ENTRENAMIENTO Y PROGRAMACIÓN DE LA FUERZA
IV JORNADAS DE ACTUALIZACIÓN EN RENDIMIENTO DEPORTIVO

EJEMPLO DE APLICACIÓN EN
DEPORTES DE EQUIPO

JOSÉ CONDE GONZÁLEZ

Vitoria 29-09-17

ENTRENAMIENTO Y PROGRAMACIÓN DE LA FUERZA

IV JORNADAS DE ACTUALIZACIÓN EN RENDIMIENTO DEPORTIVO

Universidad del País Vasco Euskal Herriko Unibertsitatea | HEZKUNTZA ETA KIROL FAKULTATEA FACULTAD DE EDUCACIÓN Y DEPORTE

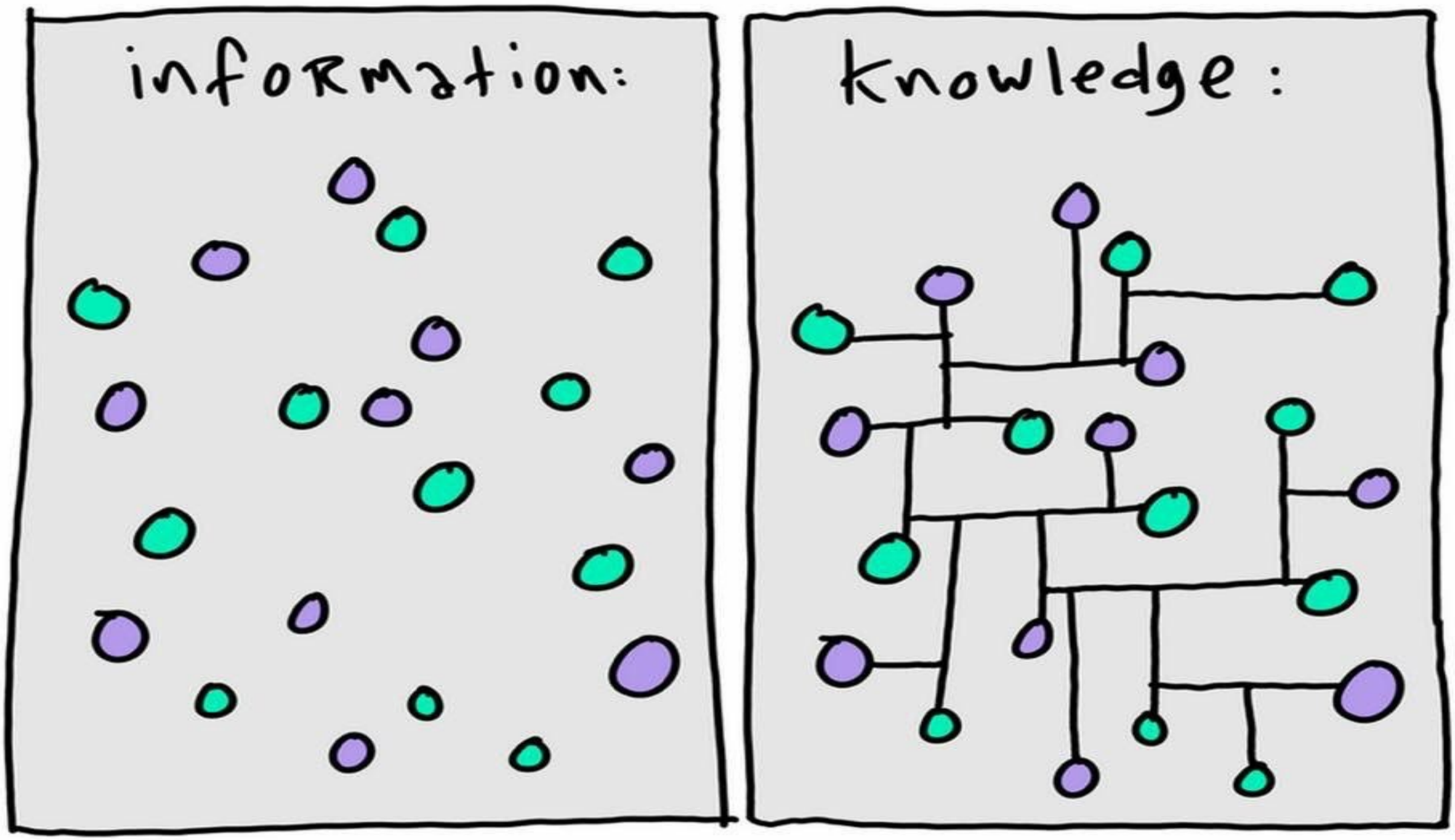
ENTRENAMIENTO Y PROGRAMACIÓN DE LA FUERZA

IV JORNADAS DE ACTUALIZACIÓN EN RENDIMIENTO DEPORTIVO

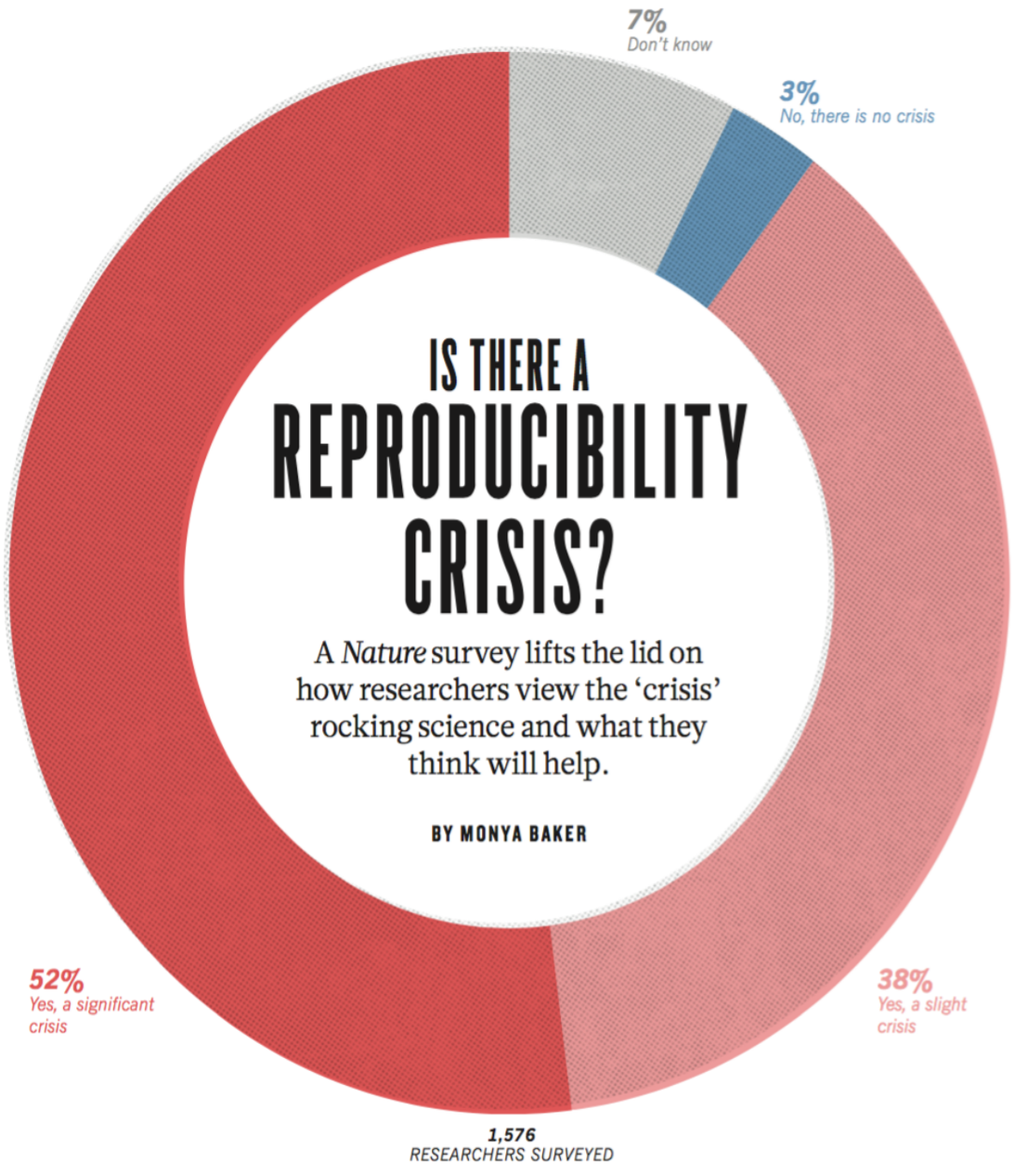
A.F.D.A. | kirolaren euskal eskola | Departamento de Educación Física y Deportiva · Gorputz eta Kirol Hezkuntzako Saila

TRANSMITIR ALGUNAS IDEAS

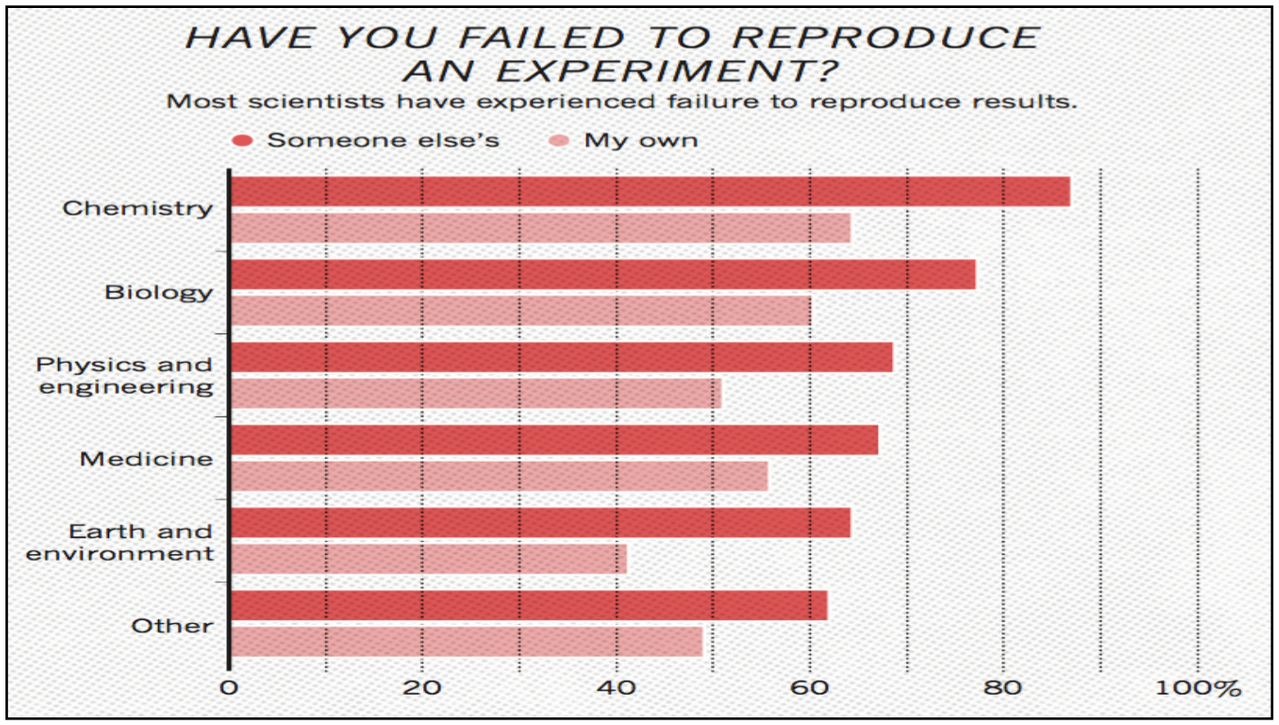
1ª INFORMACIÓN VS CONOCIMIENTO



2º ANÁLISIS Y LECTURA CRÍTICA



More than 70% of researchers have tried and failed to reproduce another scientist's experiments, and more than half have failed to reproduce their own experiment

