



ACELERACIÓN

- .GENERALIDADES
- .DEMANDAS DEL JUEGO
- .BIOMECÁNICA BÁSICA

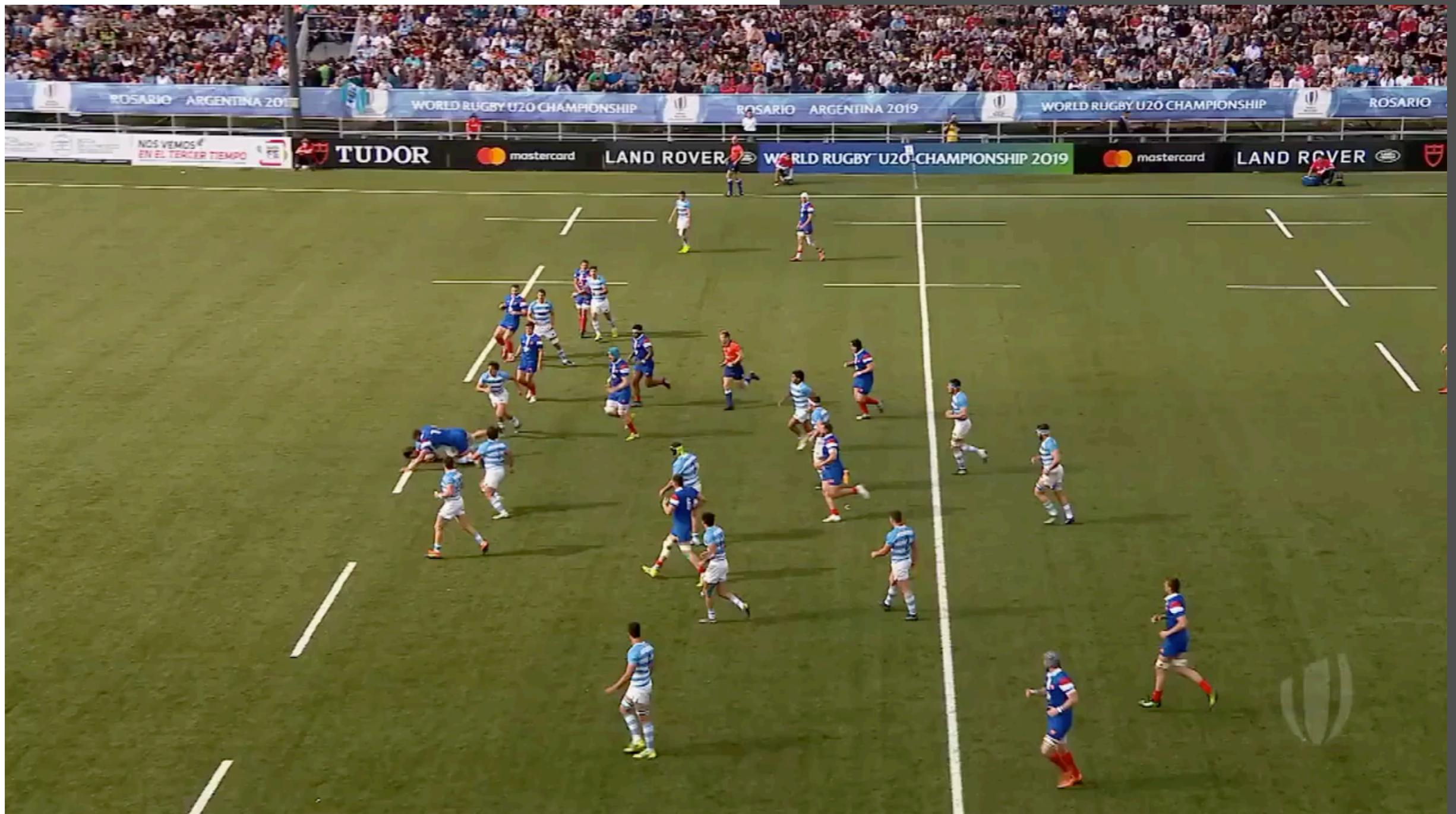
- .CINEMÁTICA
  - .CINÉTICA



# GENERALIDADES



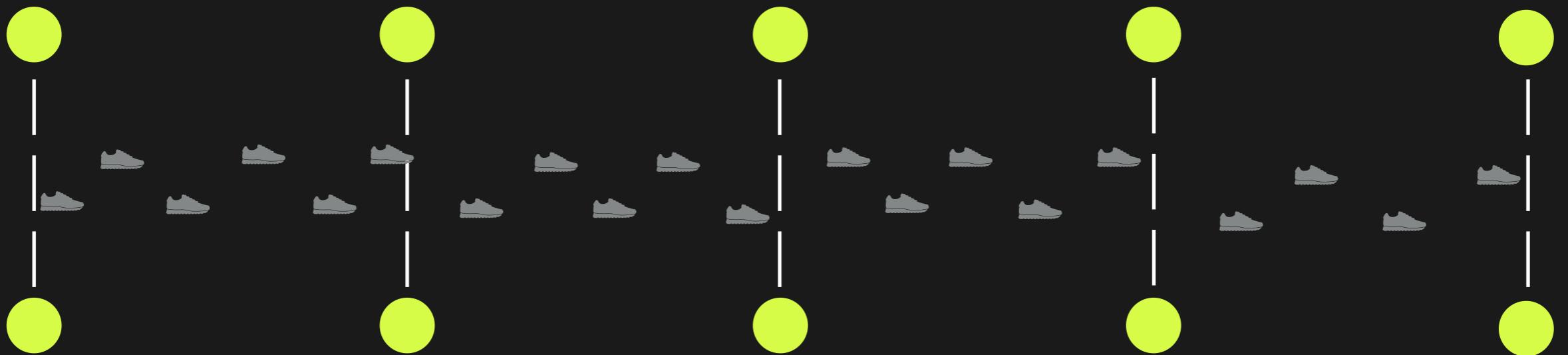
## ACELERACIONES EN EL DEPORTE



# FASES

ACELERACIÓN

VELOCIDAD MÁXIMA



1 A 6 PASOS

7 A 11 PASOS

12 A 16 PASOS

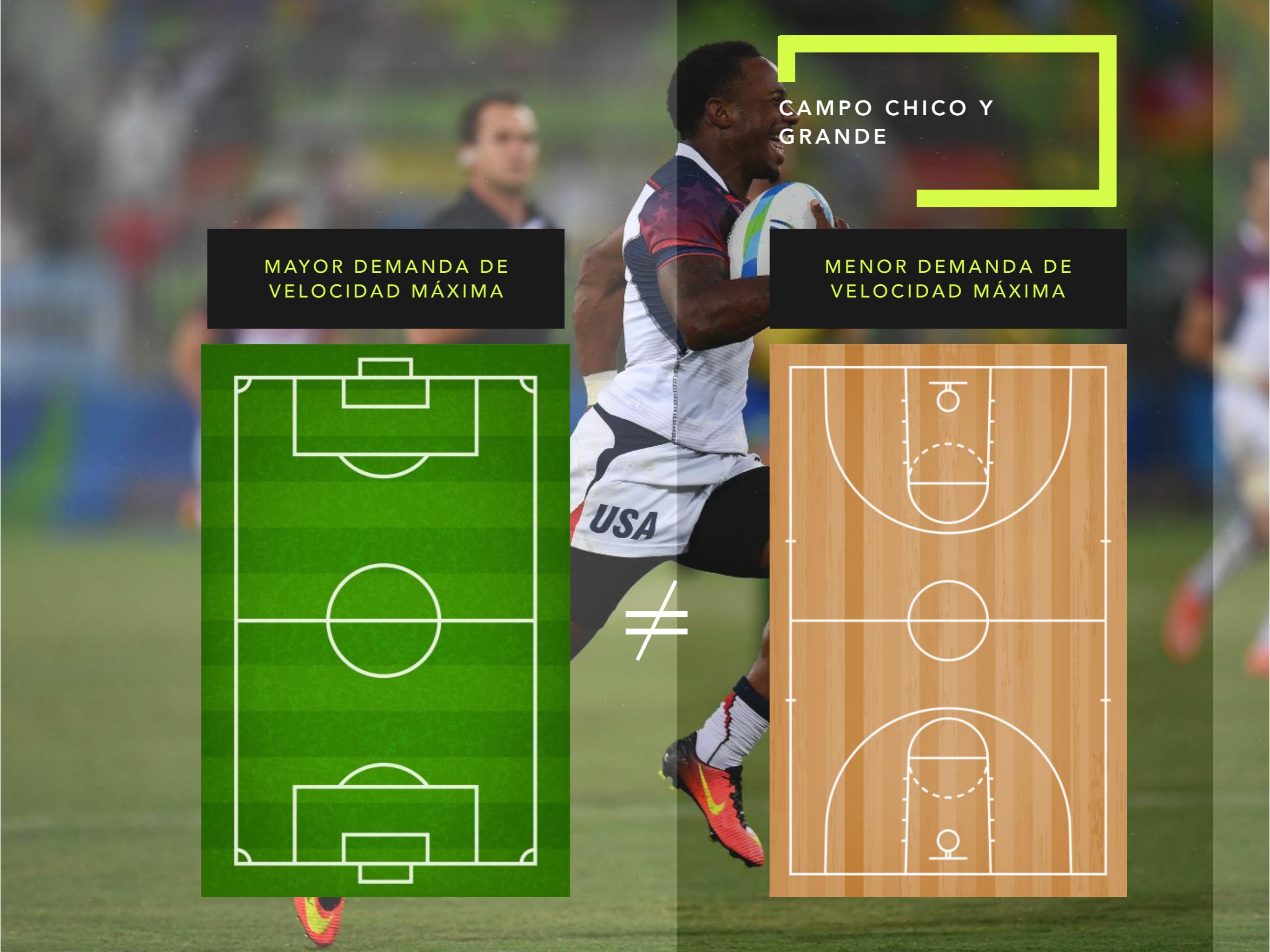
17 A 20 PASOS

## ACELERACIÓN VS MÁXIMA



## DEMANDAS DEL JUEGO

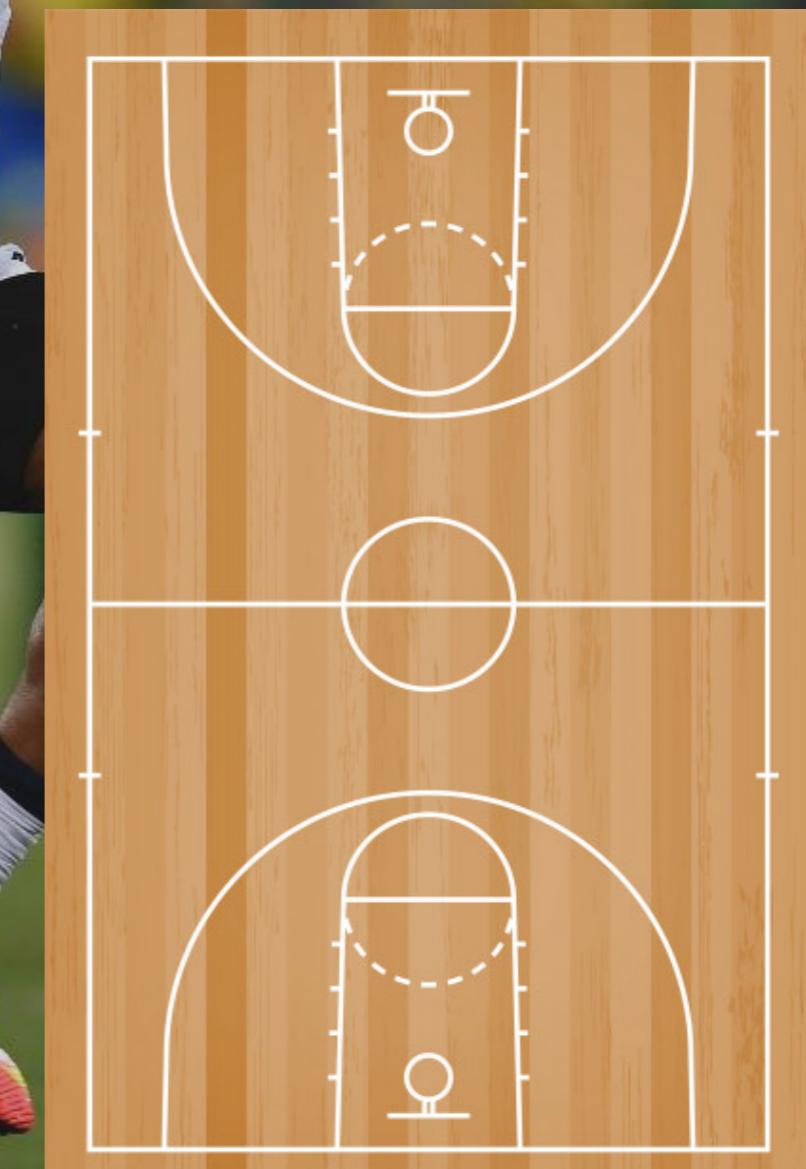




CAMPO CHICO Y  
GRANDE

MAYOR DEMANDA DE  
VELOCIDAD MÁXIMA

MENOR DEMANDA DE  
VELOCIDAD MÁXIMA





## PERFIL DE JUGADORES DE CAMPO

JUGADORAS DE CAMPO GRANDE

DISTANCIA MEDIA DE  
SPRINT

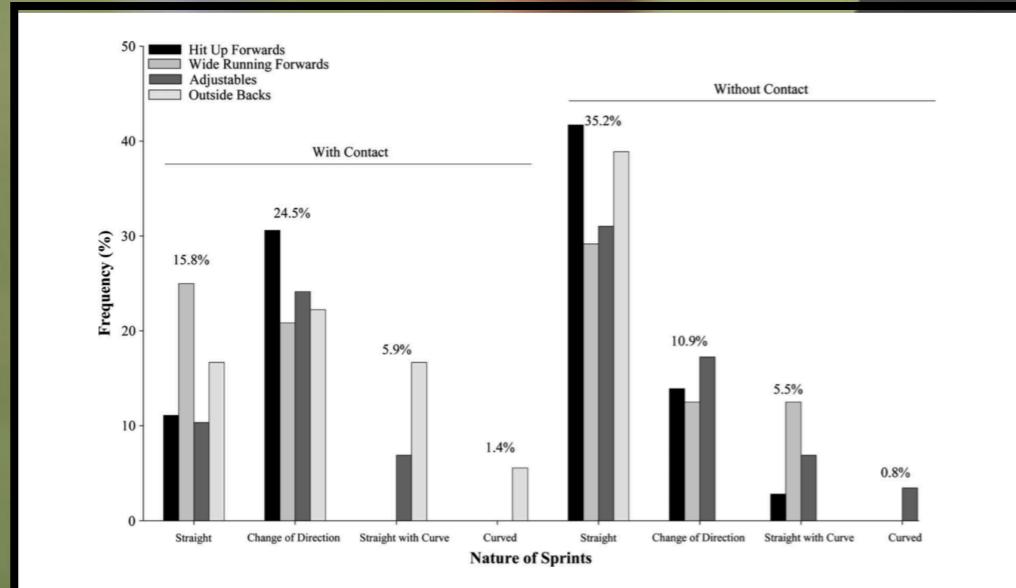
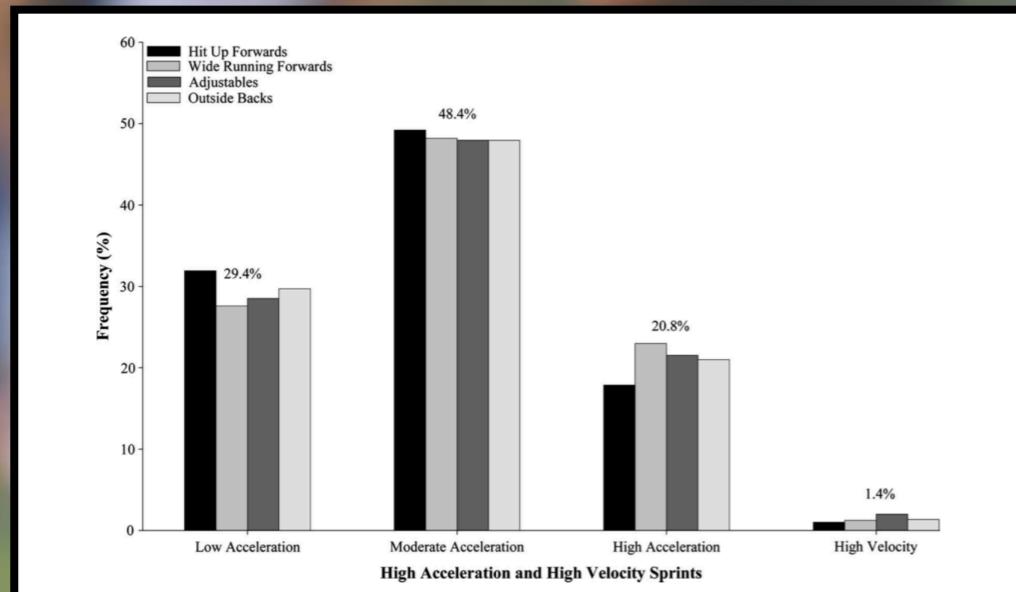
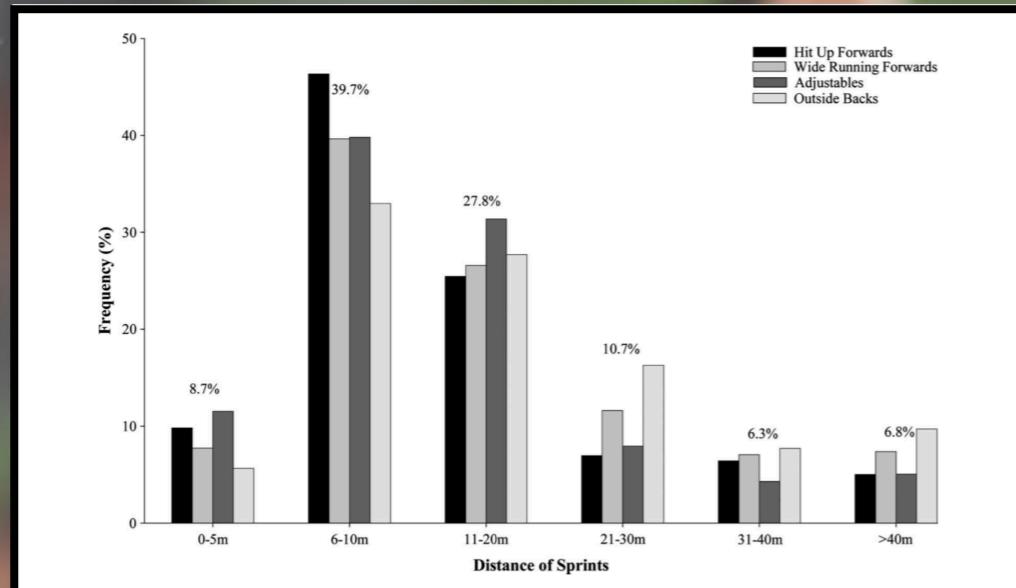
10/20 METROS

DURACIÓN MEDIA DE  
SPRINT

2/3 SEGUNDOS



Bishop & Goodman (2005)



CERCA DEL 30% SON EN LÍNEA RECTA



## MAGNITUD DE LAS ACELERACIONES

JUGADORAS DE RUGBY ELITE

FORWARDS

BACKS

2 A 3 M/S<sup>2</sup>

19.42 (10.5)

26.4 (8.4)

3 A 4 M/S<sup>2</sup>

2.2 (1.9)

4.9 (3.0)

>4 M/S<sup>2</sup>

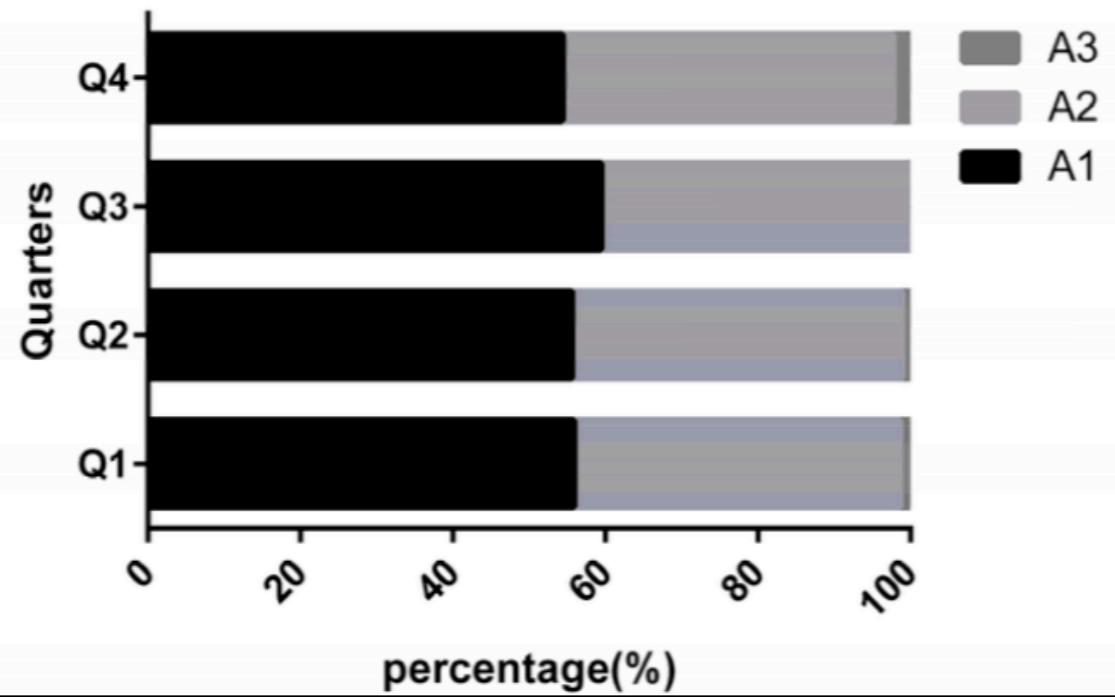
0.69 (0.95)

1.04 (1.22)

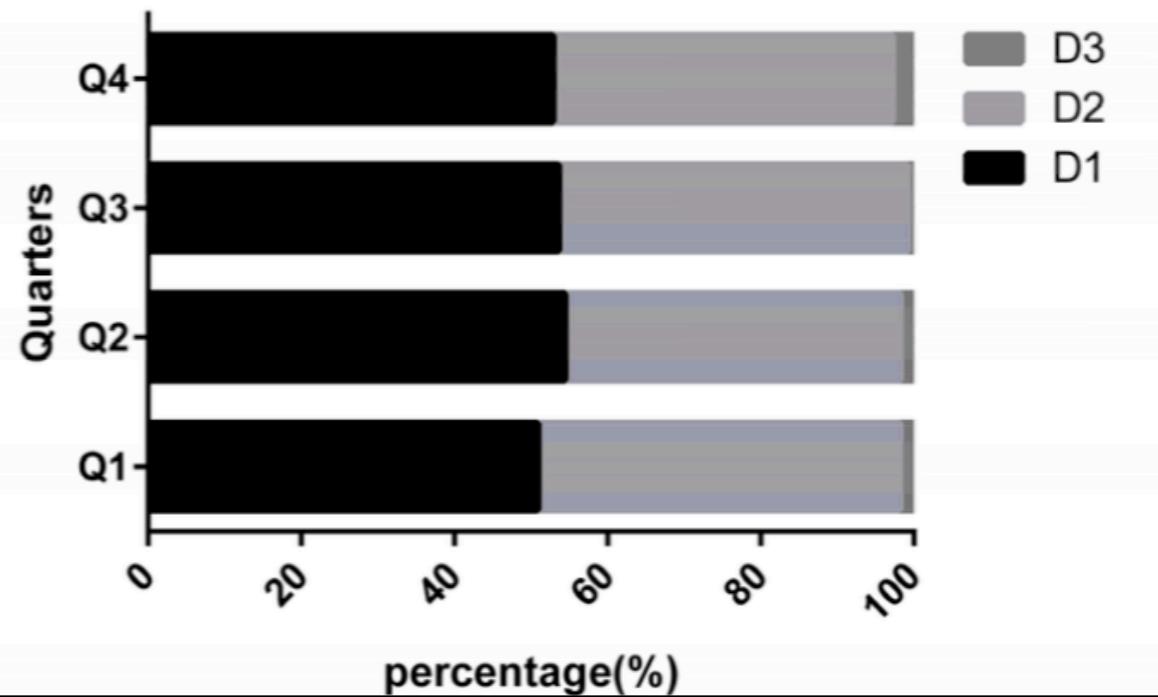
## ACELERACIONES/ DESACELERACIONES

JUGADORAS DE BASQUET U 18

Aceleration



Deceleration



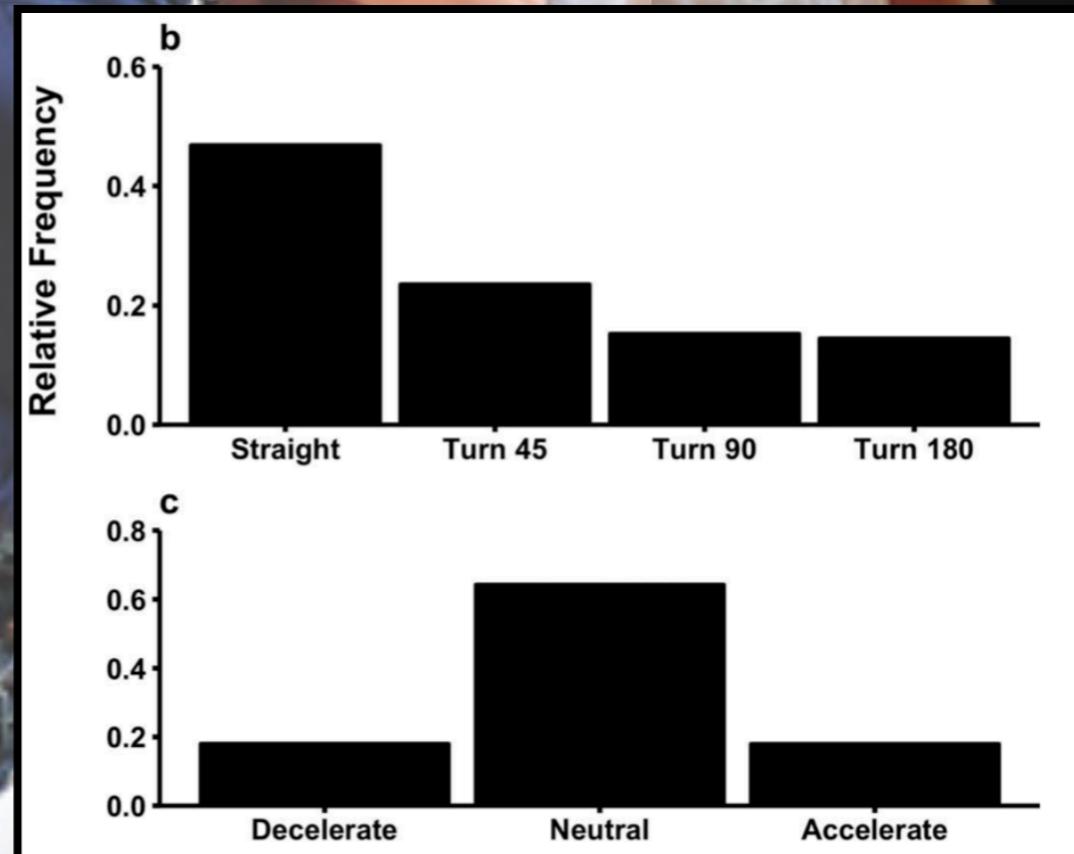
## ACELERACIONES/ DESACELERACIONES

**JUGADORAS DE FUTBOL ELITE**

	CD (n = 66)	FB (n = 80)	CM (n = 67)	WM (n = 37)	A (n = 48)	Total (n = 298)
<b>Accelerations (number)</b>						
