVE

INDICADORESCARGA



Locomotion Efficiency	To assess the wi… erLoad™ and its individual planes in comparison to the … was made relative to the total …ce covered (TDC) as a m… motor efficiency.	Arbitrary units (A.U.)	Catapult	$\frac{\sqrt{\frac{(up_{t=i+1} - up_{t=i})^2}{100}}}{Total\ Distance\ Covered}$
PlayerLoad™ (PL™)	Change in acceleration in t… sterior (ax) medio-lateral (ay) and … planes.		Catapult	$\sqrt{\frac{(fwd_{t=i+1} - fwd_{t=i})^2 + (side_{t=i+1} - side_{t=i})^2 + (up_{t=i+1} - up_{t=i})^2}{100}}$
PlayerLoad™ x-axis (PLx)	Change in acceleration …he an… rior (ax) plane.			$\sqrt{\frac{(side_{t=i+1} - side_{t=i})^2}{100}}$
PlayerLoad™ z-axis (PLz)	Change in acceleratio…			$\frac{\ldots_{i+1} - up_{t=i})^2}{100}$
PlayerLoad™ 2D (PL2D)	Change in acceleratio… e an…			$\frac{\ldots vd_{t=i})^2 + (side_{t=i+1} - side_{t=i})^2}{100}$
PlayerLoad™ slow (PLslow)	Change in acceleration in the ante… eri… planes lower than 2G.			$\frac{\ldots + (side_{t=i+1} - side_{t=i})^2 + (up_{t=i+1} - up_{t=i})^2}{100}$
Player Load$_{RT}$ (PL_{RT})	The vector sum of the Body acce… fusion of inertial device sensors (… (vertical, anteroposterior, and lat…			$\frac{\ldots_n - X_{n-1})^2 + (Y_n - Y_{n-1})^2 + (Z_n - Z_{n-1})^2}{100}$
				$PL\ acummulated = \sum_{n=0}^{m} PL_n \text{ x } 0{,}01$
Player Load$_{RE}$ (PL_{RE})	The player load is calculated and p… as a downscaled (i.e., divided … of the square sum of the high-passed filtered accelerometer values for the respect… (X, Y, and Z).			$\frac{(x^2 + y^2 + z^2)}{800}$
Total Load	The total of the forces on the player over the entire session based on accelerometer data alone where aca is acceleration along the anterior-posterior axis, acl is acceleration along the lateral axis and acv is acceleration along the vertical axis, i is the current time and t is time. This is then scaled by 1000.	A… units (A.U.)		$\frac{\ldots_{t=i+1} - aca_{t=i})^2 + (acl_{t=i+1} - acl_{t=i})^2 + (acv_{t=i+1} - acv_{t=i})^2}{1000}$



https://www.mdpi.com/1660-4601/16/24/5101



http://cdeporte.rediris.es/revista/revista77/artacelt1110.pdf


of Human Kinetics vo
259-269 DOI: 10.2478/hukin-2018-0072
259
Secti III – Sports Training
scie
Articulo
Pedro e-Soto[1], D
Suarez[1],
Alejandro Bastida-Castillo[1], Carlo
Garcia-Rubio[3],
Jose Pino-O

Pino Ortega, José

pepepinoortega@gmail.com

josepinoortega@um.es