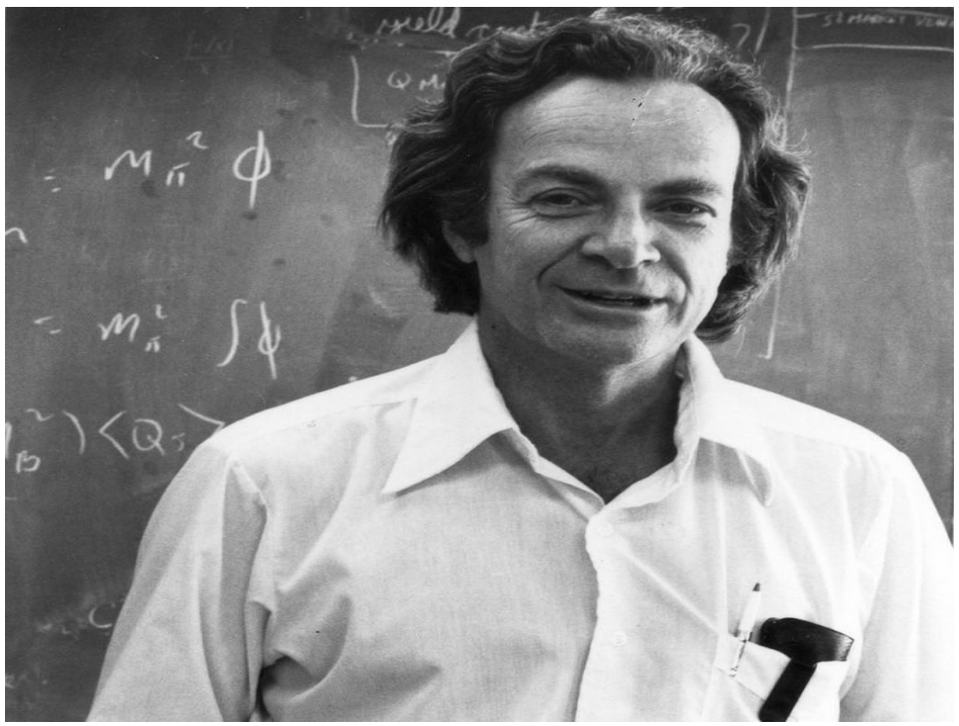


A manifesto for reproducible science

Marcus R. Munafò[1,2*], Brian A. Nosek[3,4], Dorothy V. M. Bishop[5], Katherine S. Button[6], Christopher D. Chambers[7], Nathalie Percie du Sert[8], Uri Simonsohn[9], Eric-Jan Wagenmakers[10], Jennifer J. Ware[11] and John P. A. Ioannidis[12,13,14]

Richard Feynman said:

" The first principle is that you must not fool yourself – and you are the easiest person to fool."



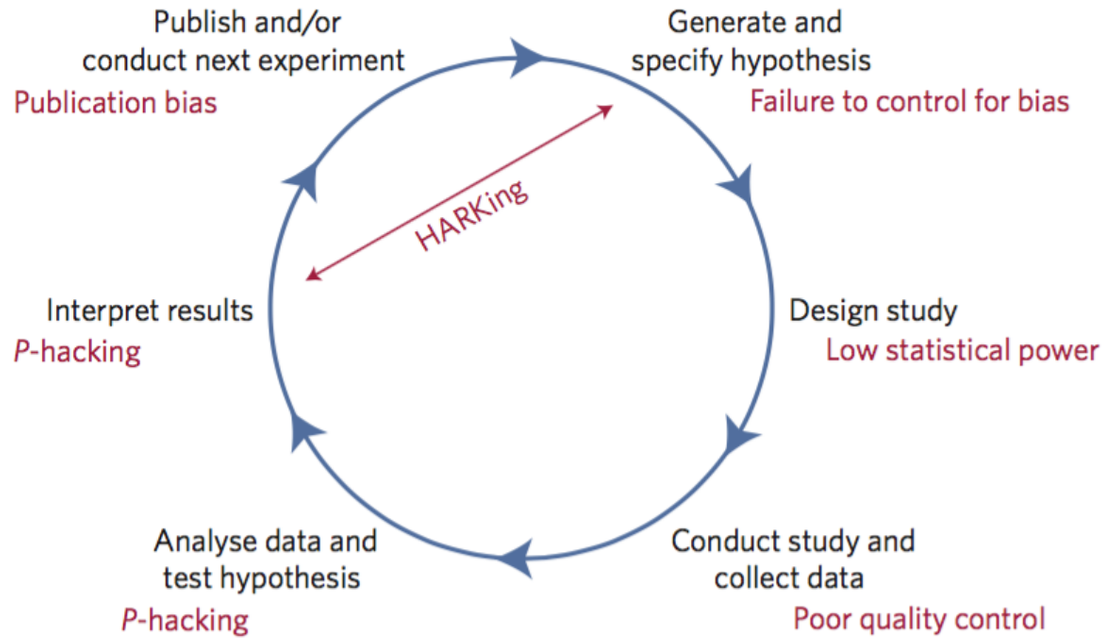
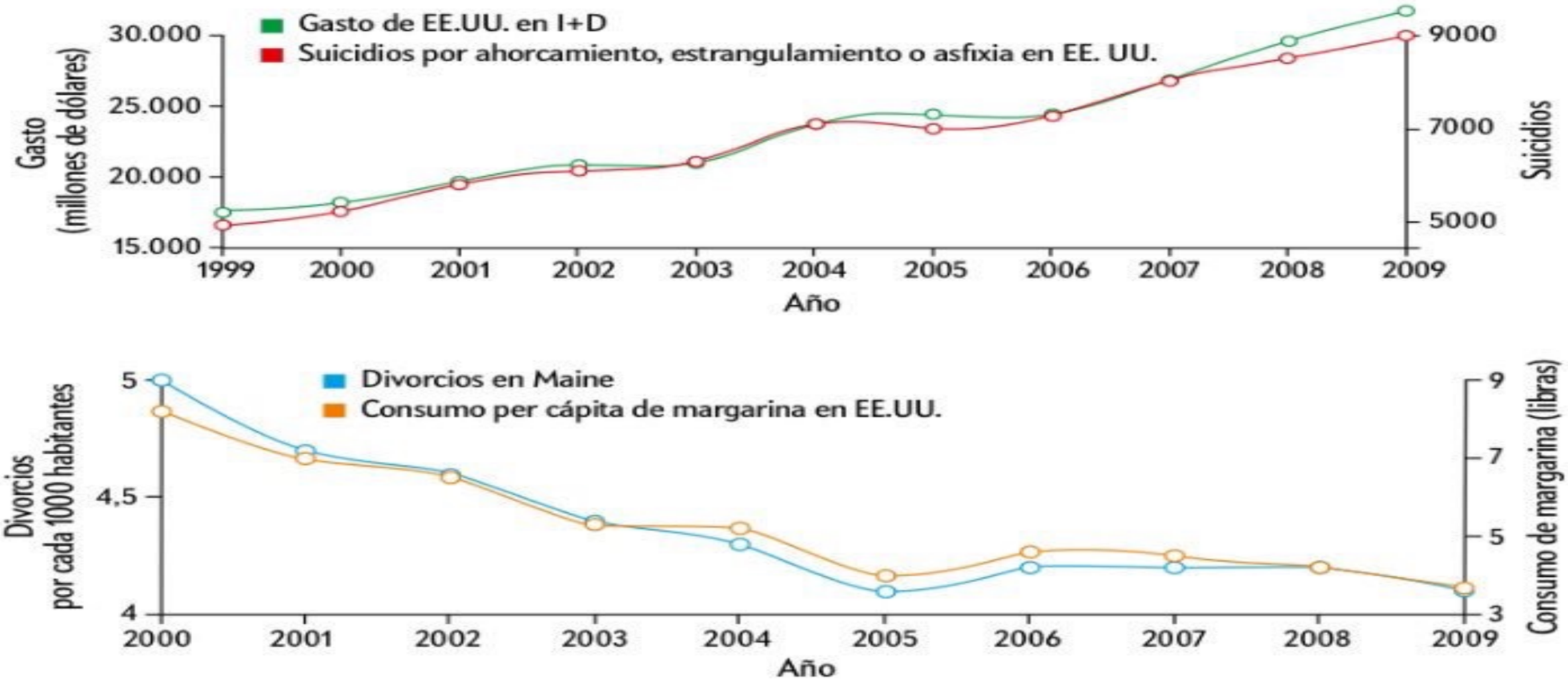


Figure 1 | Threats to reproducible science. An idealized version of the hypothetico-deductive model of the scientific method is shown. Various potential threats to this model exist (indicated in red), including lack of replication[5], hypothesizing after the results are known (HARKing)[7], poor study design, low statistical power[2], analytical flexibility[51], *P*-hacking[4], publication bias[3] and lack of data sharing[6]. Together these will serve to undermine the robustness of published research, and may also impact on the ability of science to self-correct.

3ª CORRELACIÓN NO IMPLICA CAUSALIDAD

CORRELACIONES ESPURIAS



CORRELACIONES ESPURIAS: En conjuntos de datos lo suficientemente amplios siempre es posible encontrar correlaciones casi perfectas entre variables disparatadas. Estas gráficas muestran dos ejemplos recopilados por Tyler Vigen, estudiante de criminología de Harvard. En ambos casos, el coeficiente de correlación es $r > 0{,}99$.

3ª VALOR DE LA EXPERIENCIA Y EL CONTEXTO

Research alone is not sufficient to prevent sports injury

Dale Hanson,[1] John P Allegrante,[2,3] David A Sleet,[4] Caroline F Finch[5]

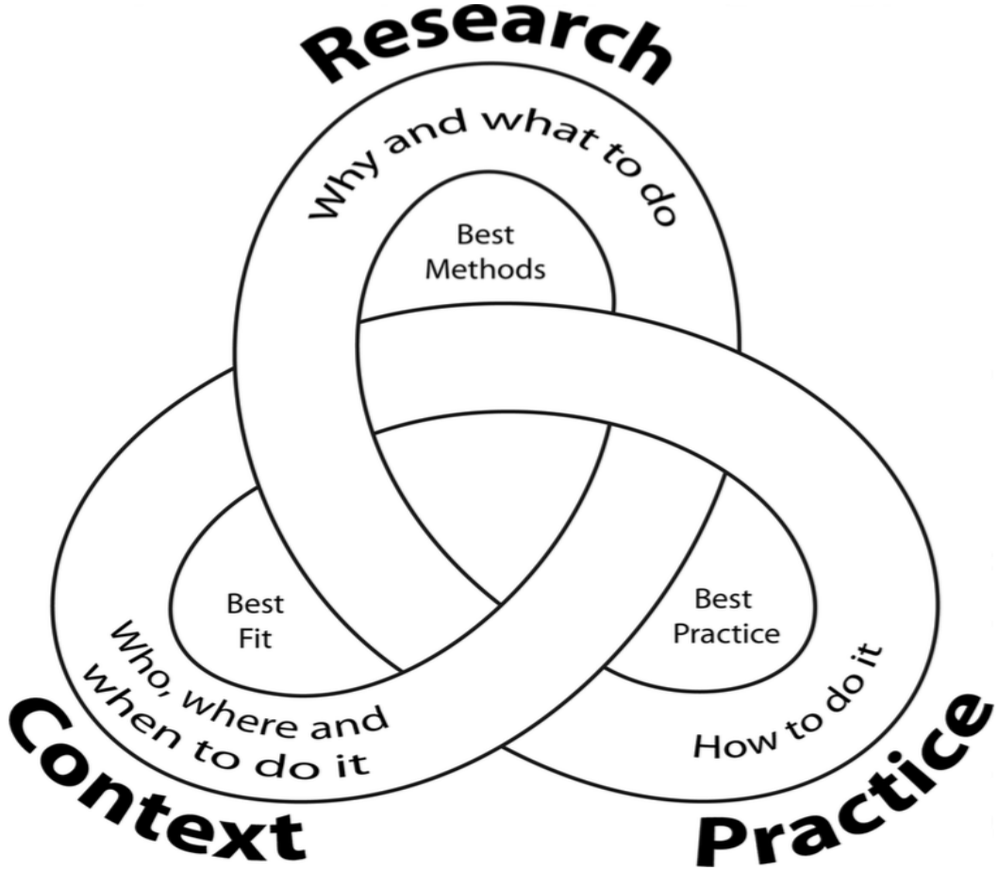
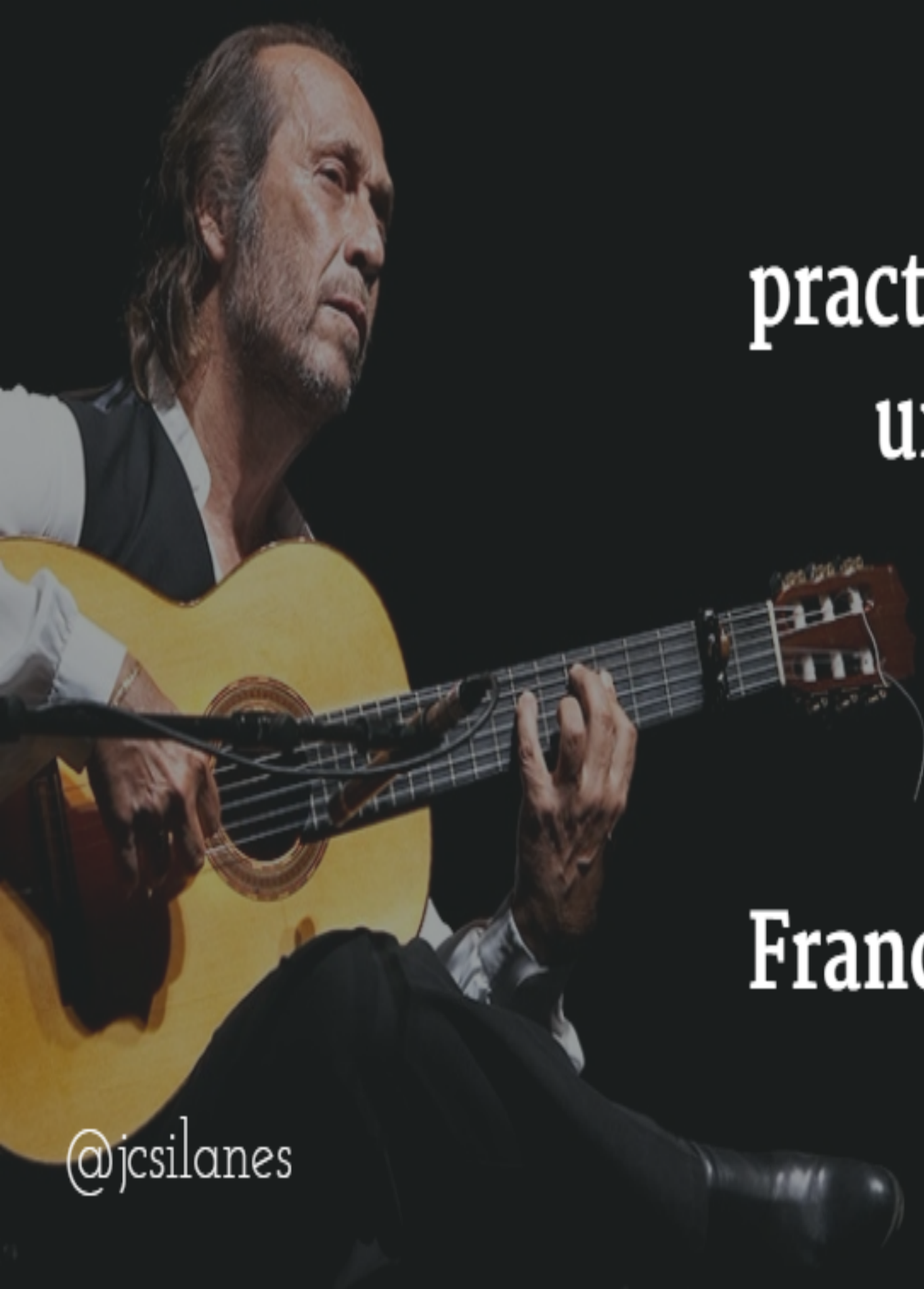