First half	33 ± 13	43 ± 13‡§	36 ± 10	44 ± 12‡§	36 ± 8	38 ± 12
Second half	28 ± 11¶	41 ± 10‡#	38 ± 12‡	42 ± 14‡	38 ± 8‡**	37 ± 12¶
Full match	61 ± 22	85 ± 21‡§	74 ± 21‡	87 ± 25‡§	74 ± 14‡	76 ± 22
<b>Acceleration distance (m)</b>						
First half	252 ± 133	365 ± 163‡§	271 ± 91	345 ± 164‡	290 ± 123	304 ± 147
Second half	215 ± 107¶	349 ± 151‡	288 ± 128#	339 ± 178‡	312 ± 129‡	298 ± 146‡
Full match	468 ± 220	714 ± 298‡§	559 ± 232	685 ± 331‡	602 ± 239	603 ± 278
<b>Acceleration effort (m·s<sup>-4</sup>)</b>						
First half	416 ± 148	467 ± 141	404 ± 142	596 ± 212‡§  ††	461 ± 128	457 ± 161
Second half	356 ± 120¶	435 ± 118‡¶	420 ± 142	554 ± 215‡§  ††	480 ± 142‡	436 ± 154¶
Full match	773 ± 227¶	902 ± 231‡	824 ± 259	1,150 ± 401‡§  ††	942 ± 237‡	893 ± 286
<b>Deceleration (number)</b>						
First half	22 ± 7	32 ± 8‡§	25 ± 8	30 ± 6‡§	29 ± 10‡	28 ± 9
Second half	18 ± 6¶	31 ± 8‡§	24 ± 8‡	30 ± 9‡§	31 ± 9‡§**	27 ± 10¶
Full match	40 ± 11	62 ± 13‡§	49 ± 15‡	60 ± 13‡§	59 ± 18‡§	54 ± 16
<b>Deceleration distance (m)</b>						
First half	158 ± 56	247 ± 75‡§	182 ± 65	227 ± 57‡§	212 ± 89‡§	204 ± 77
Second half	132 ± 53¶	243 ± 79‡§	179 ± 65‡	229 ± 69‡§	224 ± 79‡§	199 ± 81
Full match	290 ± 91	490 ± 136‡§	360 ± 120‡	456 ± 107‡§	436 ± 160‡§	403 ± 145
<b>Deceleration effort (m·s<sup>-4</sup>)</b>						
First half	330 ± 117	425 ± 148‡§	356 ± 151	479 ± 151‡§	479 ± 151‡	395 ± 156
Second half	288 ± 136¶	412 ± 151‡§	328 ± 129¶	441 ± 165‡§	428 ± 156‡§	372 ± 157¶
Full match	618 ± 220	838 ± 275‡§	685 ± 264	920 ± 285‡§	854 ± 310‡§	768 ± 289