Figure 1 Integrating expertise to ensure comprehensive, evidence-based interventions that are practical and relevant when applied in the real world.

"…63% of publications were descriptive (Stages 1 and 2), ***11% were concerned with method development and 16% were intervention-based*** *(Stage 3), and only 5% were concerned with institutionalisation or policy implementation research, with less than 1% containing diffusion research (Stage 4)".*



“Llevo desde niño
practicando todos los días
una media de 14 horas
y a eso, en mi tierra,
le llaman duende.”

Francisco Sánchez Gómez
(Paco de Lucía)

@jcsilanes

4ª COMPRENSIÓN DE LA VARIABILIDAD

"Toda la ciencia, a lo largo del siglo XIX y gran parte del XX estaba obsesionada con principios universales. Psicólogos, investigadores médicos y economistas estaba interesados en descubrir las reglas que gobiernan la manera en que todos nosotros nos comportamos, pero eso cambió.

En los últimos 10 o 15 años ha habido la transformación desde la búsqueda de principios universales a la comprensión de la variabilidad"

5ª CUALITATIVO & CUANTITATIVO

6ª SISTEMAS COMPLEJOS

[redacted]

NO PODEMOS ENTENDER EL MOVIMIENTO COMO ALGO INDEPENDIENTE DEL ENTORNO EN QUE SE EXPRESA

7ª PREVENCIÓN Y RECUPERACIÓN

UEFA CHAMPIONS LEAGUE

LFP

RFEF COPA DEL REY
CAMPEONATO DE ESPAÑA COPA DE S.M. EL REY

RENDIMIENTO

SALUD DEL DEPORTISTA

ALTA DENSIDAD DE COMPETICIÓN

TEMPORADA
2013/2014

	LIGA
	COPA DEL REY
	EUROPA LEAGUE

AGOSTO						
L	M	X	J	V	S	D
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5	6	7	8	9	10	11
12	13	14	15	16	17	18
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SEPTIEMBRE						
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30						

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28	29	30	31			

NOVIEMBRE						
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DICIEMBRE						
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ENERO						
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FEBRERO						
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MARZO						
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ABRIL						
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MAYO						
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ENTRENAMIENTO Y PROGRAMACIÓN DE LA FUERZA

IV JORNADAS DE ACTUALIZACIÓN EN RENDIMIENTO DEPORTIVO

TEMPORADA 16-17

ENTRENAMIENTO Y PROGRAMACIÓN DE LA FUERZA

IV JORNADAS DE ACTUALIZACIÓN EN RENDIMIENTO DEPORTIVO

GOLDEN STATE WARRIORS

15 16 SEASON PRESENTED BY KAISER PERMANENTE

2015 NBA CHAMPIONS GOLDEN STATE WARRIORS

OCTOBER-NOVEMBER 2015

SUN	MON	TUE	WED	THU	FRI	SAT
OCT 25	OCT 26	OCT 27 NOP ● 7:30	OCT 28	OCT 29	OCT 30 HOU ▲ 6:30	OCT 31 NOP ★ 4:30
1	2 MEM ★ 7:30	3	4 LAC ▲ 7:30	5	6 DEN 7:30	7 SAC 7:00
8	9 DET 7:30	10	11 MEM 5:00	12 MIN ● 5:30	13	14 BKN 7:30
15	16	17 TOR ★ 7:30	18	19 LAC ● 7:30	20 CHI ▲ 7:30	21
22 DEN 5:00	23	24 LAL ● 7:30	25	26	27 PHO 6:30	28 SAC 7:30
29	30 UTA 6:00					

DECEMBER 2015

SUN	MON	TUE	WED	THU	FRI	SAT
		1	2 CHA 4:00	3	4	5 TOR 2:00
6 BKN 3:00	7	8 IND 4:00	9	10	11 BOS 4:30	12 MIL 5:30
13	14	15	16 PHO 7:30	17	18 MIL 7:30	19
20	21	22	23 UTA 7:30	24	25 CLE ■ 2:00	26
27	28 SAC 7:30	29	30 DAL 5:30	31 HOU 4:00		

JANUARY 2016

SUN	MON	TUE	WED	THU	FRI	SAT
					1	2 DEN 7:30
3	4 CHA 7:30	5 LAL ★ 7:30	6	7	8 POR 7:00	9 SAC 7:00
10	11 MIA 7:30	12	13 DEN 6:00	14 LAL ● 7:30	15	16 DET 4:30
17	18 CLE ● 5:00	19	20 CHI ▲ 5:00	21	22 IND ▲ 7:30	23
24	25 SAS ★ 7:30	26	27 DAL ▲ 7:30	28	29	30 PHI 2:00
31 NYK 4:30						

FEBRUARY 2016

SUN	MON	TUE	WED	THU	FRI	SAT
	1	2	3 WAS ▲ 5:00	4	5	6 OKC ▲ 6:00
7	8	9 HOU ● 7:30	10 PHO 6:00	11	12	13
14 ALL-STAR	15	16	17	18	19 POR 7:00	20 LAC ■ 5:30
21	22 ATL ★ 5:00	23	24 MIA 4:30	25 ORL 4:00	26	27 OKC ■ 5:30
28	29					

MARCH 2016

SUN	MON	TUE	WED	THU	FRI	SAT
		1 ATL ★ 7:30	2	3 OKC ● 7:30	4	5
6 LAL ■ 12:30	7 ORL 7:30	8	9 UTA 7:30	10	11 POR 7:30	12 PHO 7:30
13	14 NOP ▲ 7:30	15	16 NYK 7:30	17	18 DAL 5:30	19 SAS ■ 5:30
20	21 MIN 5:00	22	23 LAC 7:30	24	25 DAL 7:30	26
27 PHI 5:00	28	29 WAS ● 7:30	30 UTA 6:00	31		

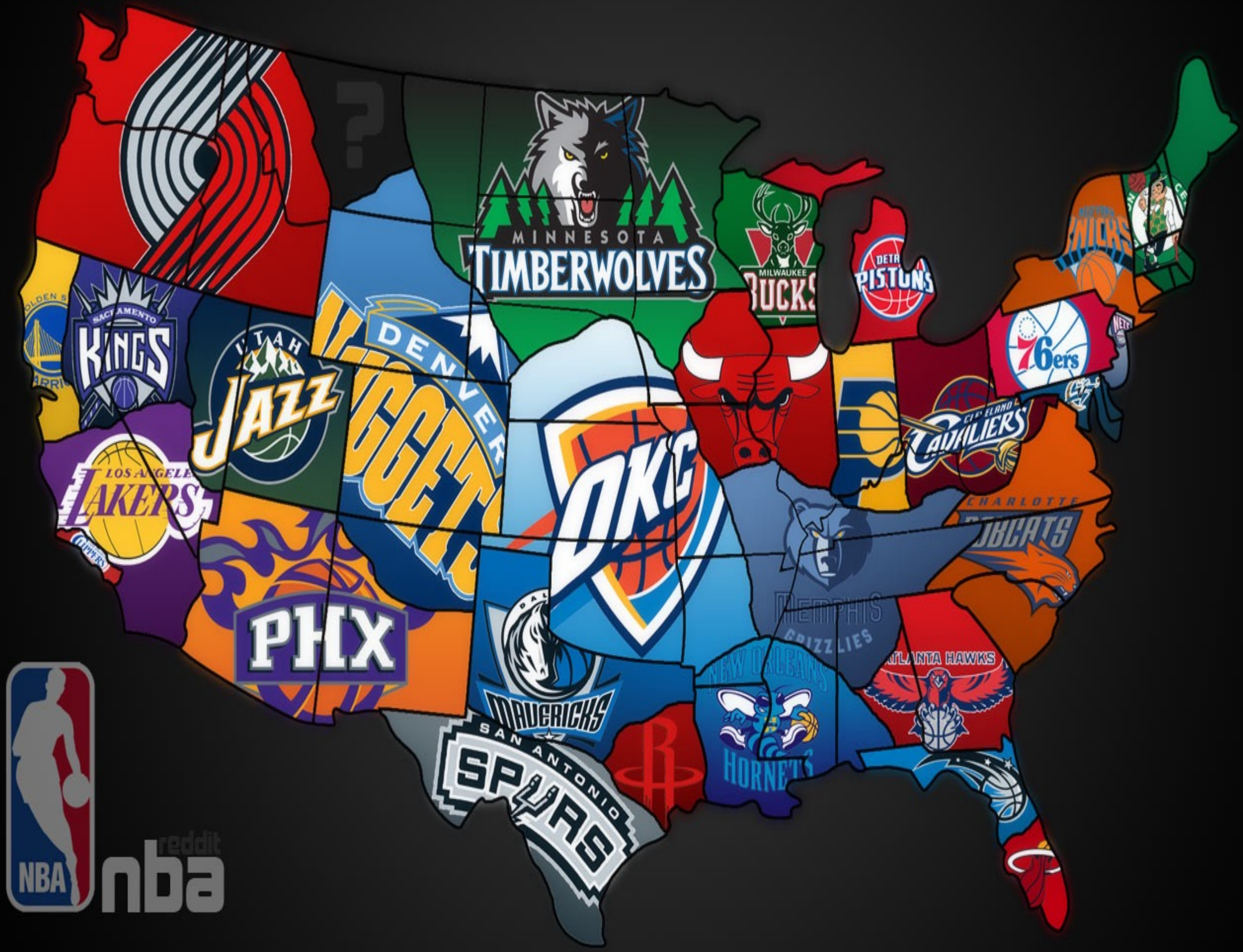
APRIL 2016

SUN	MON	TUE	WED	THU	FRI	SAT
					1 BOS ▲ 7:30	2
3 POR ★ 5:00	4	5 MIN 7:30	6	7 SAS ● 7:30	8	9 MEM 5:00
10 SAS ★ 4:00	11	12	13 MEM 7:30			