## LINEA RECTA VS CCD

JUGADORAS DE BASQUET ELITE



ACELERAMOS

LINEALMENTE

MULTILINEALMENTE

ADELANTE

LATERAL

DIAGONAL

ATRÁS

DESDE POSICIÓN  
ESTÁTICA

DESDE POSICIÓN  
SEMI-ESTÁTICA

DESDE  
MOVIMIENTO

ACELERAMOS

LINEALMENTE

MULTILINEALMENTE

ACCIÓN  
PREVIA

PATRÓN  
ESPECÍFICO

DIRECCIÓN

ESTÁTICO/SEMI-  
ESTÁTICO

ACELERAR

ADELANTE

CAMINAR/TROTAR/  
CORRER

ACELERAR

ADELANTE

ANDANDO DE  
LADO

ACELERAR

ADELANTE

ANDANDO  
HACÍA ATRÁS

ACELERAR

ADELANTE

ACCIÓN  
PREVIA

PATRÓN  
ESPECÍFICO

DIRECCIÓN

ESTÁTICO/SEMI-  
ESTÁTICO

ACELERAR

HACIA ATRÁS

CAMINAR/TROTAR/  
CORRER

ACELERAR

HACIA EL  
LADO

ANDANDO DE  
LADO

ACELERAR

DIAGONAL  
ADELANTE

ANDANDO  
HACÍA ATRÁS

ACELERAR

DIAGONAL  
ATRÁS

# BIOMECÁNICA BÁSICA



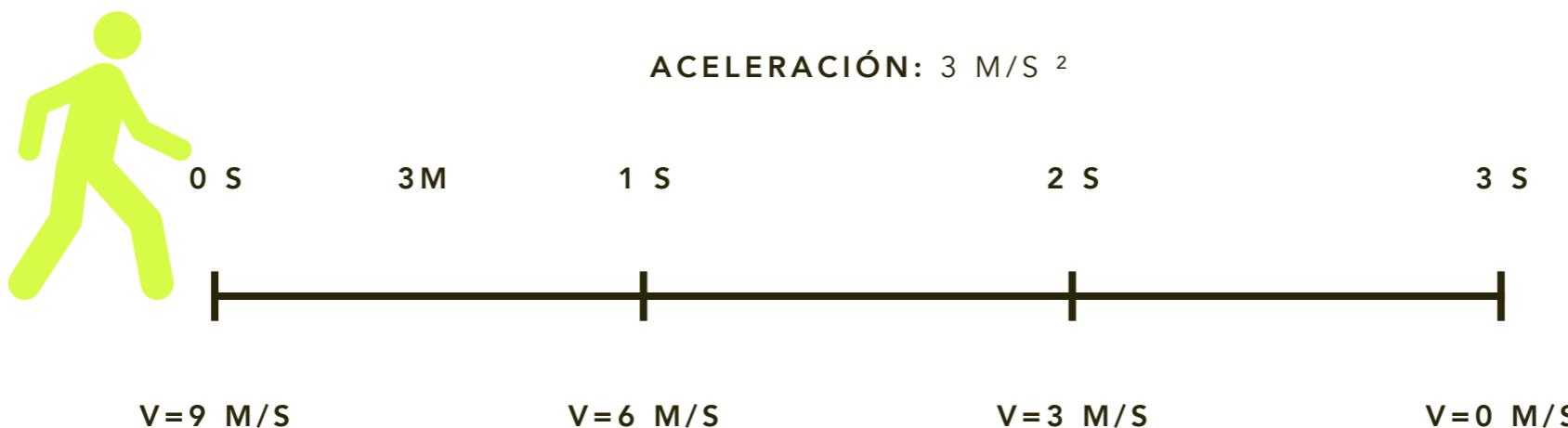
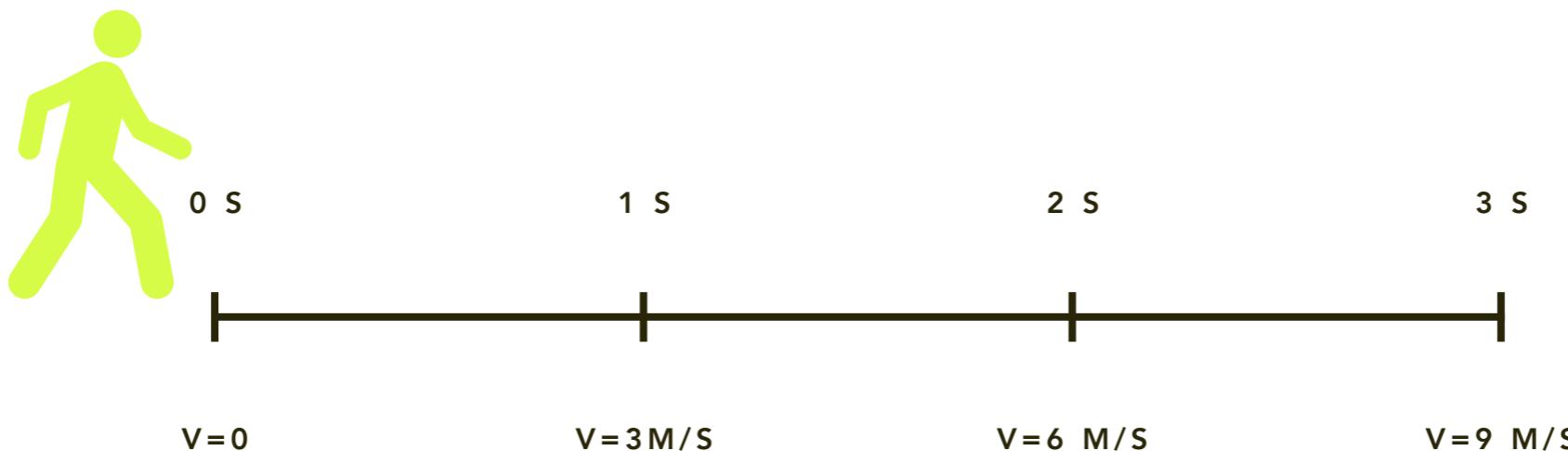


ACELERACIÓN

LA CAPACIDAD DE GENERAR UNA VELOCIDAD DE  
CARRERA LO MÁS ALTA POSIBLE EN LA MENOR DISTANCIA  
O TIEMPO POSIBLE.



## ACELERACIÓN

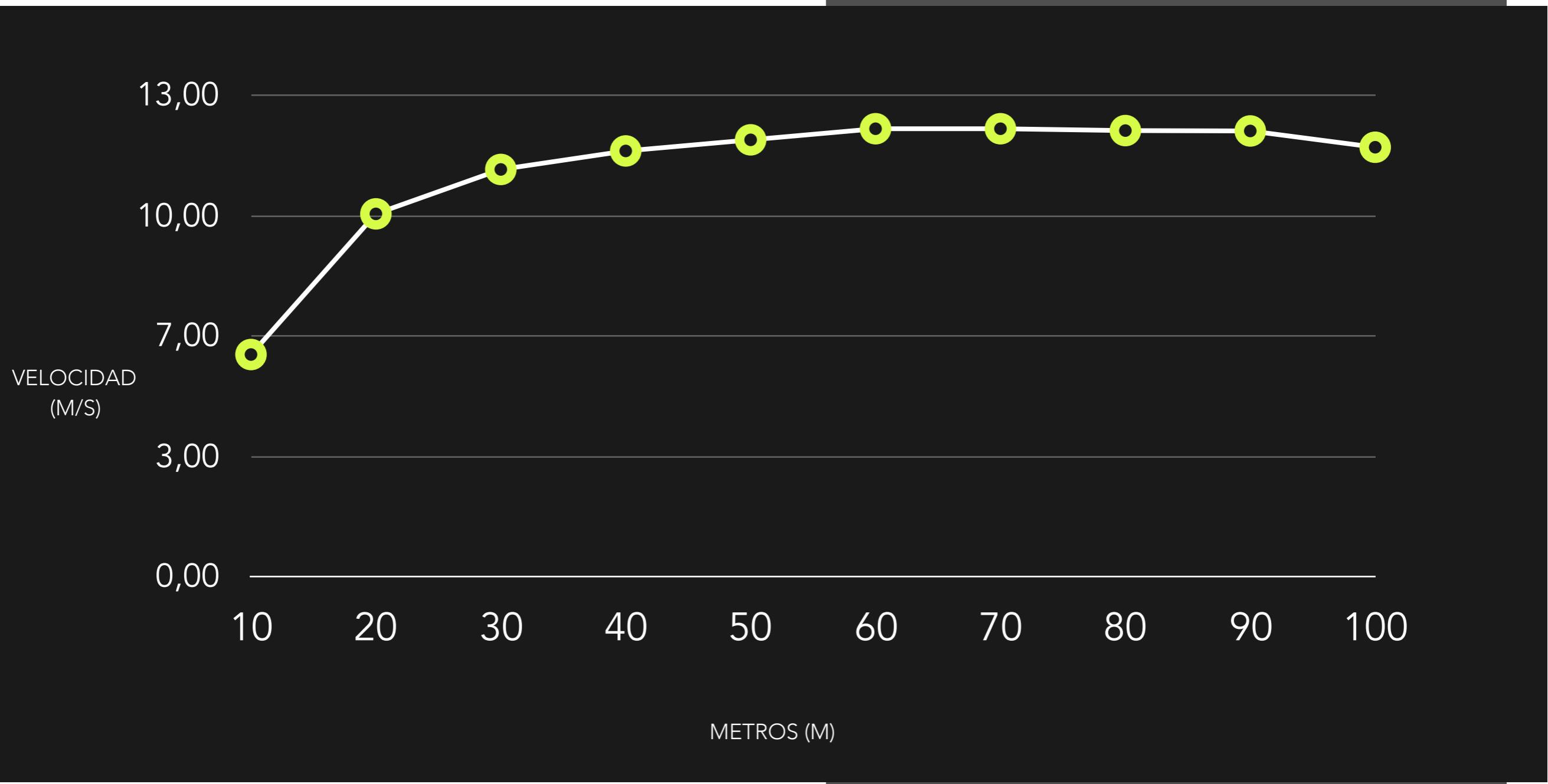


ACELERACIÓN:  $-3 \text{ M/S}^2$

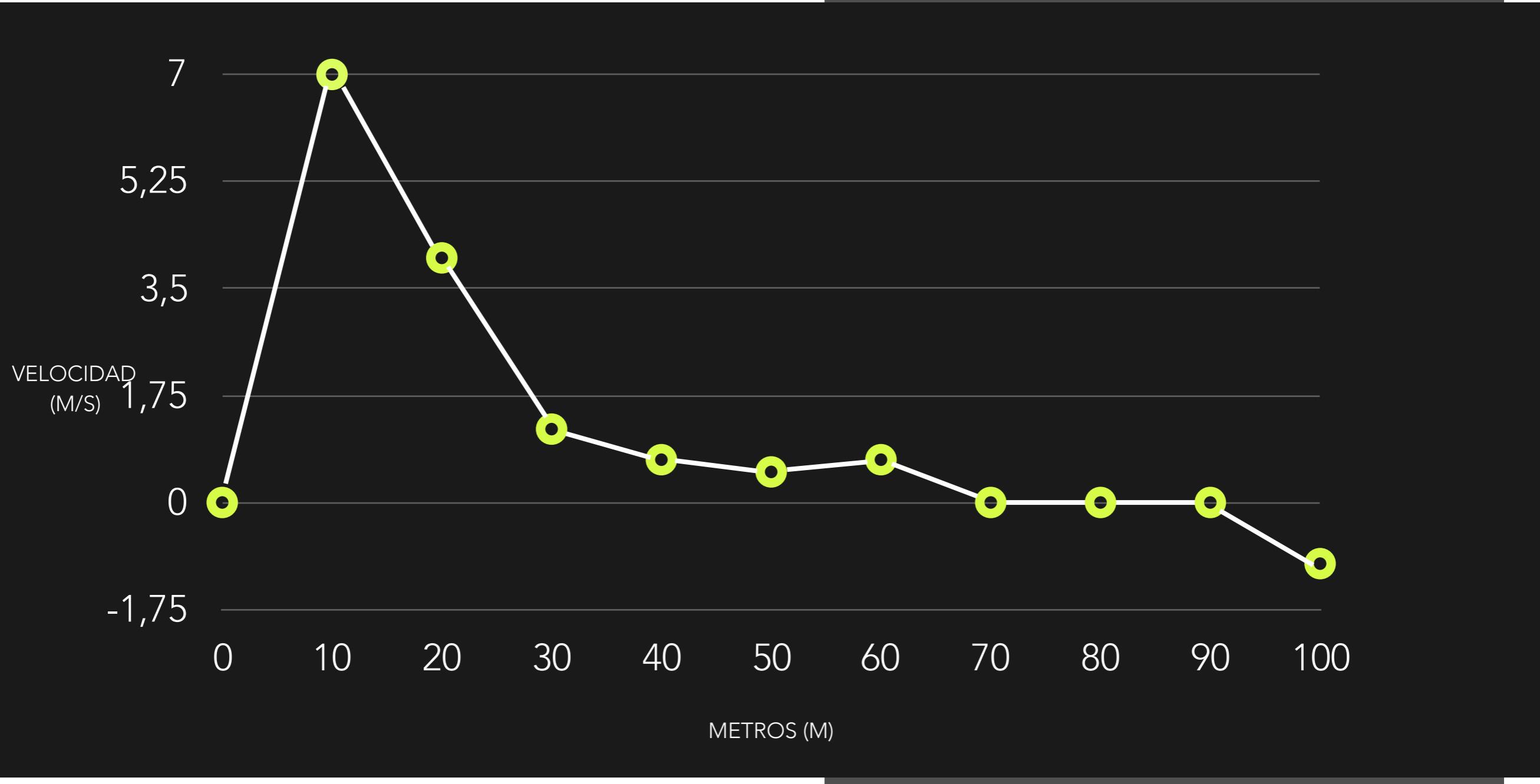
CINEMÁTICA



## VELOCIDAD USAIN B. (BEIJING)



## ACELERACIÓN USAIN B. (BEIJING)



## LOS PRIMEROS PASOS

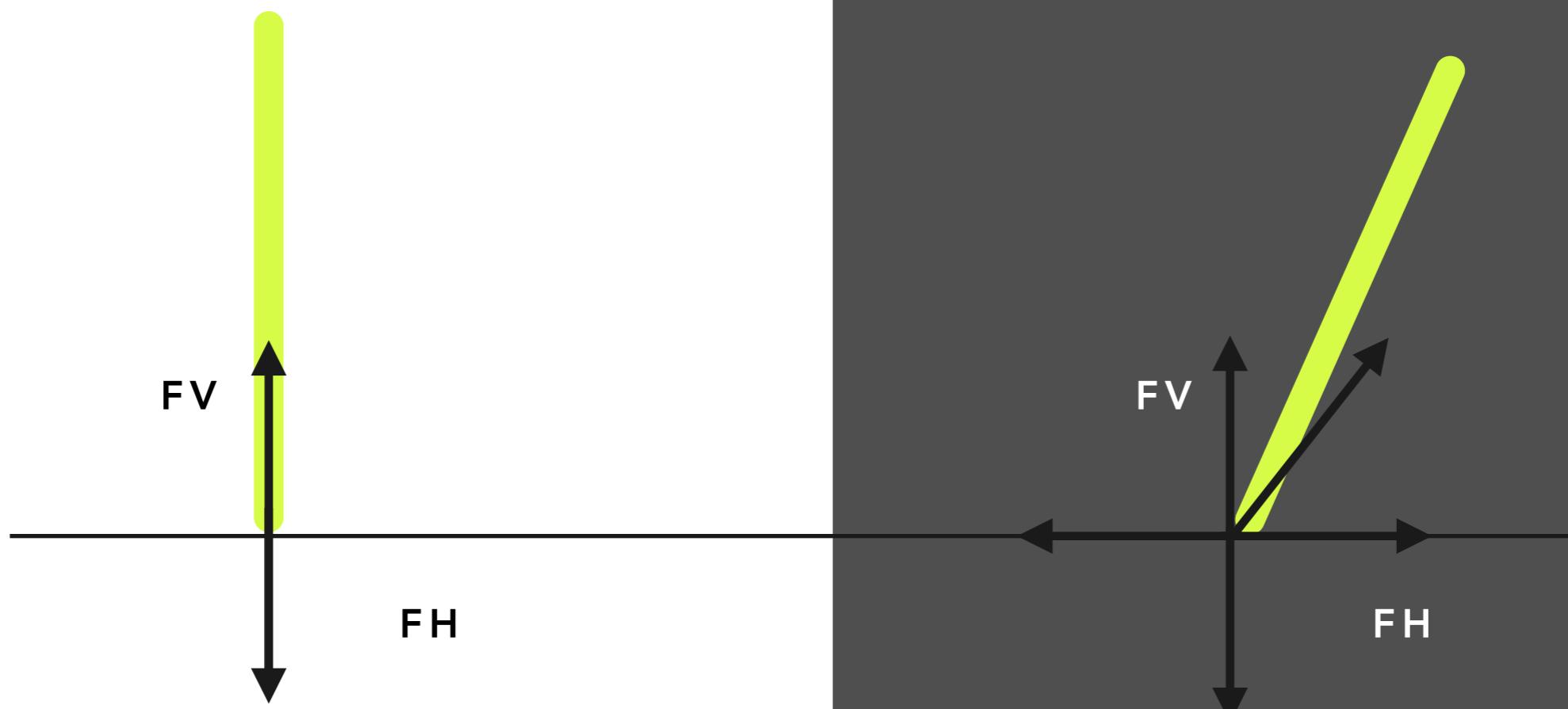




DIRECCIÓN DE LA FUERZA



## RESULTANTE DE FUERZA



## SPRINTERS VS FUTBOLISTAS

28 ESPECIALISTAS EN SPRINT  
24 FUTBOLISTAS

PROMEDIO DE POTENCIA HORIZONTAL (W/KG)	17.9 (4.8)	11.9 (2.6)	15.7 (5.2)	7.9 (3.4)
RESULTANTE DE FUERZA MEDIA (N/KG)	20.5 (1.7)	19.2 (1.2)	21.4 (1.2)	19.6 (1.5)
FUERZA HORIZONTAL MEDIA (N/KG)	2.5 (0.6)	1.7 (0.5)	2.4 (0.5)	1.5 (0.6)
FUERZA VERTICAL MEDIA (N/KG)	19.6 (1.2)	18.4 (1.6)	19.6 (1.2)	18.6 (1.8)
RATIO DE FUERZA MEDIO (%)	18.4 (2.6)	16.8 (2.6)	16.8 (2.3)	15.3 (2.0)
TIEMPO DE CONTACTO (S)	0.109 (0.006)	0.111 (0.006)	0.105 (0.006)	0.107 (0.007)
TIEMPO DE VUELO (S)	0.109 (0.012)	0.101 (0.012)	0.113 (0.012)	0.105 (0.010)



## SPRINTERS VS FUTBOLISTAS

28 ESPECIALISTAS EN SPRINT  
24 FUTBOLISTAS

IMPULSO HORIZONTAL NETA  
(N/S)

15.9  
(4.5)

11.2  
(4.4)

12.5  
(4.3)

7.6  
(2.5)

IMPULSO PROPULSIVA

22.7  
(3.3)

19.8  
(3.1)

20.9  
(3.1)

17.6  
(2.4)

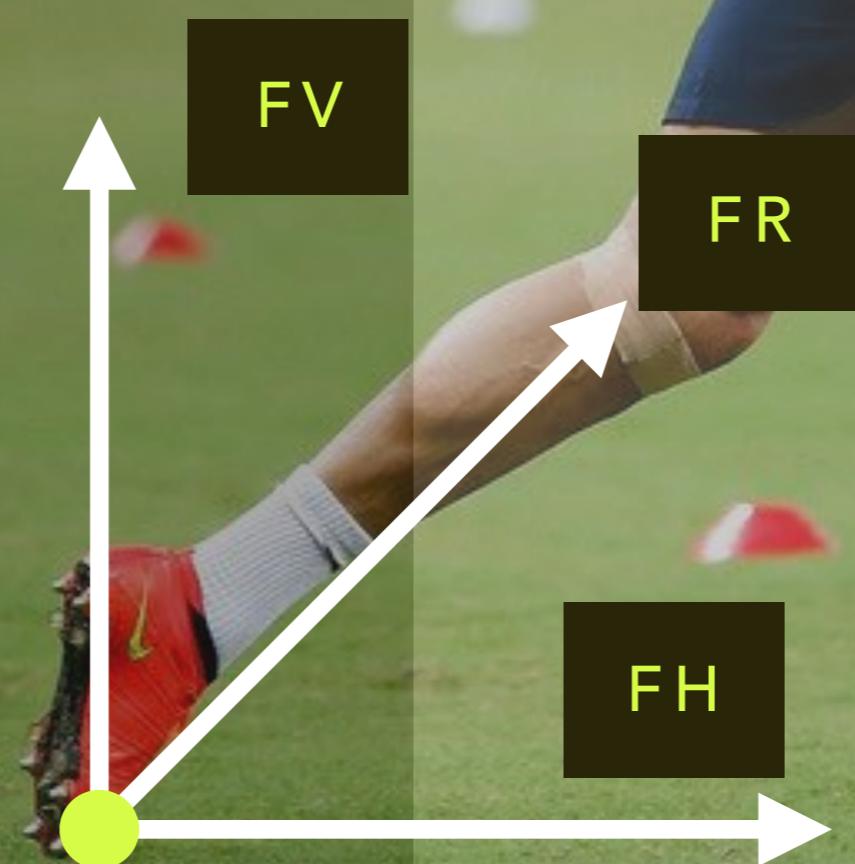
IMPULSO DE FRENADO

-6.8  
(2.7)

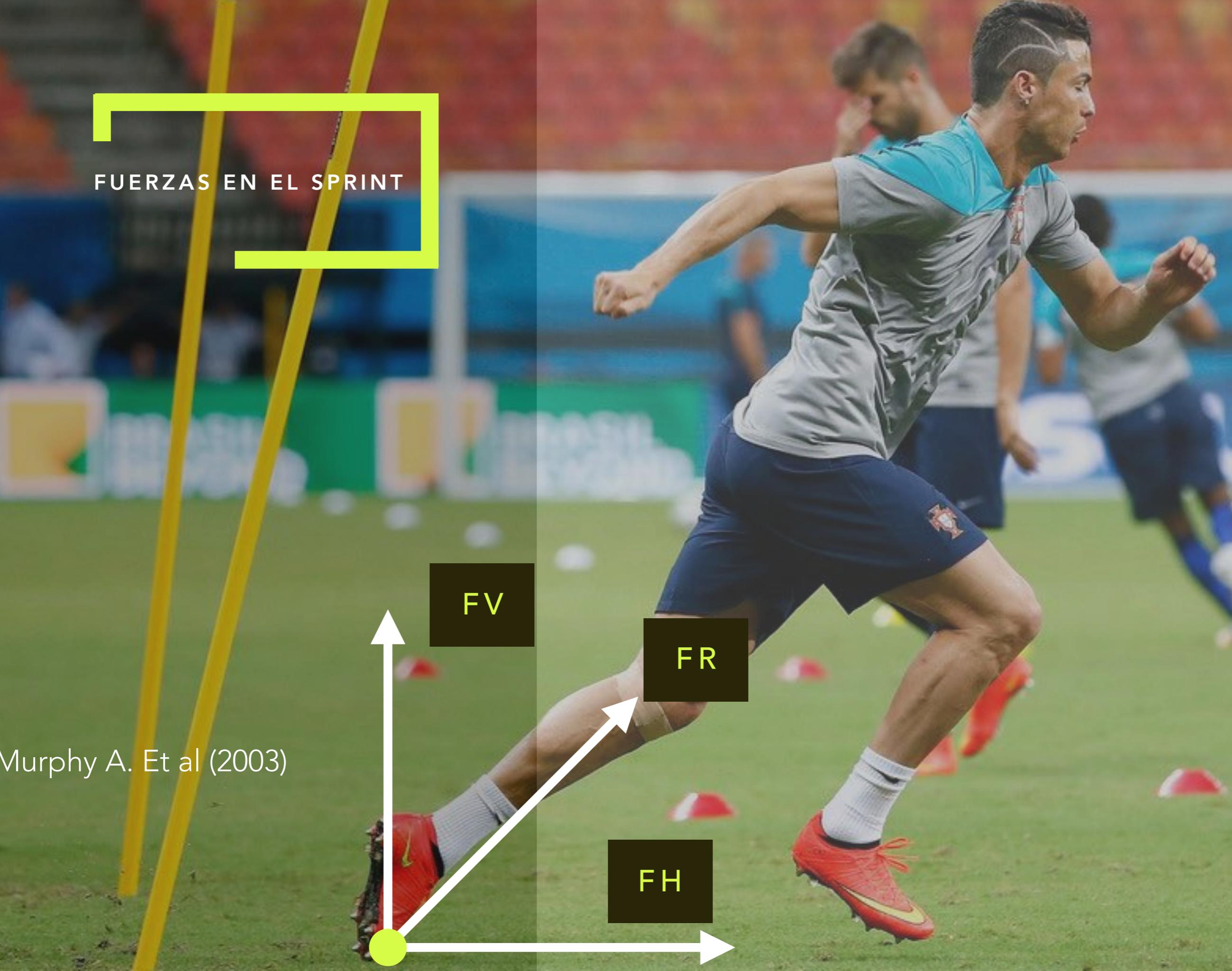
-8.6  
(2.3)

-8.3  
(2.5)

-10  
(1.7)

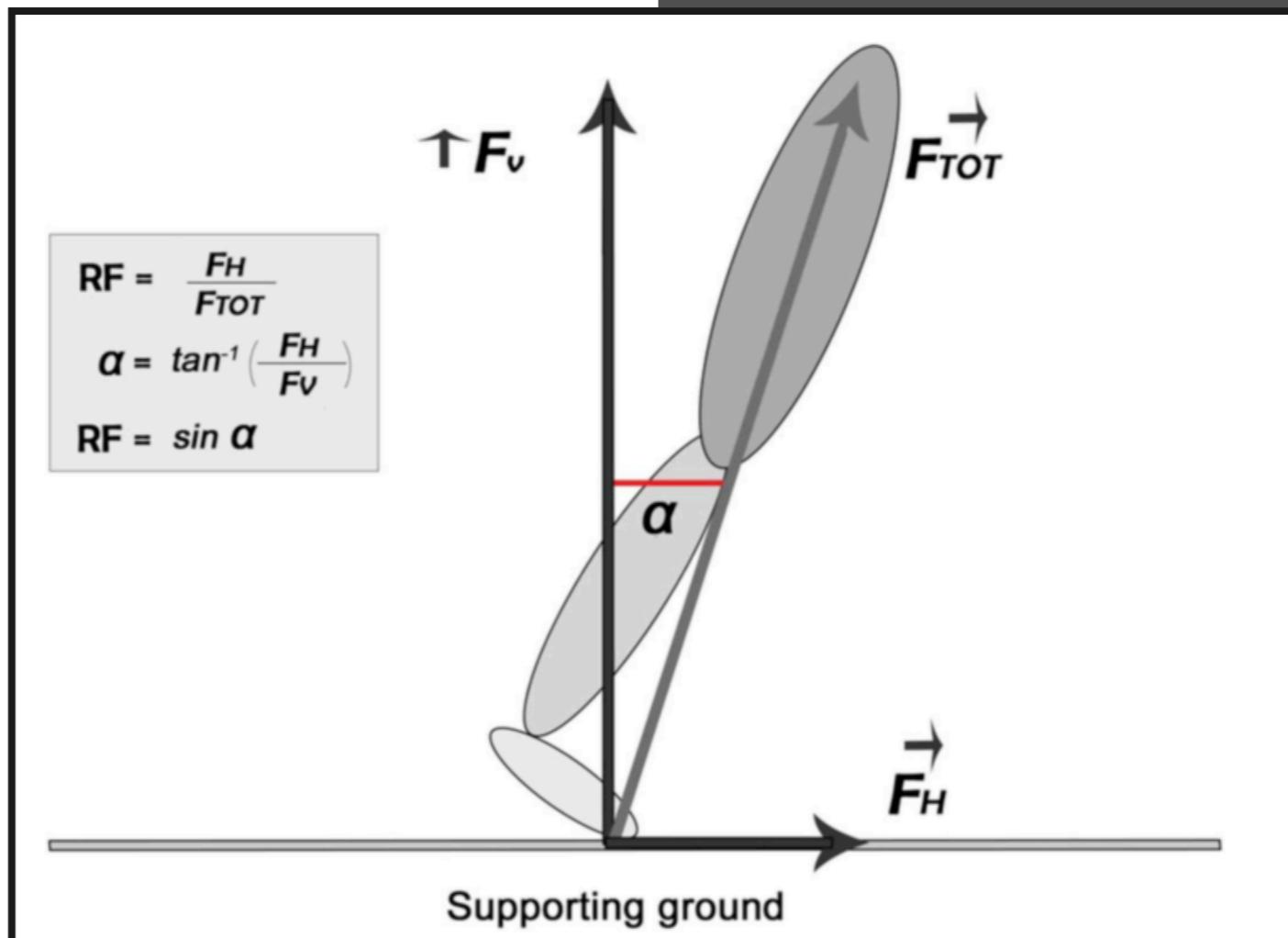


Murphy A. Et al (2003)