HOME GAMES

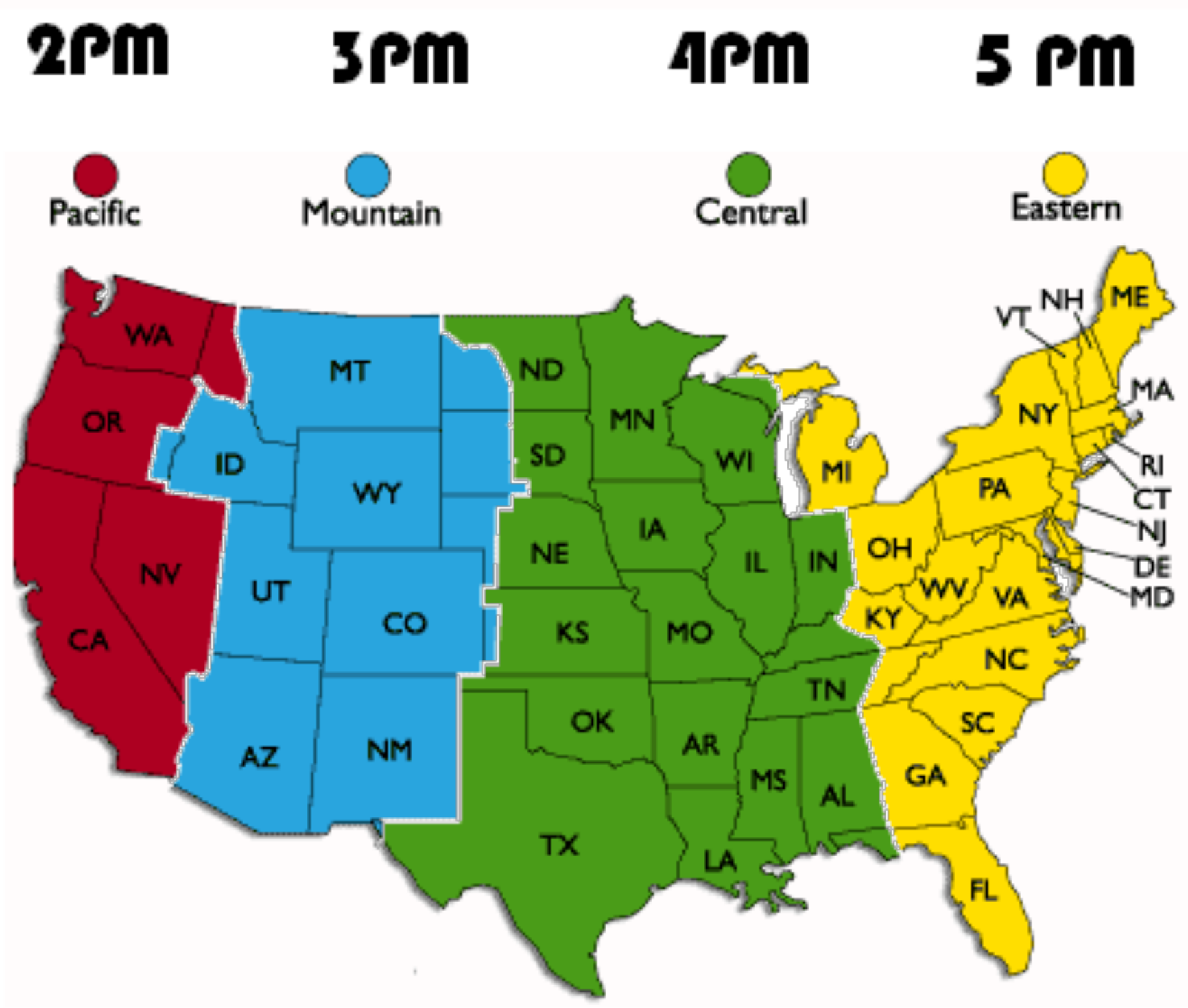
■ ABC ● TNT ▲ ESPN ★ NBA TV

All games televised on CSN Bay Area unless otherwise noted.
All games broadcast on KNBR radio. All times Pacific.



NBA

reddit nba


2PM
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OH
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WV
VA
NC
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RI
CT
NJ
DE
MD

Injuries affect team performance negatively in professional football: an 11-year follow-up of the UEFA Champions League injury study

Martin Hägglund,[1,2] Markus Waldén,[2,3] Henrik Magnusson,[1,2] Karolina Kristenson,[2,3] Håkan Bengtsson,[2] Jan Ekstrand[2,3]

Table 3 Association between team season injury rates and performance in professional football

	Crude analyses*			Adjusted analyses*		
	β	95% CI	p Value	β	95% CI	p Value
Final league ranking†						
Injury incidence	−0.057	−0.187 to 0.072	0.386	−0.049	−0.161 to 0.062	0.387
Injury burden	−0.009	−0.017 to −0.002	0.015	−0.010	−0.017 to −0.002	0.011
Match availability	0.086	0.005 to 0.168	0.037	0.085	0.008 to 0.163	0.031
Points per league match†						
Injury incidence	−0.026	−0.048 to −0.003	0.026	−0.024	−0.046 to −0.002	0.035
Injury burden	−0.002	−0.003 to −0.001	<0.001	−0.002	−0.003 to −0.001	<0.001
Match availability	0.019	0.009 to 0.029	<0.001	0.019	0.009 to 0.028	<0.001
UEFA SCC‡						
Injury incidence	0.228	−0.533 to 0.990	0.557	0.198	−0.634 to 1.030	0.641
Injury burden	−0.016	−0.032 to 0.001	0.062	−0.021	−0.042 to −0.001	0.043
Match availability	0.179	−0.009 to 0.367	0.062	0.205	0.002 to 0.408	0.048

*Analyses were made using a Generalised Estimating Equation with identity link to fit a linear regression on team-level data, with each team-season change as an observation. A negative β value for injury incidence and injury burden, and a positive β value for match availability, indicate an association between a lower season injury rate (compared with the adjacent preceding season) and a higher final league ranking, higher average points per league match and higher UEFA SCC, respectively.
†Adjusted analyses of final league ranking and points per league match included change of head coach and UEFA SCC as independent variables.
‡Adjusted analyses of UEFA SCC included change of head coach and points per league match as independent variables.
SCC, season club coefficient; UEFA, Union of European Football associations.