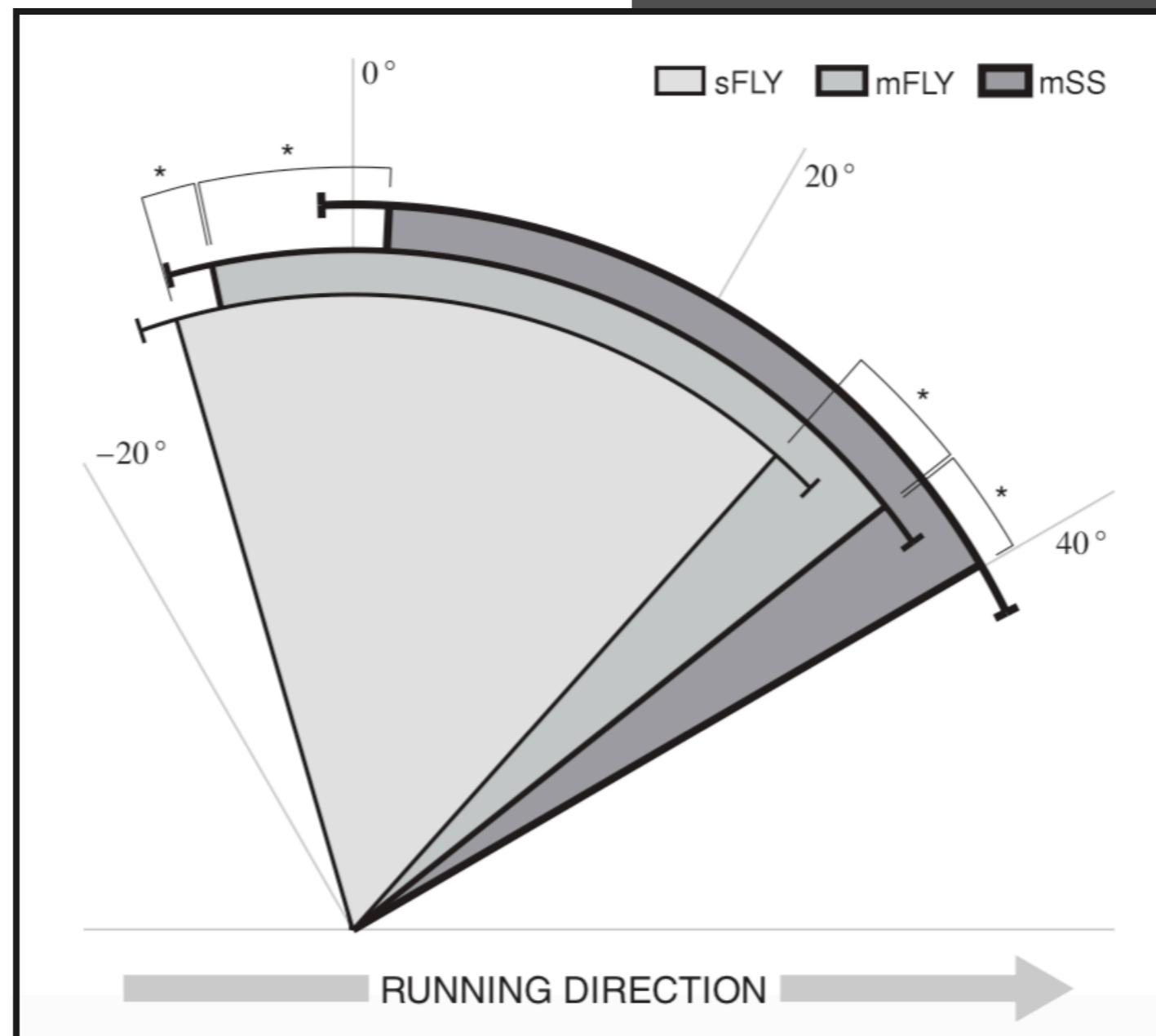


# PORCENTAJE DE FUERZA QUE SE HACE EN EL VECTOR HORIZONTAL

ORIENTACIÓN DE LAS FUERZAS VS FUERZA



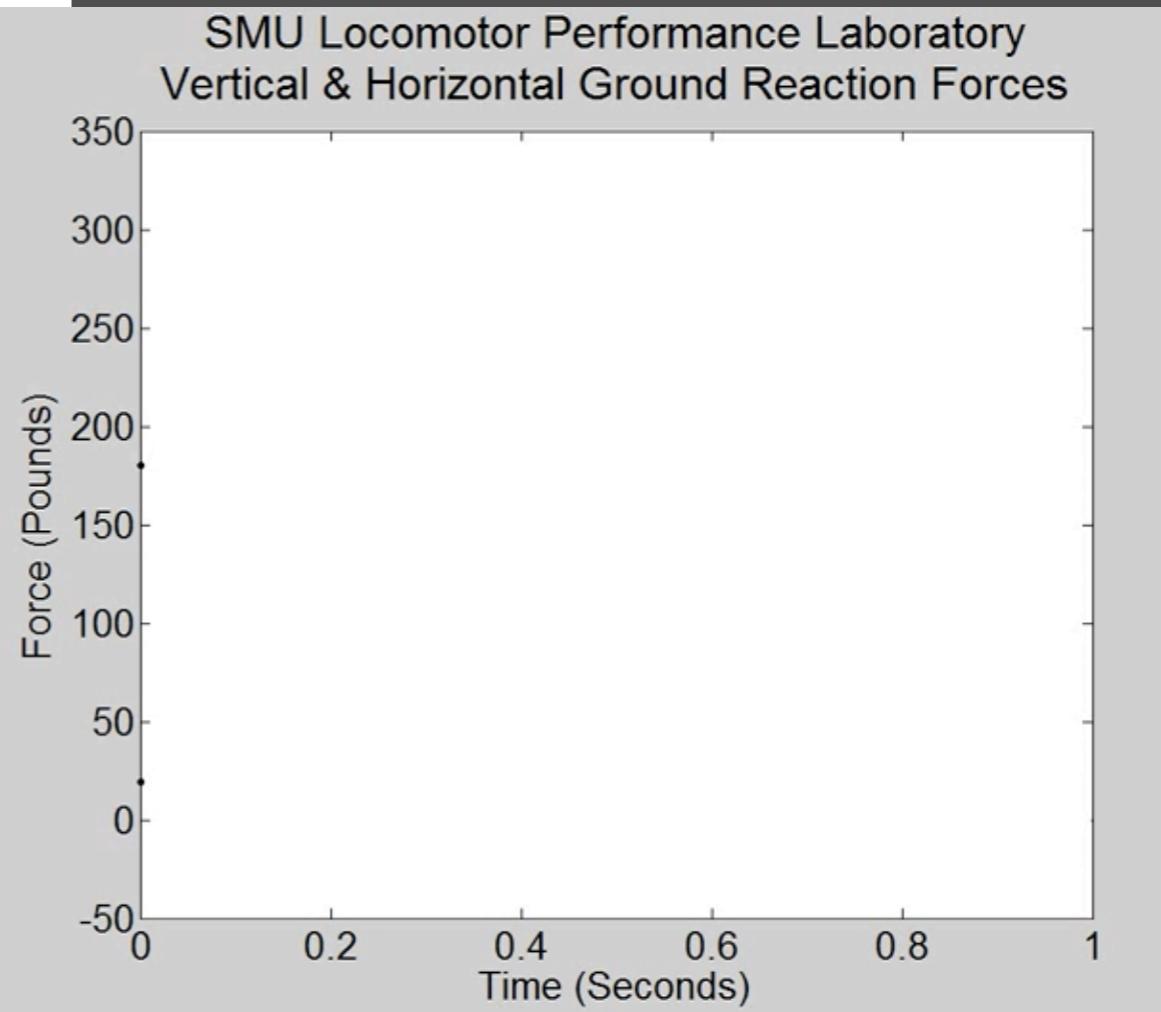
## ORIENTACIÓN DE LAS FUERZAS VS FUERZA



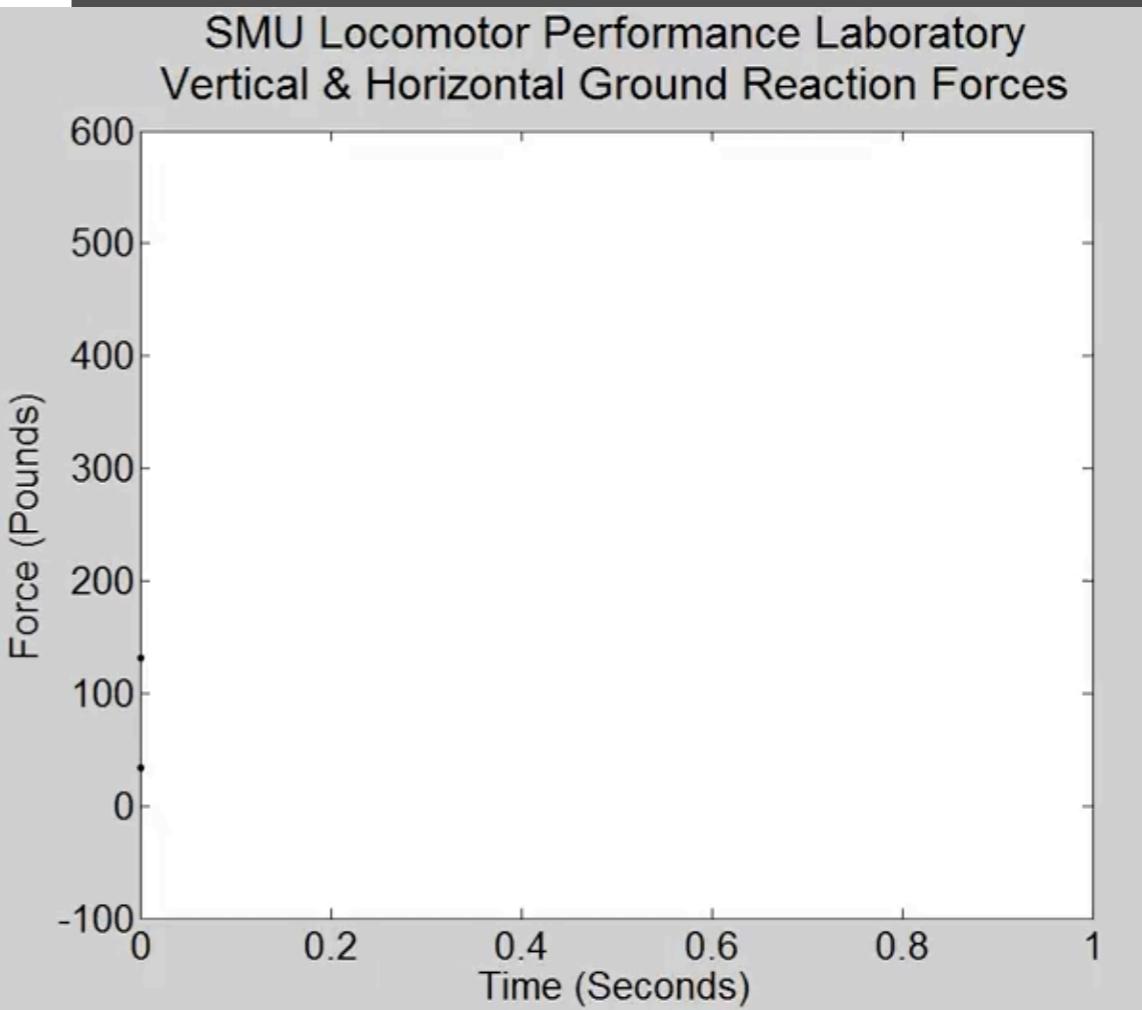
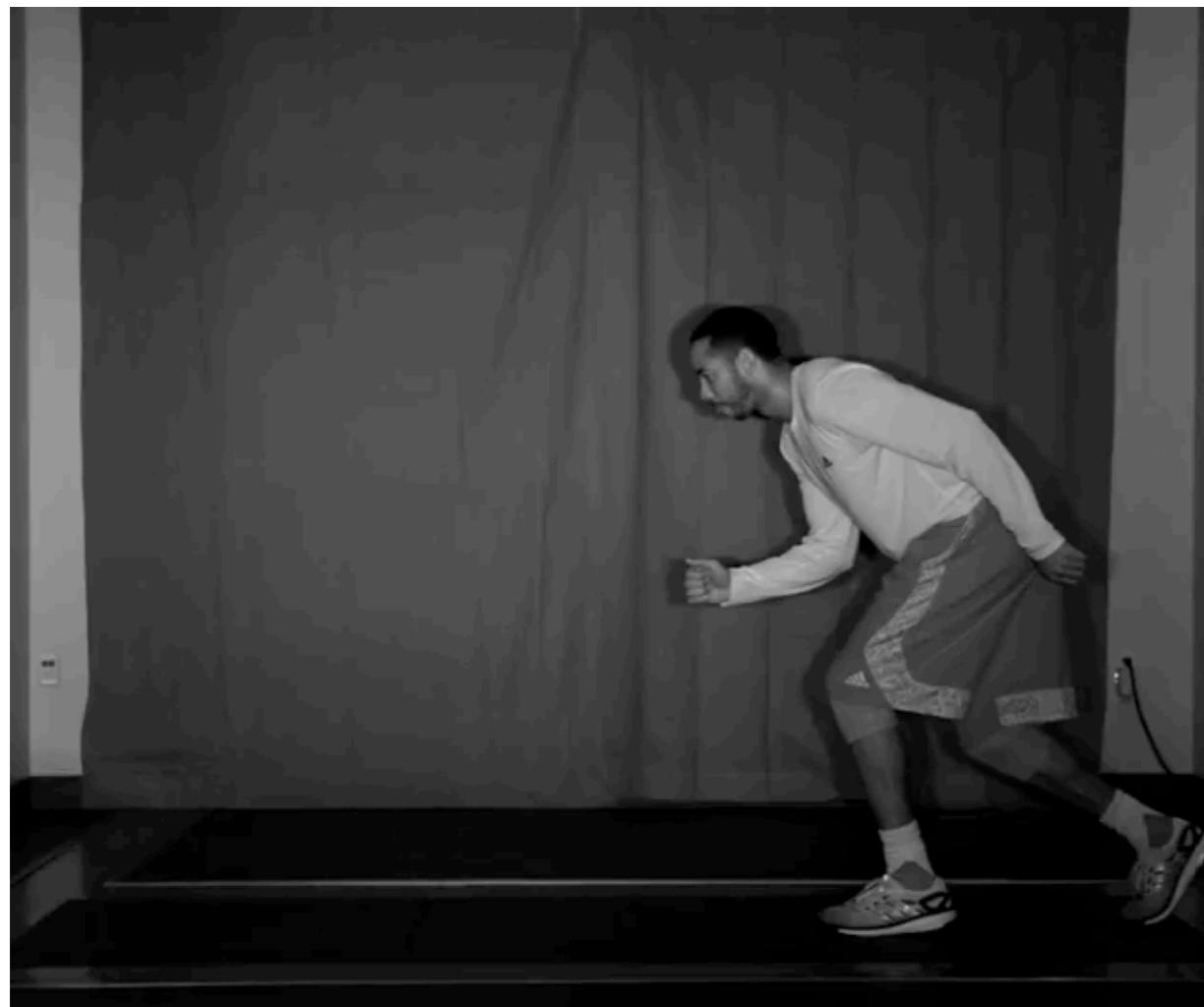
CINÉTICA

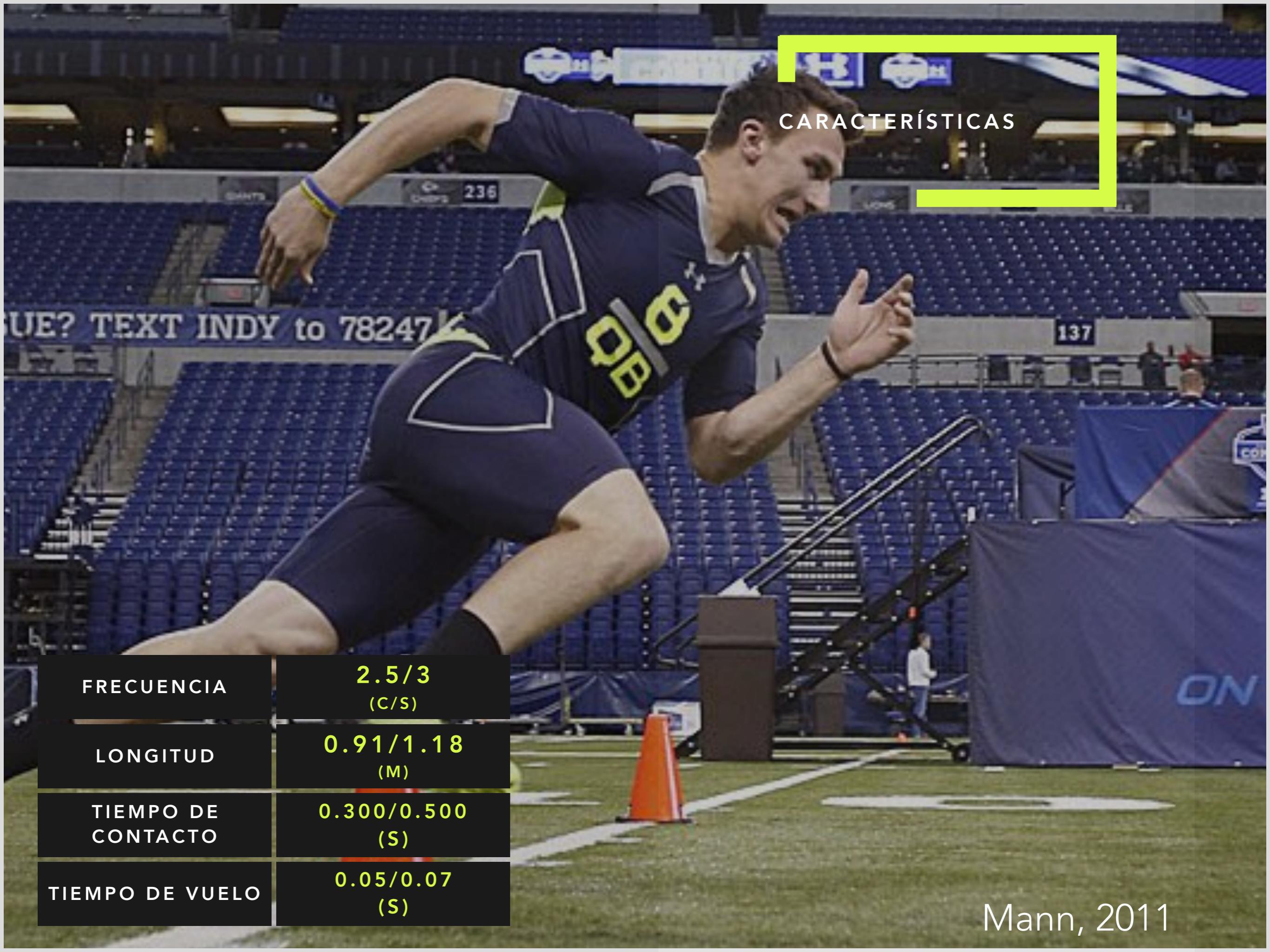


## FUERZAS EN LA ACELERACIÓN



## FUERZAS EN LA ACELERACIÓN



A football player in a blue jersey with the number 236 is performing a lateral throw. He is leaning forward with his right arm extended to the side. The background shows a stadium with blue seats and a scoreboard.