MENOS LESIONES POR TEMPORADA

=

- MEJOR POSICIÓN EN LA LIGA
- MÁS PUNTOS POR PARTIDO EN LIGA
- MAYOR COEFICIENTE UEFA

ENTRENAMIENTO Y PROGRAMACIÓN DE LA FUERZA

IV JORNADAS DE ACTUALIZACIÓN EN RENDIMIENTO DEPORTIVO

AREAS Y CONTENIDOS

DESPLAZAMIENTOS

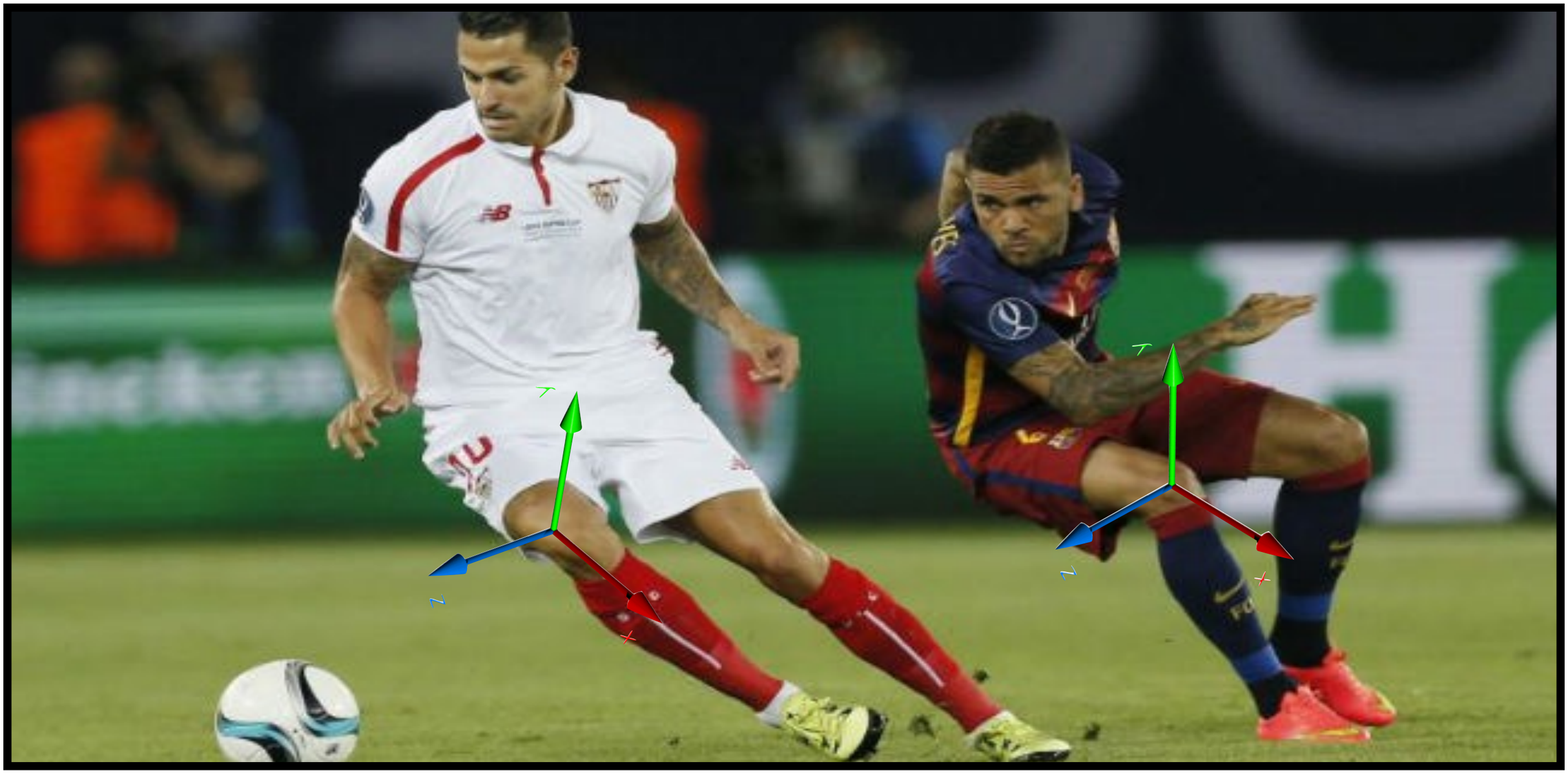
SALTOS Y RECEPCIONES

LUCHAS

GOLPEOS

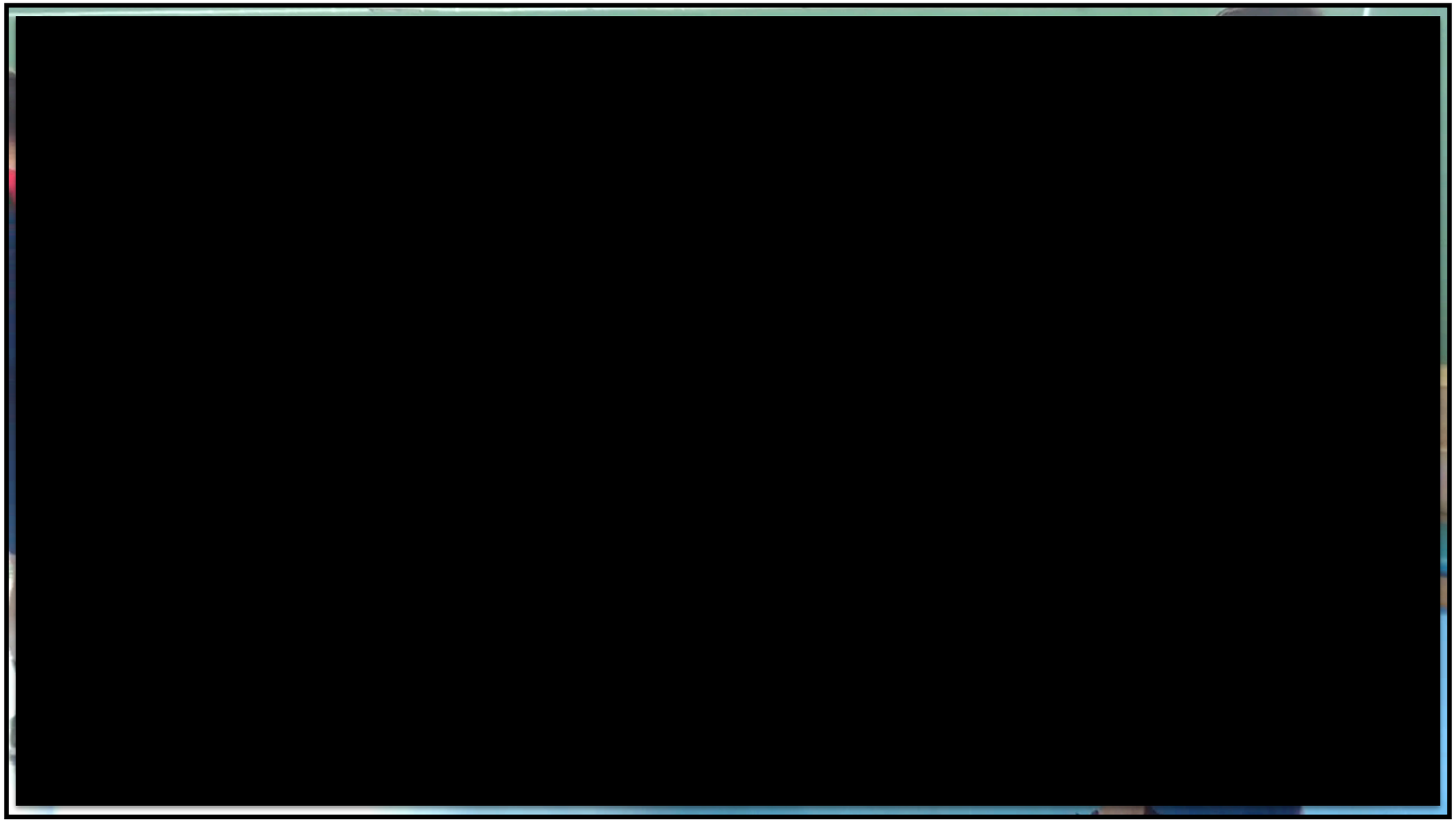
ENTRENAMIENTO Y PROGRAMACIÓN DE LA FUERZA

IV JORNADAS DE ACTUALIZACIÓN EN RENDIMIENTO DEPORTIVO



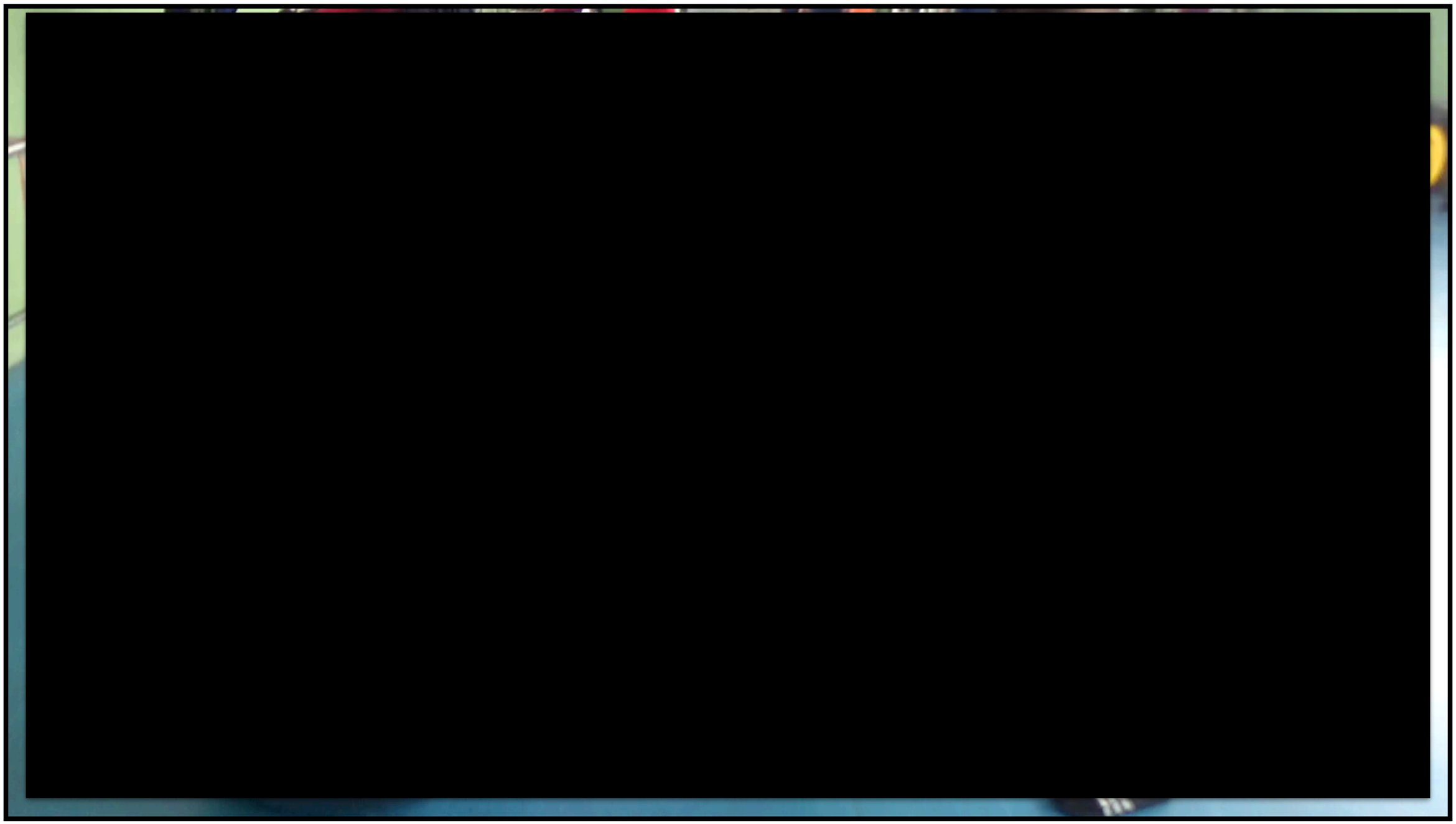
FUERZA

En función comportamiento técnico/táctico y las necesidades individuales del jugador



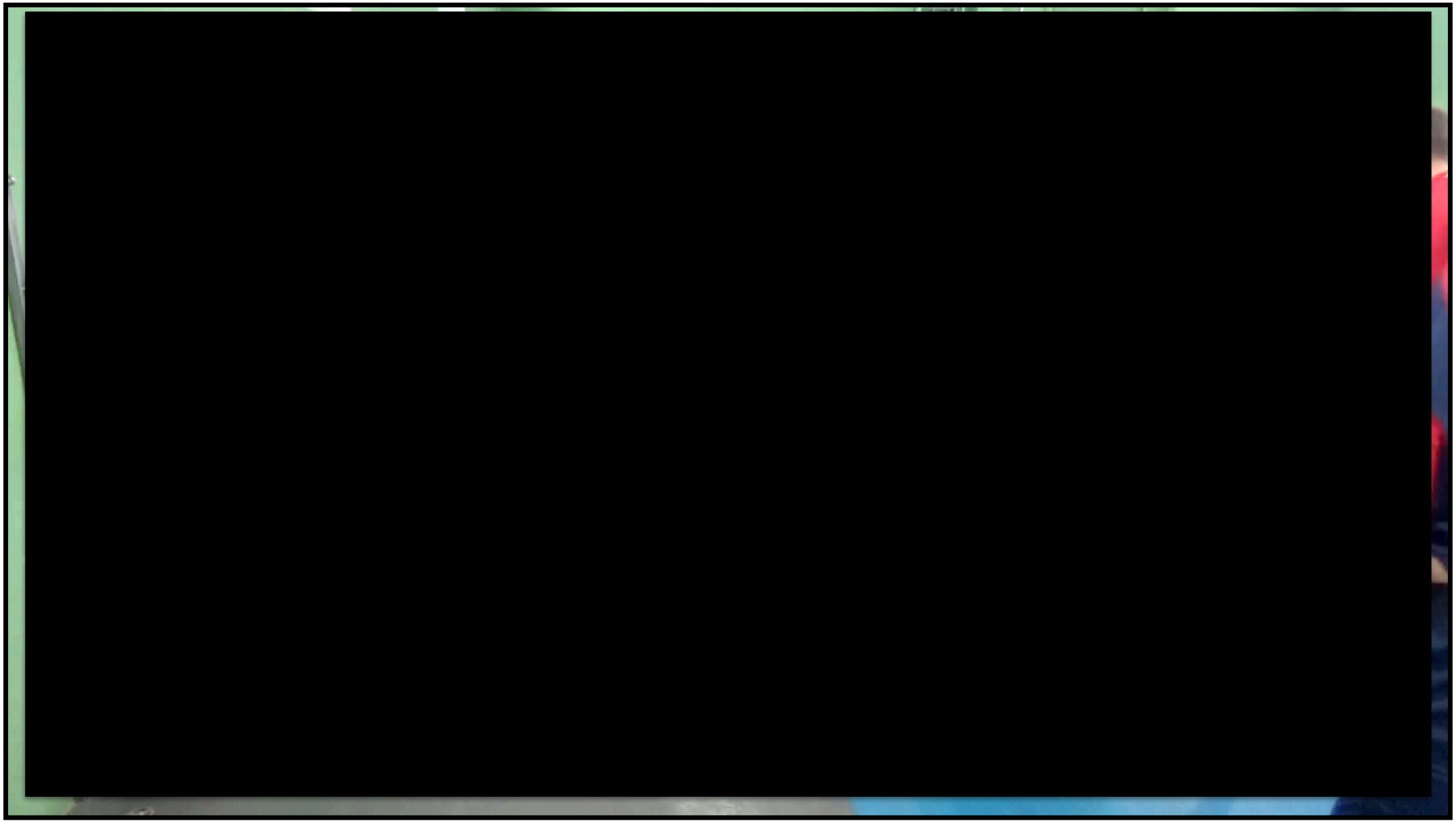
FUERZA

Activaciones y regenerativo (efecto agudo)



FUERZA

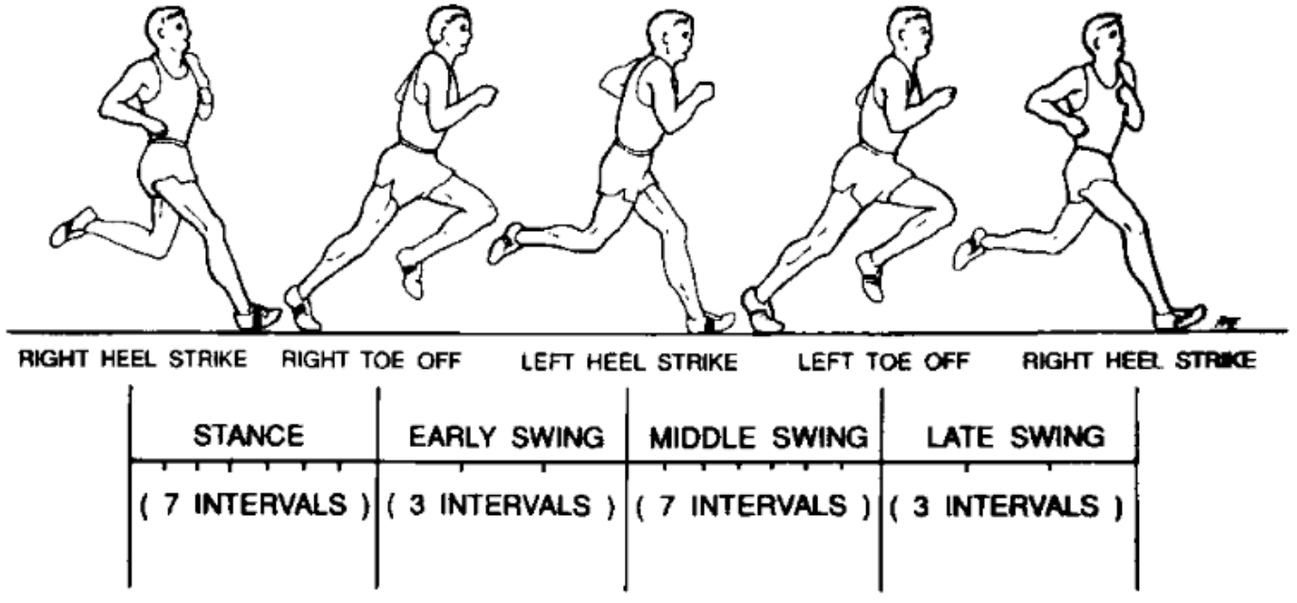
Efecto a medio y largo plazo. Mejora de desequilibrios



FATIGA

MECANISMO DE LESIÓN
ACELERACIÓN
Early Swing Phase

Hip-flexor muscles generate force at the same time as the knee-extensor muscles absorbed energy through an eccentric muscle action



Electromyographic Analysis of Hip and Knee Musculature During Running

William H. Montgomery III, MD, Marilyn Pink,* MS, PT, and Jacquelin Perry, MD

From the Centinela Hospital Medical Center, Biomechanics Laboratory, Inglewood, California

The association football medical research programme: an audit of injuries in professional football

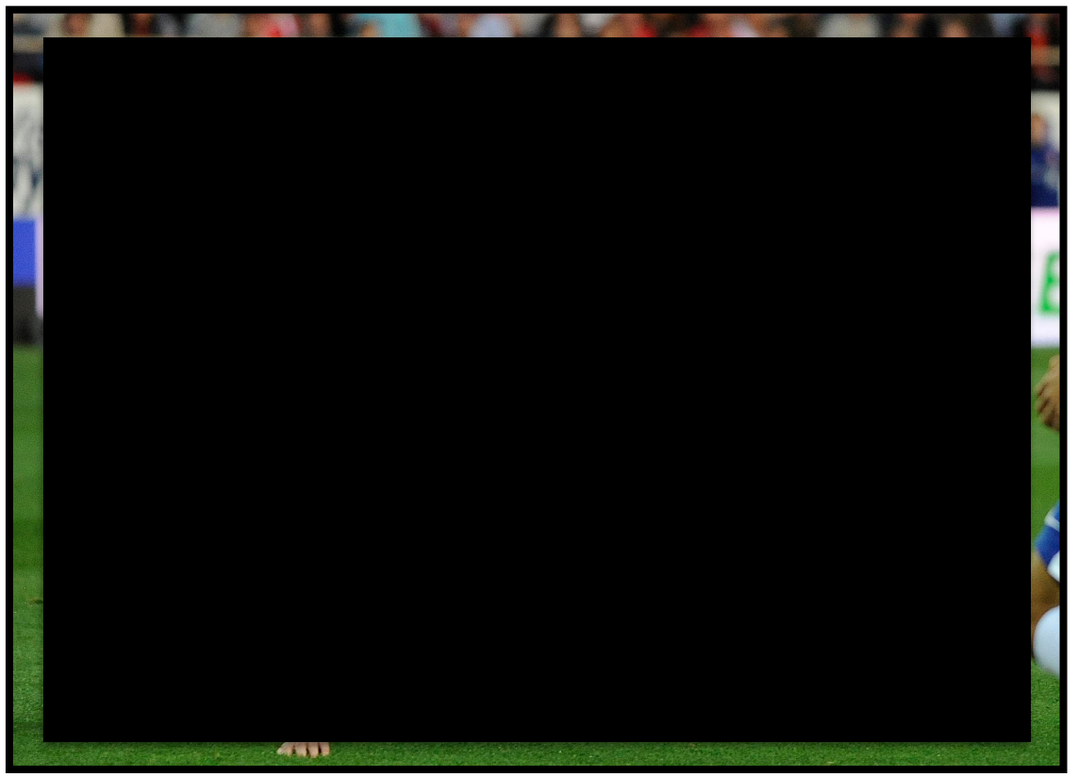
R D Hawkins, M A Hulse, C Wilkinson, A Hodson, M Gibson

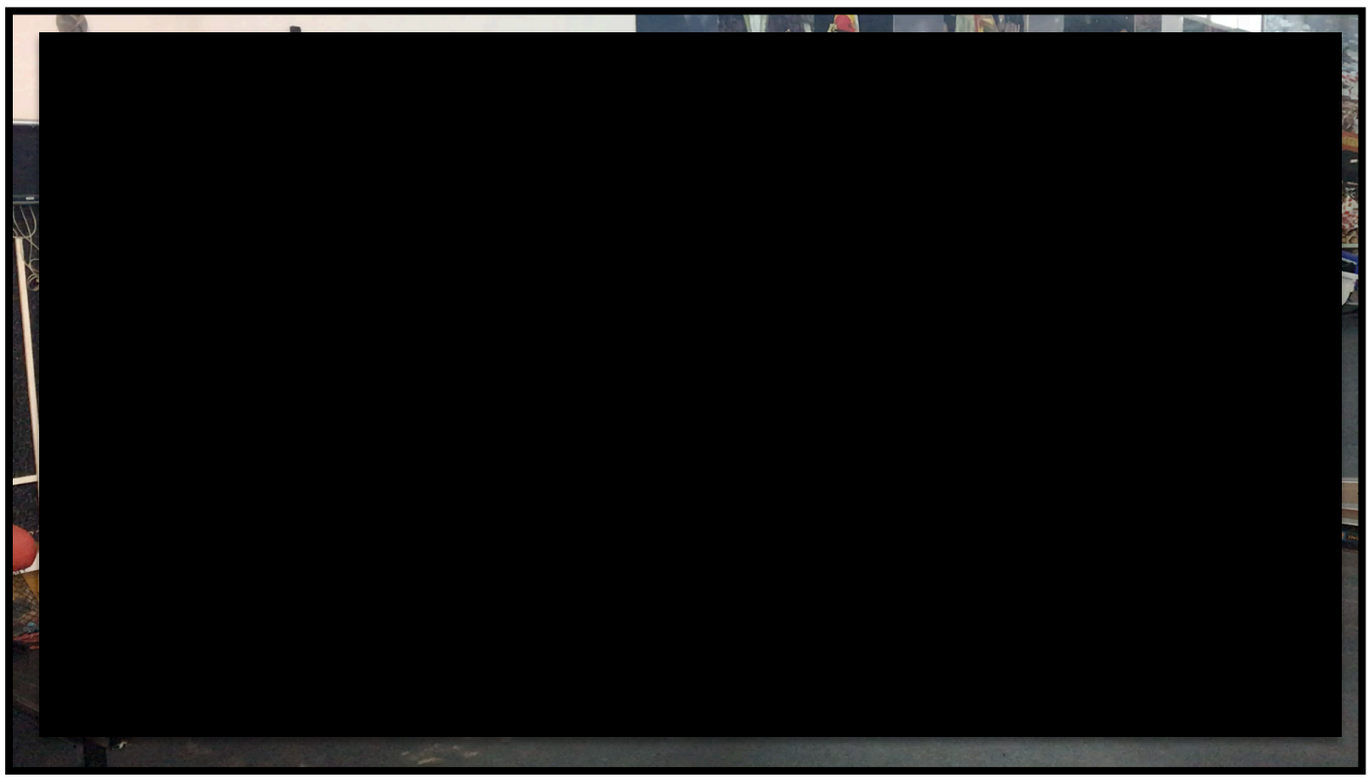
MECANISMO DE LESIÓN
DESACELERACIÓN

Football players repeatedly change in direction, decelerate or stop suddenly.

This results in additional horizontal braking forces and consequently more eccentric force imposed on the quadriceps.

(Mendiguchía, et al. 2013)





FUERZA / FLEXORES DE CADERA

↑Fuerza Flexión Cadera = ↑Velocidad del Pie en el Golpeo

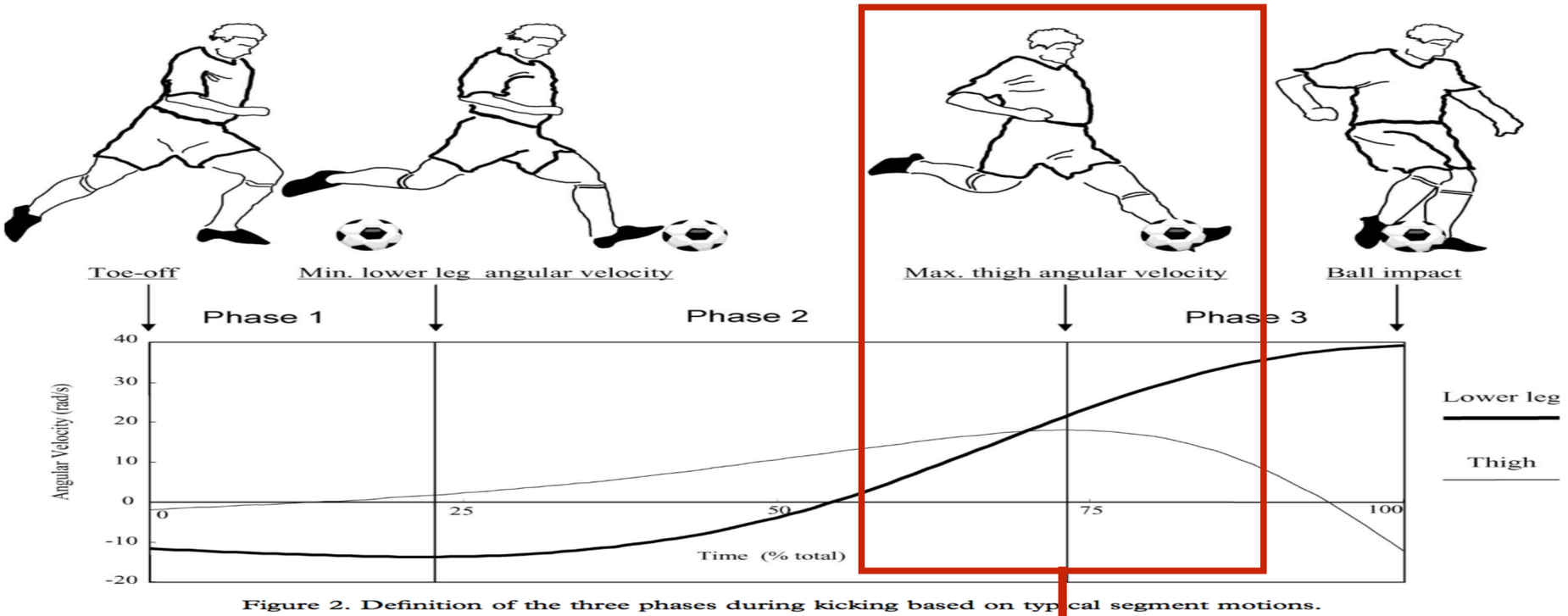
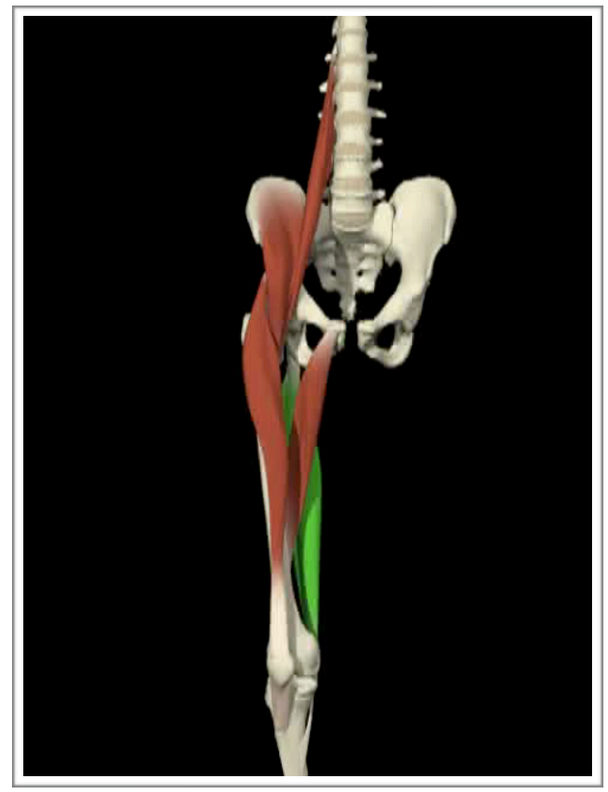


Figure 2. Definition of the three phases during kicking based on typical segment motions.