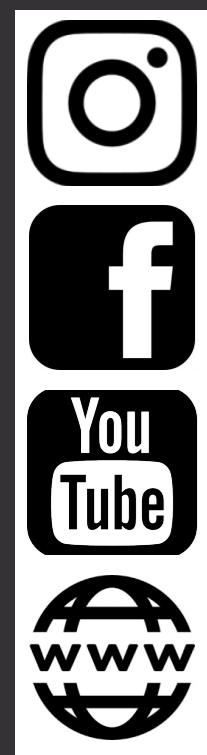
## CARACTERÍSTICAS

FRECUENCIA	2.5/3 (C/S)
LONGITUD	0.91/1.18 (M)
TIEMPO DE CONTACTO	0.300/0.500 (S)
TIEMPO DE VUELO	0.05/0.07 (S)

Mann, 2011

## REFERENCIAS

- [1] Gabbet T. (2012). Sprinting patterns of national rugby league competition.
- [2] Cunningham D. Et al (2016). Movement demands of elite U20 international rugby union players.
- [3] Sweeting A. Et al (2017). Discovering frequently recurring movement sequences in team-sport athlete spatiotemporal data. PAS.
- [4] Morin J.B. Et al (2011). Technical ability of force application as a determinant factor of sprint performance. MSSE.
- [5] Kugler F. Et al (2009). Body position determines propulsive forces in accelerated running. JB.
- [5] Colyer S. Et al (2018). How sprinters accelerate beyond the velocity plateau of soccer players: waveform analysis of ground reaction forces.
- [6] Dalen T. Et al (2016). PLAYER LOAD, ACCELERATION, AND DECELERATION DURING FORTY-FIVE COMPETITIVE MATCHES OF ELITE SOCCER. JSCR.
- Reina M. Et al (2019). The Acceleration and Deceleration Profiles of U-18 Women's Basketball Players during Competitive Matches



LIC. FEDERICO PÉREZ MANETTI  
@FEDEPEREZMANETTI  
FEDEPEREZMANETTI.COM.AR





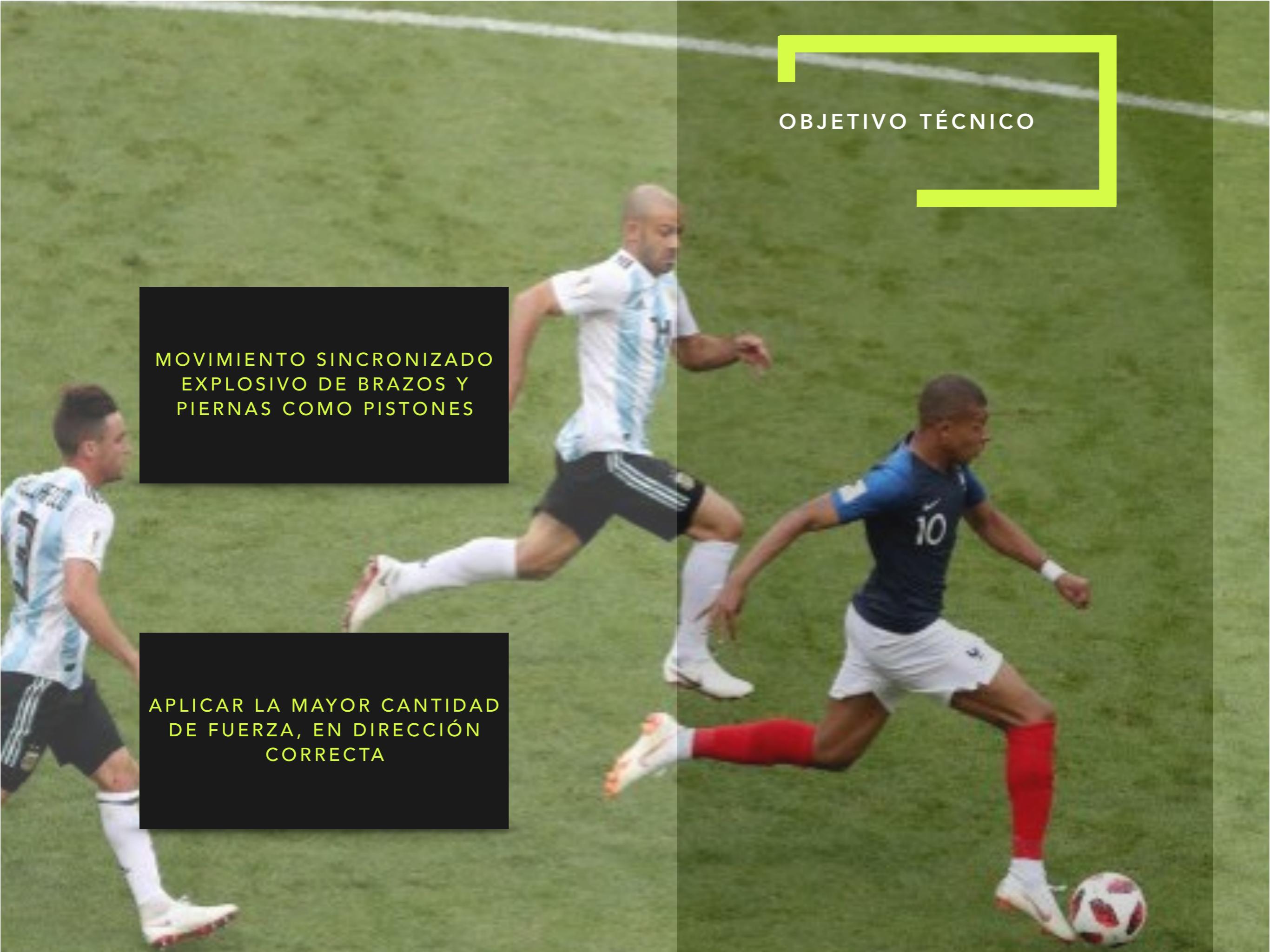
ACELERACIÓN

.TÉCNICA  
.ANÁLISIS



TÉCNICA

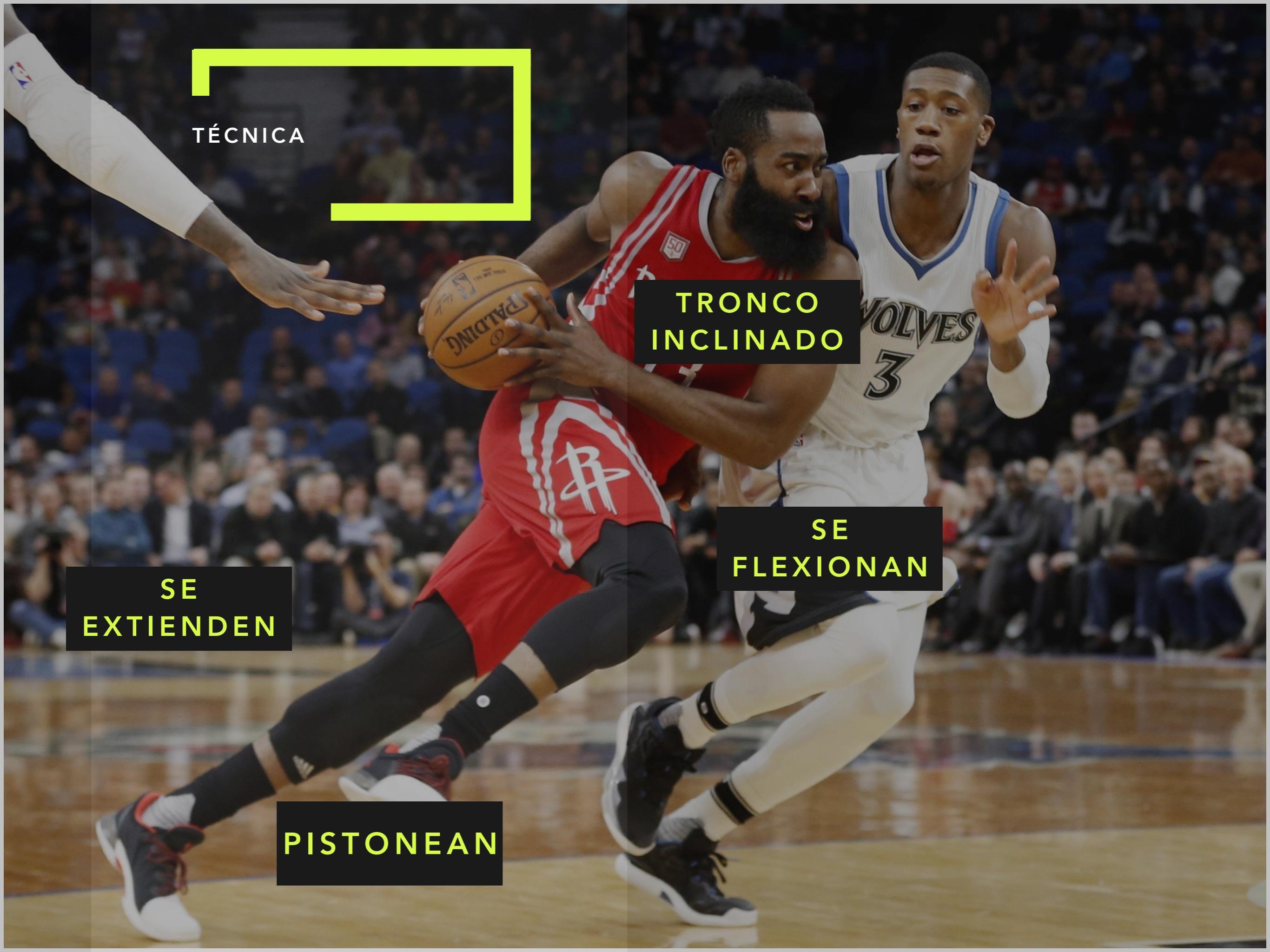




## OBJETIVO TÉCNICO

MOVIMIENTO SINCRONIZADO  
EXPLOSIVO DE BRAZOS Y  
PIERNAS COMO PISTONES

APLICAR LA MAYOR CANTIDAD  
DE FUERZA, EN DIRECCIÓN  
CORRECTA



TÉCNICA

SE  
EXTIENDEN

PISTONEAN

TRONCO  
INCLINADO

SE  
FLEXIONAN

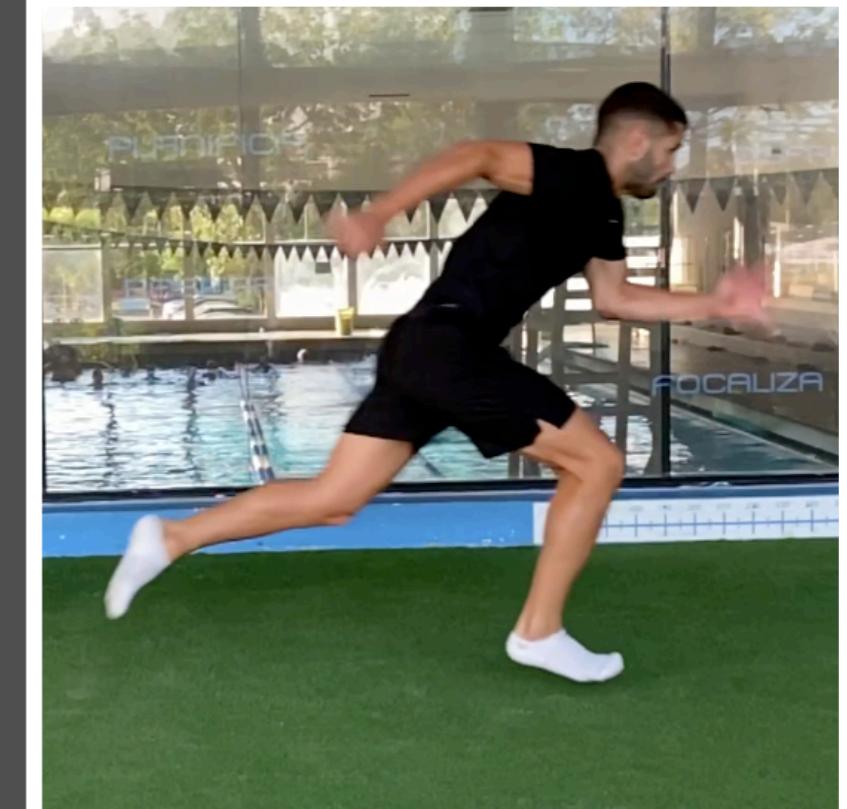
## FASES

APOYO

AÉREA

FRENADO

PROPULSIÓN



[1] Moir Murphy G. (2016)

## PIERNAS COMO PISTONES



PIERNAS COMO  
PISTONES



RÁPIDOS VS LENTOS

The diagram consists of two panels. The left panel shows a close-up of a runner's legs with a yellow frame around the upper body. The right panel shows a wider shot of a runner in motion. A large white diagonal line connects the knee of the front leg in each panel to the hip of the back leg. Four green circles are placed along this line: one at the knee of the front leg in the left panel, one at the hip of the back leg in the left panel, one at the knee of the front leg in the right panel, and one at the hip of the back leg in the right panel. Labels are positioned near these points.