PROTAGONISTAS : PSOAS ILIACO + RECTO FEMORAL

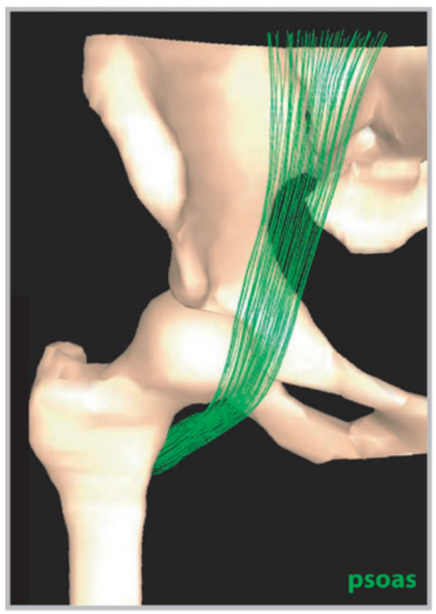
FUERZA / FLEXORES DE CADERA

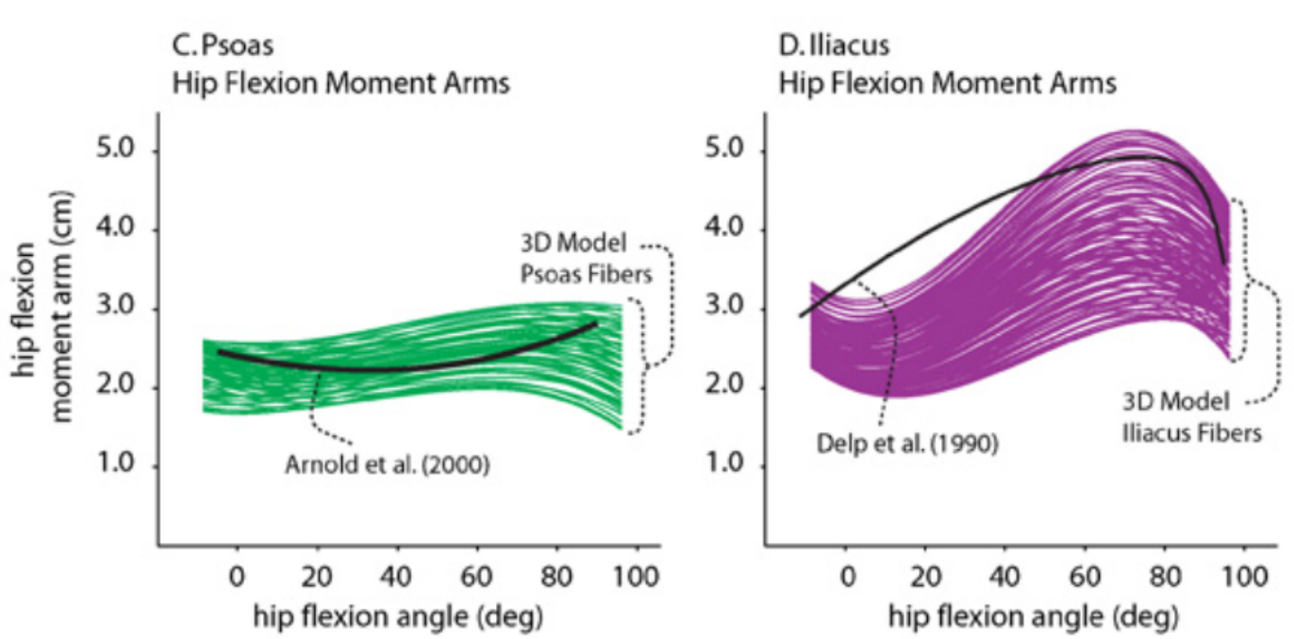
Three-Dimensional Representation of Complex Muscle Architectures and Geometries

SILVIA S. BLEMKER and SCOTT L. DELP

Departments of Bioengineering and Mechanical Engineering, Stanford University, Stanford, CA

(Received 1 July 2004; accepted 17 November 2004)





Therefore, effective training of hip flexors should include hip flexion angles above 90°.[75]

METER UNA ACCION DE CARRERA COMO LA DE GOLPEO (EJ. ARTICULO MENDIGUCHIA)

FUERZA / FLEXORES DE CADERA

PSOAS ILÍACO

ROBERT H. BROPHY, MD[1] • SHERRY I. BACKUS, PT, DPT, MA[2] • BRIAN S. PANSY, BS[3]
STEPHEN LYMAN, PhD[4] • RILEY J. WILLIAMS, MD[5]

Lower Extremity Muscle Activation and Alignment During the Soccer Instep and Side-foot Kicks

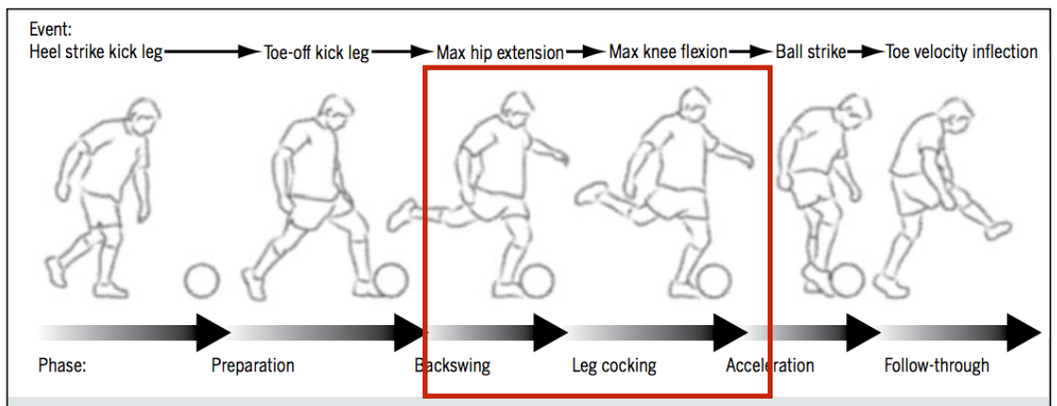


FIGURE 2. The instep kick is divided into 5 phases delimited by 6 events.

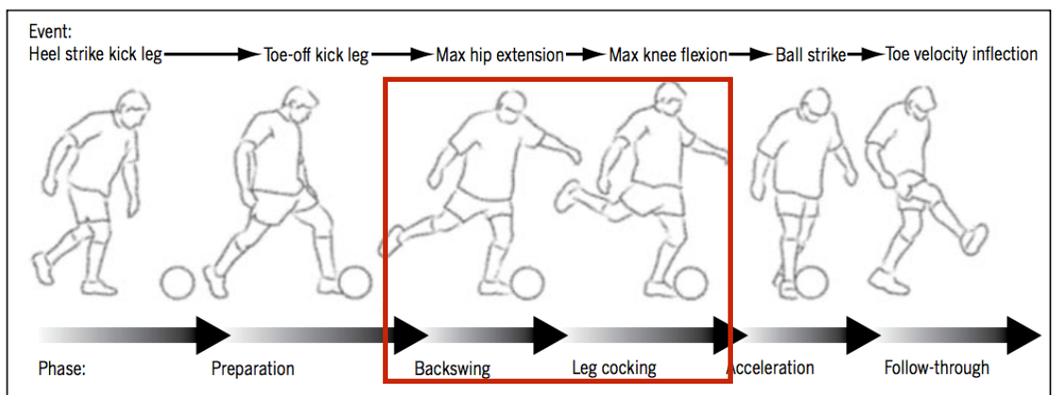


FIGURE 3. The side-foot kick is divided into 5 phases delimited by 6 events.

TABLE 3 KICKING-LIMB MUSCLE ACTIVATION COMPARING INSTEP KICK TO SIDE-FOOT KICK FOR EACH PHASE*

	Phase 1		Phase 2		Phase 3		Phase 4		Phase 5	
	Instep	Side-foot	Instep	Side-foot	Instep	Side-foot	Instep	Side-foot	Instep	Side-foot
Iliacus†	57 ± 90	28 ± 34	96 ± 97	65 ± 58	149 ± 112	128 ± 91	131 ± 117	106 ± 93	95 ± 170	82 ± 119
Gluteus medius‡	104 ± 68	100 ± 68	75 ± 60	63 ± 48	57 ± 46	72 ± 99	71 ± 61	80 ± 95	89 ± 78	82 ± 59
Gluteus maximus‡	148 ± 182	127 ± 113	74 ± 80	57 ± 55	73 ± 59	77 ± 69	114 ± 86	115 ± 79	129 ± 125	120 ± 109
Hamstrings§	63 ± 23	59 ± 28	39 ± 23	35 ± 34	26 ± 22	20 ± 13	33 ± 21	41 ± 26	50 ± 26	62 ± 34
Vastus lateralis‡	60 ± 33	48 ± 35	36 ± 36	24 ± 23	50 ± 21	58 ± 39	87 ± 66	90 ± 64	52 ± 43	47 ± 43
Vastus medialis‖	128 ± 103	115 ± 75	23 ± 20	15 ± 14	78 ± 52	50 ± 44	100 ± 57	99 ± 61	69 ± 62	71 ± 68
Gastrocnemius¶	99 ± 35	82 ± 36	33 ± 24	22 ± 18	42 ± 27	19 ± 13	57 ± 33	34 ± 52	67 ± 51	68 ± 68
Hip adductors#	60 ± 29	50 ± 27	68 ± 59	54 ± 34	75 ± 52	67 ± 38	81 ± 60	58 ± 31	75 ± 49	71 ± 46
Tibialis anterior**	25 ± 27	21 ± 25	19 ± 16	50 ± 26	40 ± 34	96 ± 36	44 ± 37	86 ± 29	39 ± 30	42 ± 23

**Data are reported as the mean ± SD percent of maximal voluntary isometric contraction.*
†Main effect demonstrated greater activity during the instep kick (P<.01).
‡No significant difference in muscle activation between kicks for any phase (P>.05).
§Interaction effect (P = .02); greater activity for side-foot kick during phase 5 (P = .03).
‖Main effect demonstrated greater activity during the instep kick (P = .016).
¶Main effect demonstrated greater activity during the instep kick (P<.01).
#Main effect demonstrated greater activity during the instep kick (P<.01).
***Interaction effect (P<.01); greater activity for side-foot kick during phases 2-4 (P<.01).*

MECANISMO DE LESIÓN

GOLPEO

The most common mechanism of rectus femoris muscle injury in soccer is kicking.
(Woods, et al. 2002)

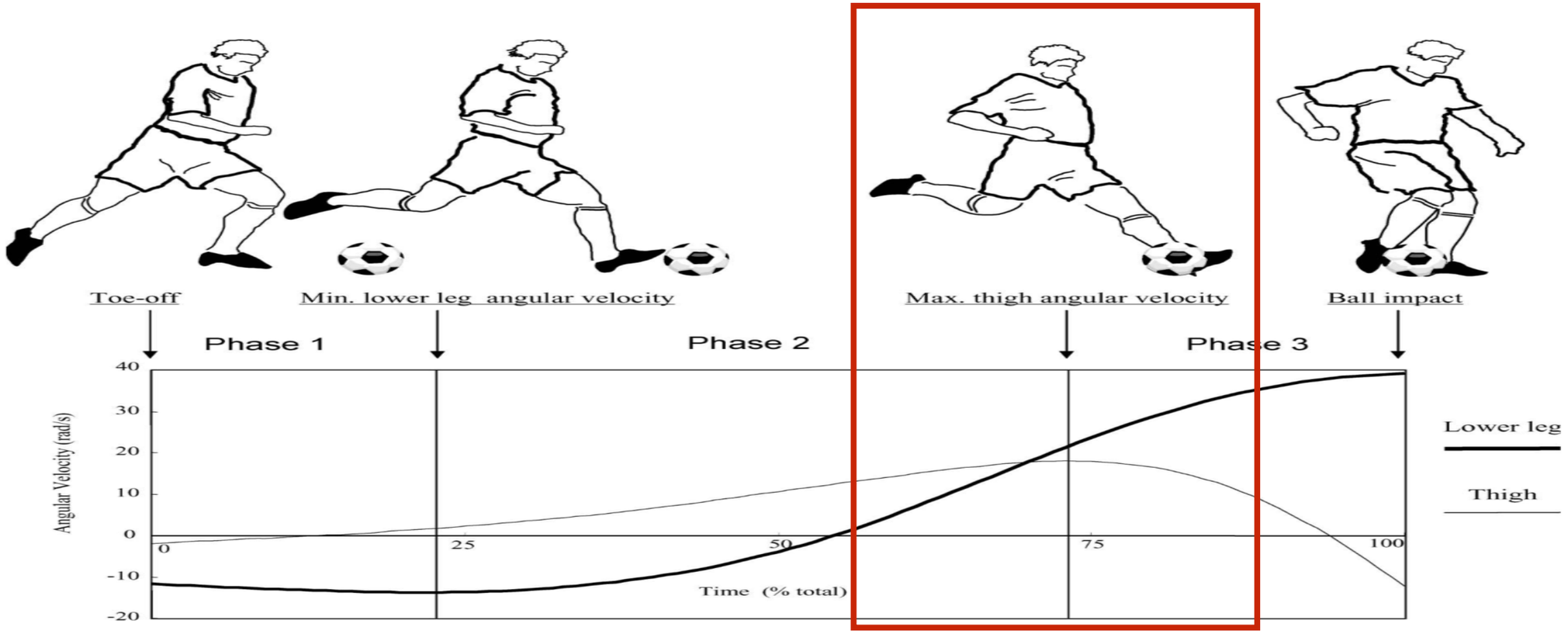


Figure 2. Definition of the three phases during kicking based on typical segment motions.