CARRERA RECTA

RÁPIDOS

LENTOS

<EXTENSIÓN DE  
RODILLA

>EXTENSIÓN DE  
RODILLA

<EXTENSIÓN DE  
CADERA

>EXTENSIÓN DE  
CADERA

EXTENSIÓN  
DE CADERA

EXTENSIÓN  
DE RODILLA

RÁPIDOS VS LENTOS

MAYOR FRECUENCIA DE  
PASOS (11%-13%)

MENOR TIEMPO DE  
CONTACTO (9%)

RÁPIDOS  
ACELERADORES

LENTO  
ACELERADOR

VS

RÁPIDOS VS LENTOS

CARRERA RECTA Y COD

RÁPIDOS

LENTOS

>INCLINACIÓN  
DE TRONCO

<INCLINACIÓN  
DE TRONCO

>FLEXIÓN DE  
CADERA

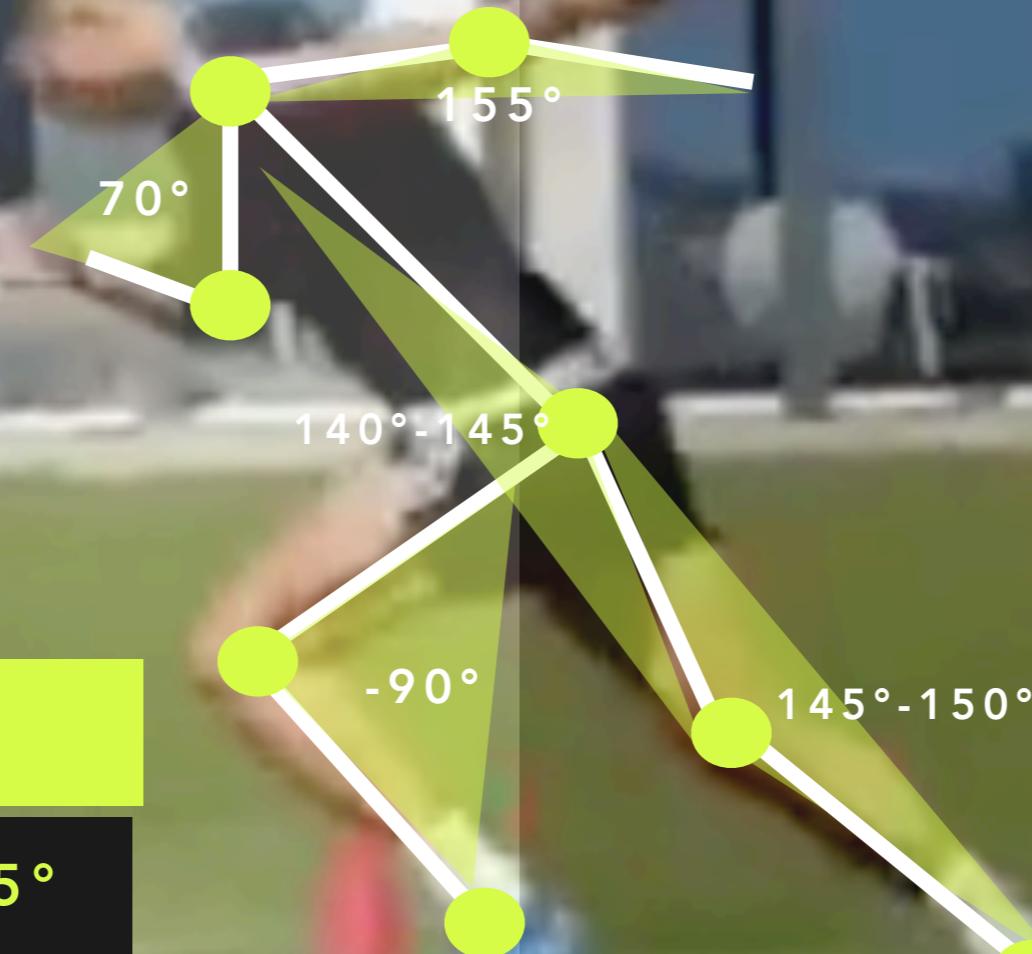
<FLEXIÓN DE  
CADERA

TRONCO

FLEXIÓN DE  
CADERA

## RODILLA/CADERA

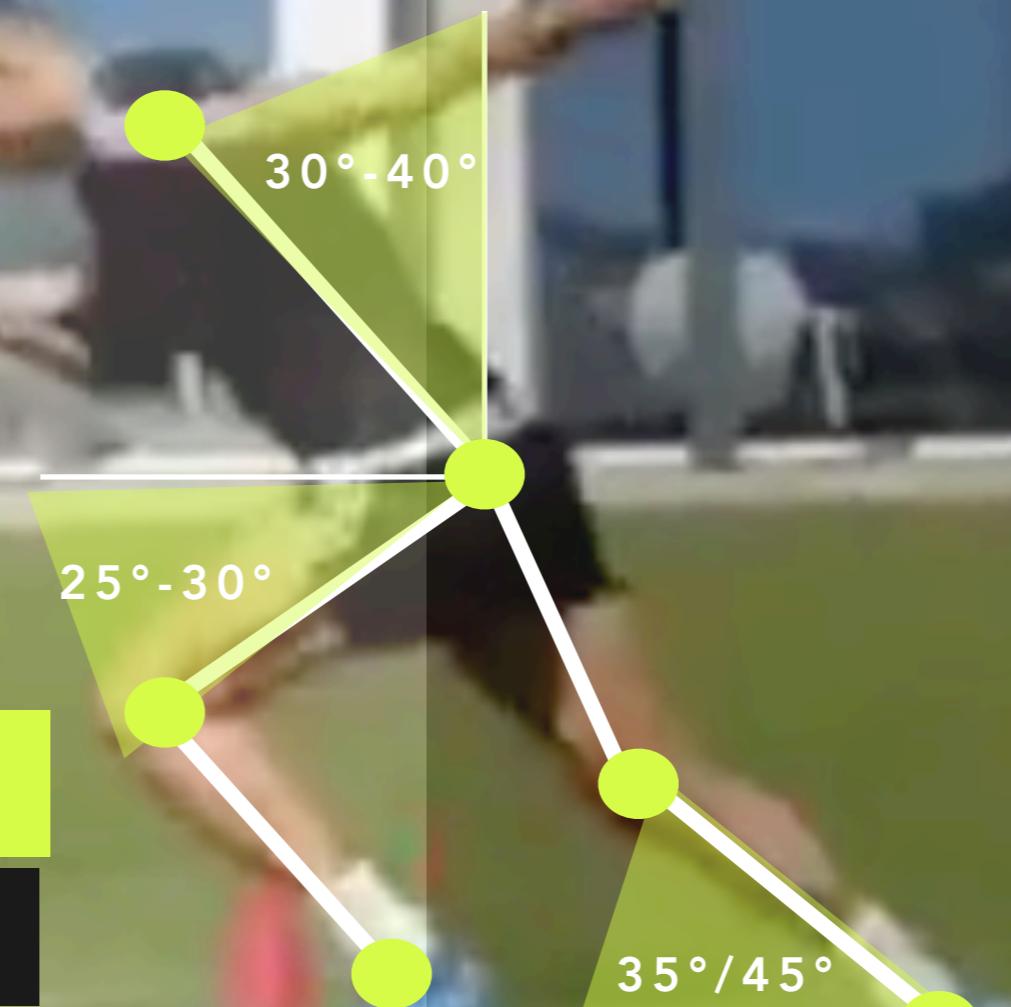
CADERA DE APOYO	$140^\circ - 145^\circ$
RODILLA DE APOYO	$145^\circ - 150^\circ$
ROILLA DE RECOBRO	$80^\circ$



TOE-OFF

## TIBIA/TRONCO/CADERA

TIBIA DE APOYO	$35^\circ - 45^\circ$
TRONCO	$40^\circ$
CADERA	$25^\circ - 30^\circ$



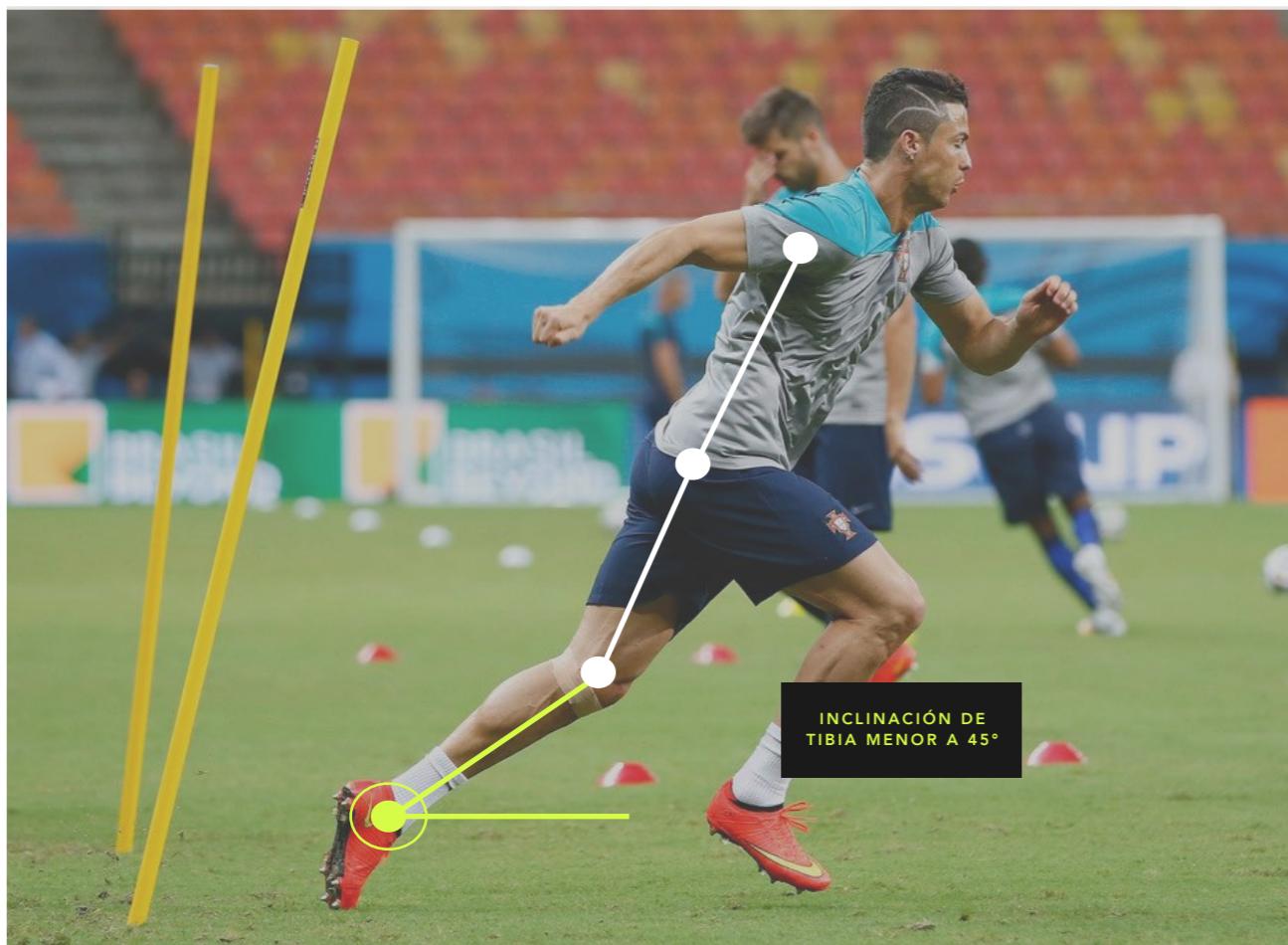
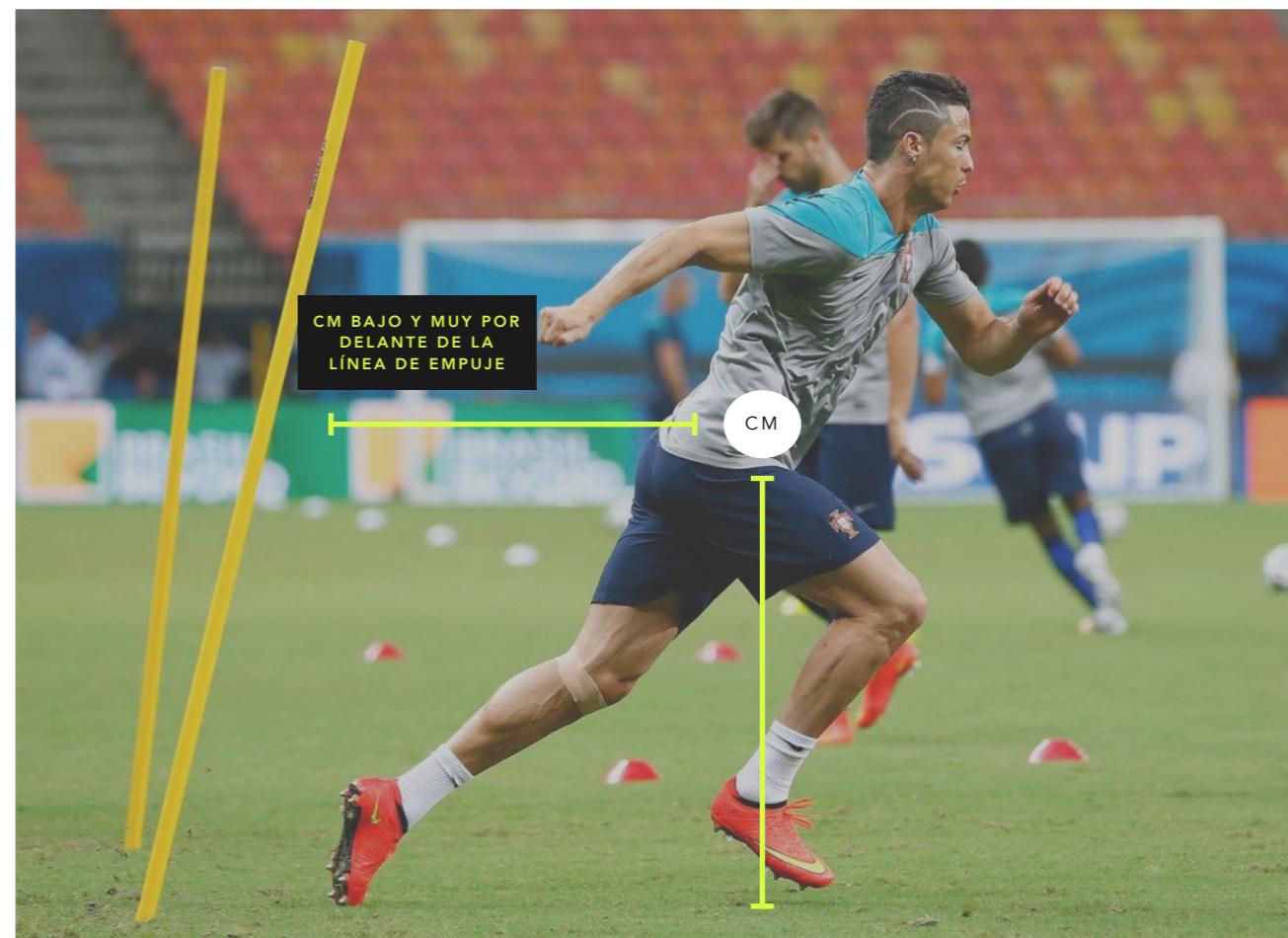
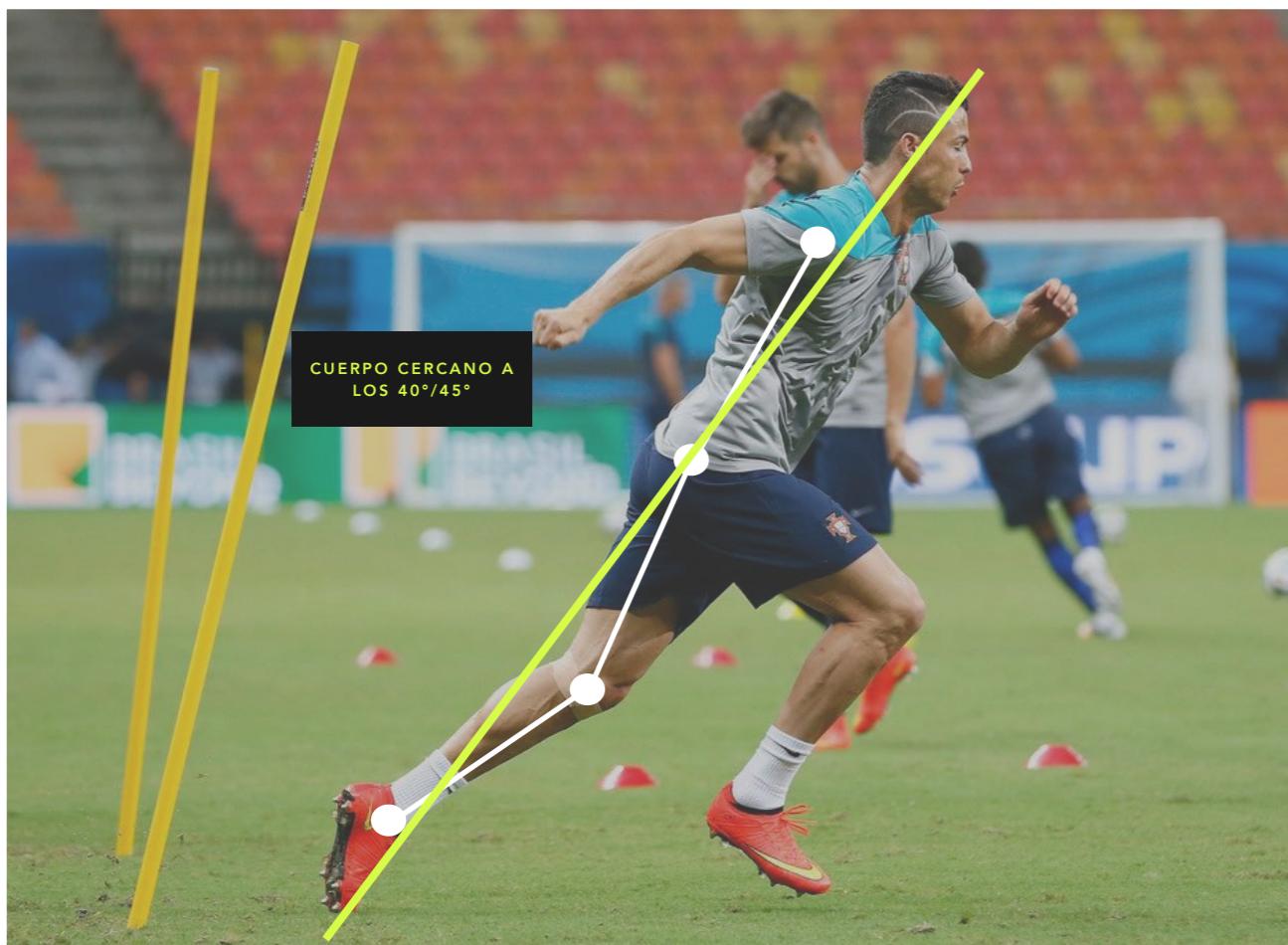
TOE-OFF



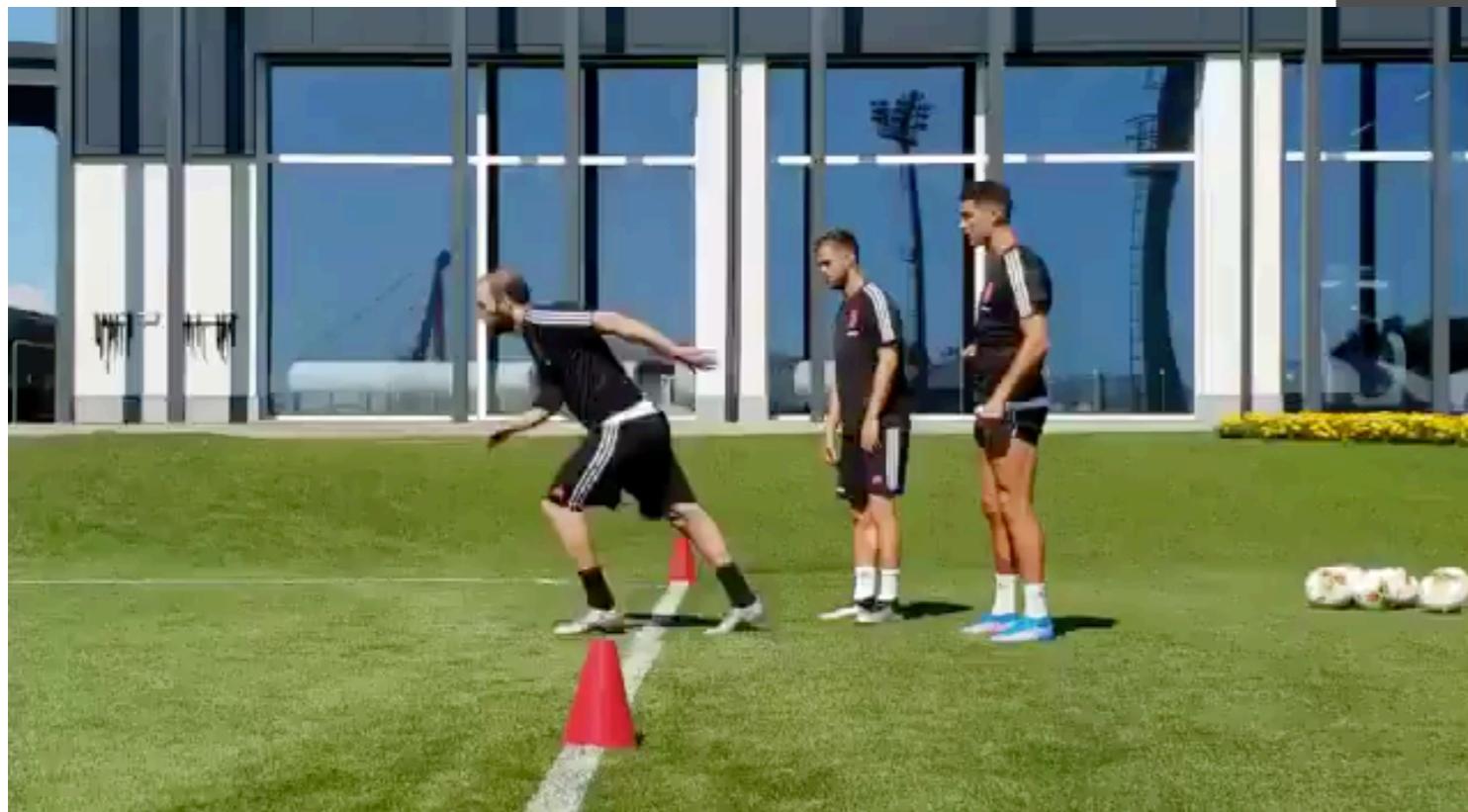
TOUCH-DOWN



RODILLA DEBAJO DE LA  
CADERA



## TÉCNICA



## ANALISIS



KINOGRAM  
METHOD

## FASE DE APOYO

## FASE DE VUELO



## MODELO SIMPLIFICADO

APOYO



TOUCH-DOWN

DESPEGUE



TOE-OFF



"LAS VELOCIDADES MÁXIMAS MÁS RÁPIDAS SE  
ALCANZAN CON MAYORES FUERZAS TERRESTRES,  
NO CON MOVIMIENTOS DE PIERNAS RÁPIDOS"

Weyand, P. G et al

4



ALCANZAR

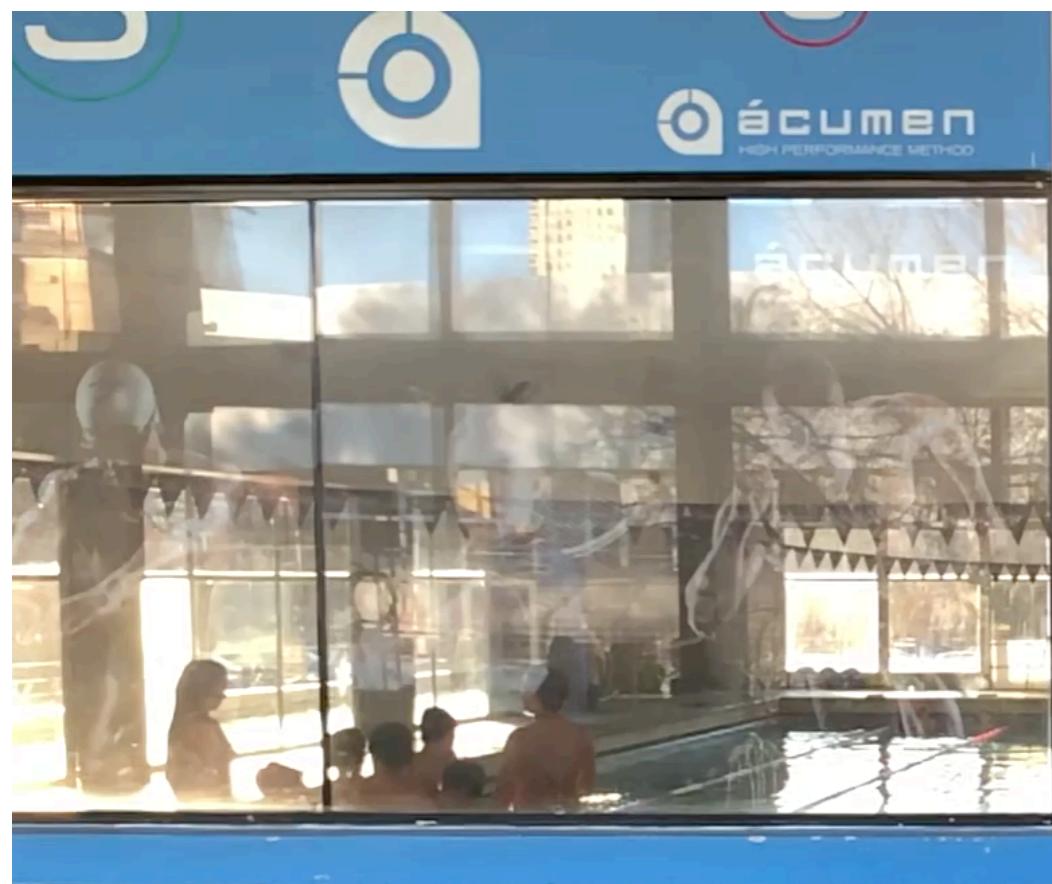


EMPUJAR

# ANÁLISIS

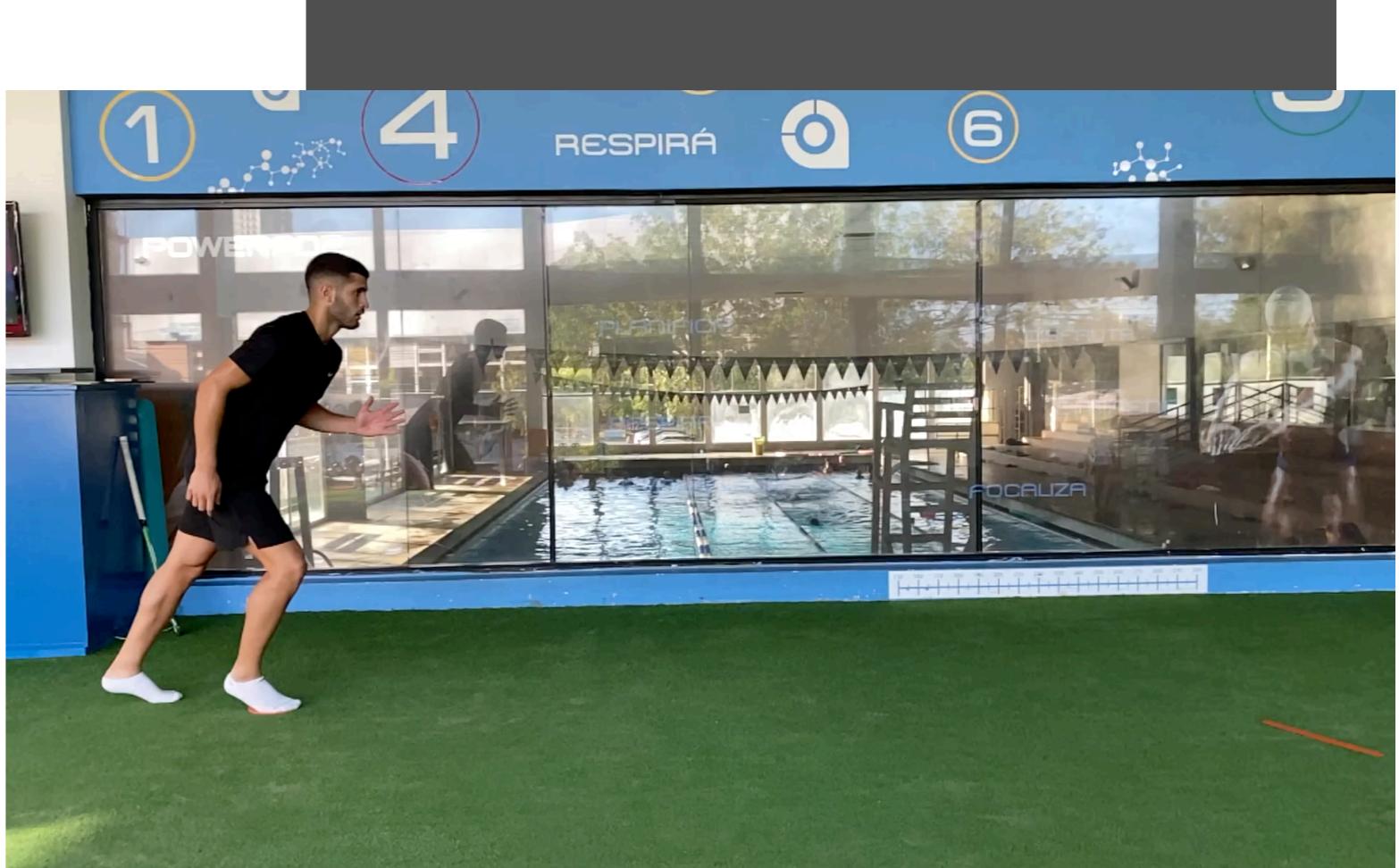


## JUGADOR DE FÚTBOL





BUENO VS MUY BUENO

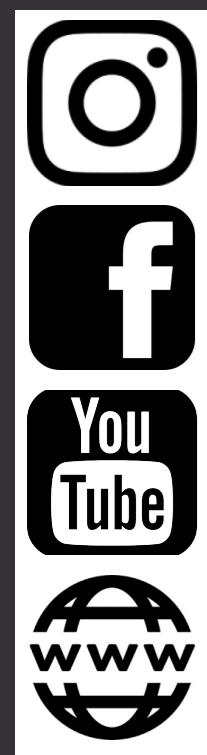


JUGADOR DE RUGBY



## REFERENCIAS

- [1] Moir G. (2016). Biomechanics and conditioning. A biomechanical approach.
- [2] Murphy A. Et al (2003). KINEMATIC DETERMINANTS OF EARLY ACCELERATION IN FIELD SPORT ATHLETES. JSCM.
- [3] Hewit J. Et al (2013). kINEMATIC FACTORS AFFECTING FAST AND sLOW sTRAIGHT AND cHANGE-OF-DIRECTION ACCELERATION TIMES



LIC. FEDERICO PÉREZ MANETTI  
@FEDEPEREZMANETTI  
FEDEPEREZMANETTI.COM.AR