MECANISMO DE LESIÓN
GOLPEO

Three-dimensional kinetic analysis of side-foot and instep soccer kicks

HIROYUKI NUNOME, TAKESHI ASAI, YASUO IKEGAMI, and SHINJI SAKURAI

Research Center of Health, Physical Fitness and Sports, Nagoya University, Furo-cho, Chikusa, Nagoya, JAPAN; and Faculty of Education, Yamagata University, Yamagata, JAPAN

ENTRENAR LOS MUSCULOS RESPETANDO SU ANATOMIA y FUNCIÓN TRIDIMENSIONAL

Short communication

Region specificity of rectus femoris muscle for force vectors in vivo

Shota Hagio, Kaori Nagata, Motoki Kouzaki*

Laboratory of Neurophysiology, Graduate School of Human and Environmental Studies, Kyoto University, Yoshida-nihonmatsu-cho, Sakyo-ku, Kyoto 606-8501, Japan

"…These findings support our hypothesis that divergent regions of muscle fibers within RF have different functions for determining the force direction"

Esta acción va acompañada de **Vectores Rotacionales.**

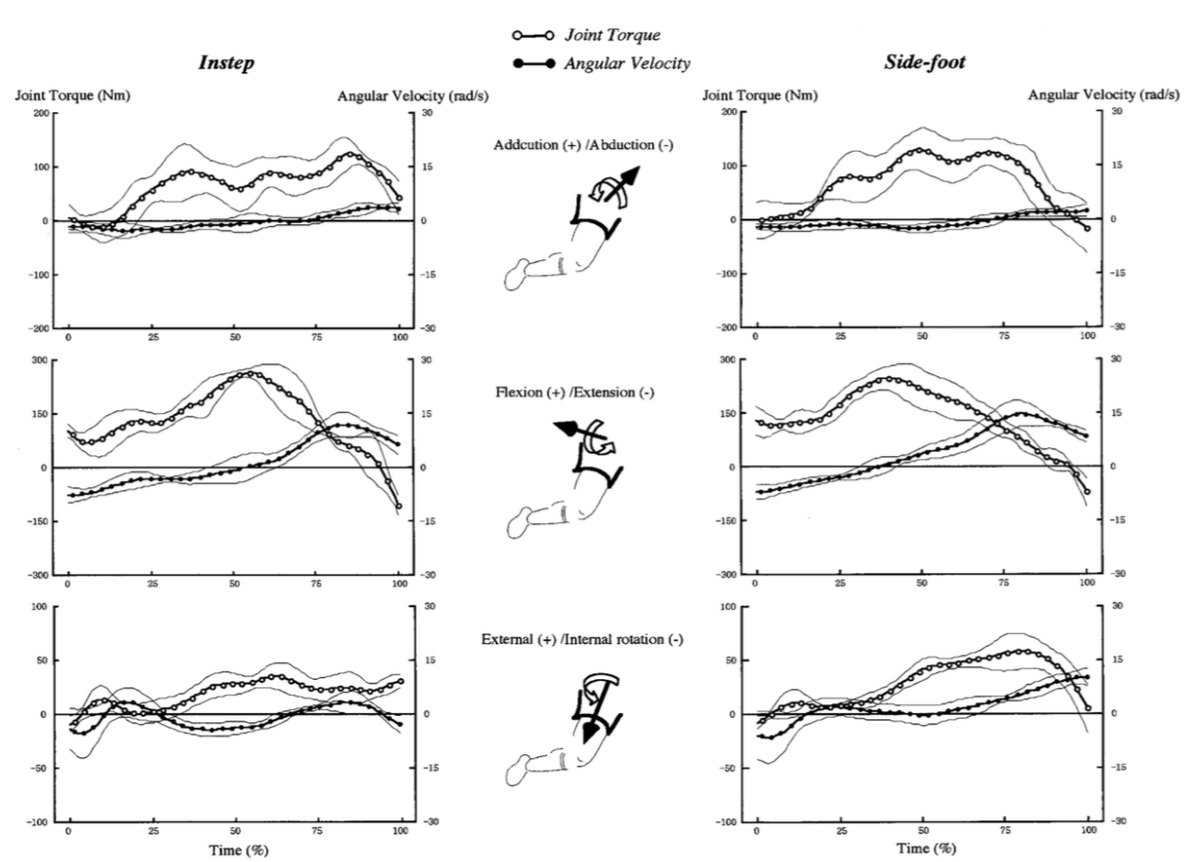


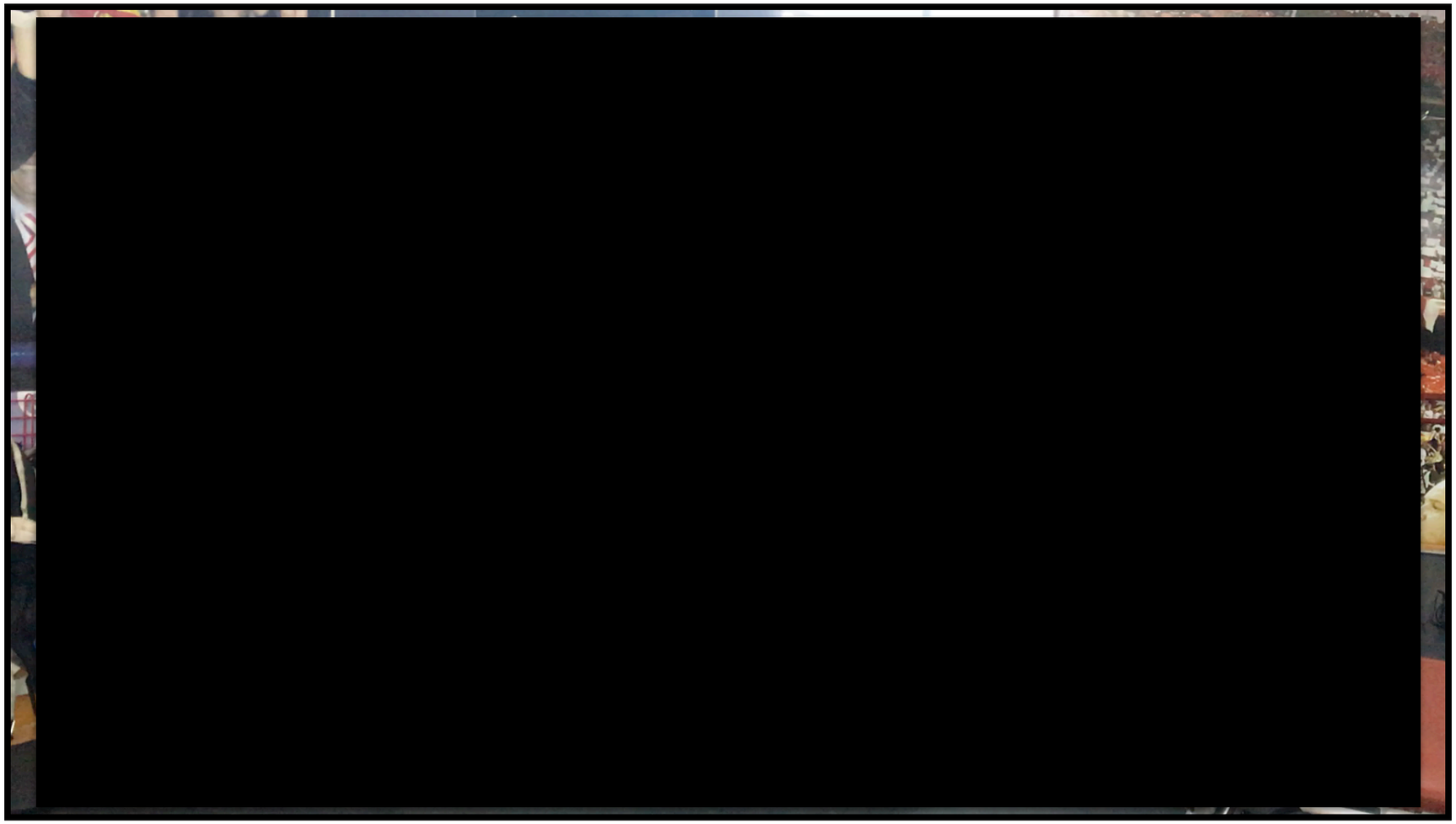
FIGURE 3—Changes in joint torque and angular velocity at the hip of the side-foot (right column) and instep (left column) kicks. For the hip adduction/abduction (top), positive and negative values corresponded to adduction and abduction, respectively. For the hip flexion/extension (middle), positive and negative values corresponded to flexion and extension, respectively. For the hip external/internal rotation (bottom), positive and negative values corresponded to external and internal rotation, respectively.

MECANISMO DE LESIÓN

GOLPEO

Foot to ball contact is much lower than ground reaction forces in the deceleration at the final step of the kicking leg.

“Deceleration during a kicking motion causes the body to lean backwards and the leg to move farther behind the body than normal, which places extra stress and strain on the rectus femoris". *(Mendiguchía, et al. 2013)*



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Departamento de Educación Física y Deportiva
Gorputz eta Kirol Hezkuntzako Saila

EVITAR ENTRENAMIENTO VACIO (Gerad Moras)

Stimuli that apply must be justified and be useful

Entrenamiento bajo exigencia coordinativa

ENTRENAMIENTO FUNCIONAL DE LA FUERZA

COORDINACIÓN INTERMUSCULAR	COORDINACIÓN INTRAMUSCULAR	PROCESOS REFLEJOS
DEFICIT-FACILITACIÓN BILATERAL	RECLUTAMIENTO TEMPORAL	FACILITACIÓN - INHIBICIÓN
COACTIVACIÓN ANTAGONISTA	RECLUTAMIENTO ESPACIAL	
EFECTO CRUZADO	SINCRONIZACIÓN UNIDADES MOTORAS	

Tous, J. (1999)

AREAS Y CONTENIDOS

DESPLAZAMIENTOS

- Acelerar
- Desacelerar
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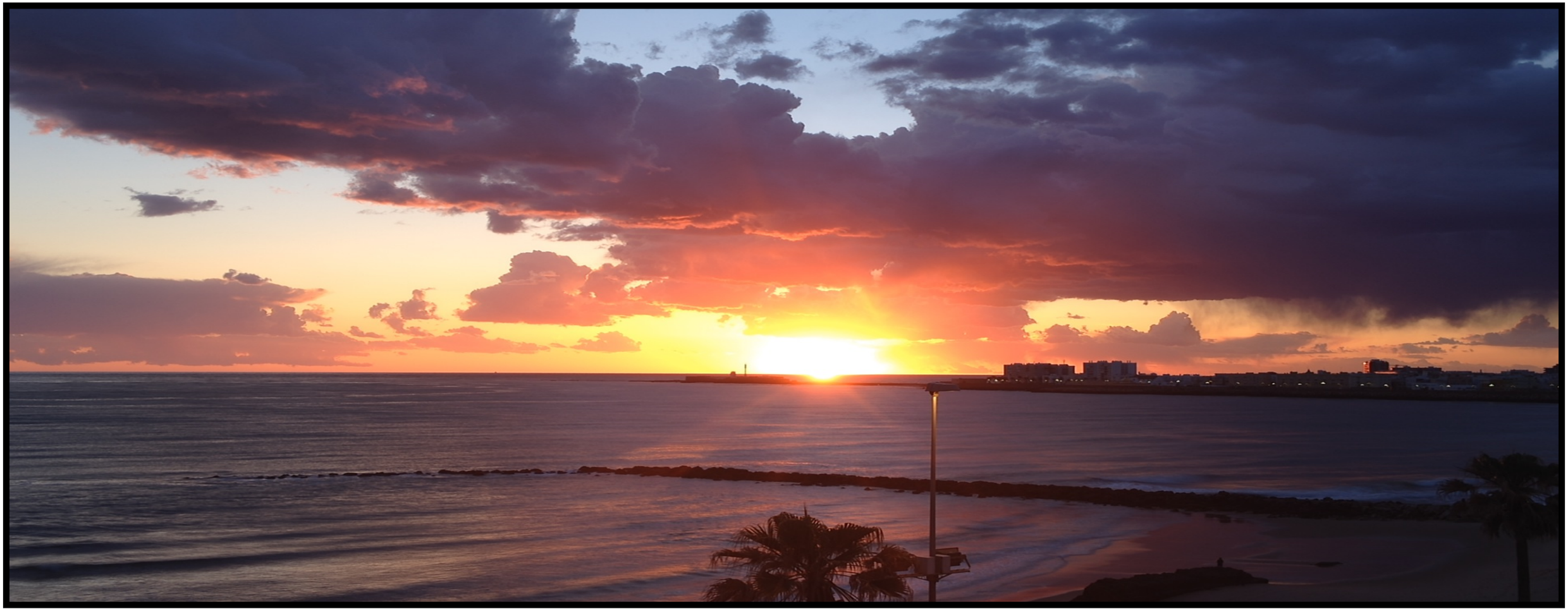
"No menos que saber, dudar me gusta más".

(Dante Alighieri)



MUCHAS GRACIAS

JOSE CONDE GONZALEZ

Vitoria, 29 Septiembre 2017