

**Taller 2:
NUTRICIÓN,
DEPORTE Y
MUJER.
INTERVENCIÓN
NUTRICIONAL EN
FÚTBOL
FEMENINO**
GE-NuDAFD



II CONGRESO
DE ALIMENTACIÓN,
NUTRICIÓN Y
DIETÉTICA

AVANCES EN NUTRICIÓN
Y DIETÉTICA CLÍNICA:
PREVENCIÓN,
TRATAMIENTO Y GESTIÓN
ROL DEL DIETISTA-NUTRICIONISTA



ACADEMIA
ESPAÑOLA DE
NUTRICIÓN
Y DIETÉTICA



Consejo General de
Dietistas-Nutricionistas
de España

MADRID,
5 Y 6 DE OCTUBRE
DE 2018

10:00h-10:15h Presentación.

10:15h-11:00h. Análisis de los requerimientos nutricionales en deportes de equipo. Raúl López-Grueso.

11:00h-11:45h. La mujer deportista. Planificación nutricional según el ciclo menstrual. Sandra Antón San Atanasio.

11:45h-12:00h. Descanso.

12:00h-12:45h. Simulación de una intervención nutricional grupal real en un equipo de fútbol femenino. Raúl López-Grueso y Cristina Rubio Ruza.

12:45h-13:30h- Análisis de la propuesta de intervención nutricional. Sandra Antón San Atanasio



Rendimiento en Fútbol: Fisiología y Requerimientos

REVIEW ARTICLE

Sports Med 2005; 35 (6): 501-536
0112-1642/05/0006-0501/\$34.95/0

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Physiology of Soccer

An Update

Tomas Stølen,¹ Karim Chamari,² Carlo Castagna³ and Ulrik Wisløff^{4,5}



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Stølen et al. 2005

Rendimiento en Fútbol: Fisiología y Requerimientos

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Rendimiento en Fútbol: Fisiología y Requerimientos

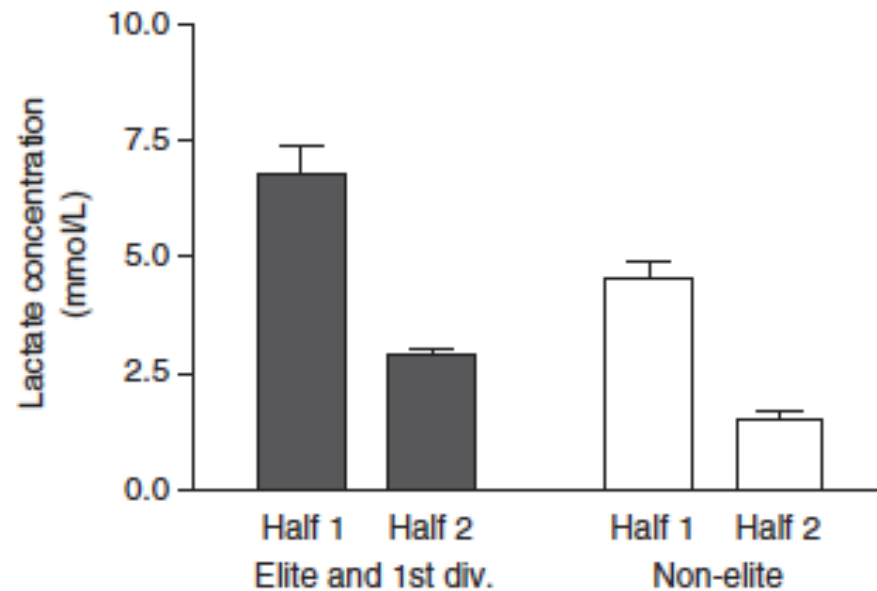


Fig. 1. Lactate concentration in elite and non-elite soccer players.



Rendimiento en Fútbol: Fisiología y Requerimientos

Table VII. Physiological profile of female soccer players

Study	Level/country	n	Anthropometry ($\pm$ SD)		VO _{2max} ($\pm$ SD)		
			height (cm)	weight (kg)	L/min	mL/kg/min	mL/kg ^{0.75} /min
Davis and Brewer ^[94]	National/England	14	166.0 $\pm$ 6.1	60.8 $\pm$ 5.2		48.4 $\pm$ 4.7	135.2
	After training period	14	166.0 $\pm$ 6.5	59.6 $\pm$ 5.2		52.2 $\pm$ 5.1 ^a	145.0
Evangelista et al. ^[95]	Division 1/Italy	12				49.75 $\pm$ 8.3	138.5 ^b
Helgerud et al. ^[91]	Elite/Norway	12	169.7 $\pm$ 7.1	62.5 $\pm$ 7.4	3.36 $\pm$ 0.37	54.0 $\pm$ 3.54	151.5 $\pm$ 9.3
Jensen and Larsson ^[96]	National/Denmark	10	169.0	63.2		53.3	150.3
	After training period	10				57.6	162.4
Polman et al. ^[97]	Elite/England	36	164.0	65.2		38.6 ^a	109.7
	After training period	36	164.0	62.7		45.7 ^a	128.6
Rhodes and Mosher ^[98]	University/Canada	12	164.8	59.5		47.1 $\pm$ 6.4	130.8
Tamer et al. ^[99]	Division 1/Turkey	22				43.15 $\pm$ 4.06 ^a	120.1 ^b
Tumilty and Darby ^[100]	National/Australia	20	164.0 $\pm$ 6.1	58.5 $\pm$ 5.7		48.5 $\pm$ 4.8 ^a	134.1

a VO_{2max} is estimated.

b VO_{2max} calculated by using a bodyweight of 60kg, data presented without standard deviation is calculated from the average bodyweight measured in the respective studies.

VO_{2max} = maximal oxygen uptake.



Rendimiento en Fútbol: Fisiología y Requerimientos

Nutrition and Football Special Populations: The Female Player and the Youth Player

Christine A. Rosenbloom¹, Anne B. Loucks², Bjorn Ekblom³

Table 1. Energy intake, macronutrient and micronutrient intakes in female football players

Nutrient Mean (SD)	U-21 players ^a (n= 11)	NCAA players ^b (n=13)	NCAA players ^c (n=13)
Energy (kcal)	2015 ± 19	2290 ± 310	1865 ± 530
Carbohydrate (g)	282 ± 118	320 ± 70	263 ± 71
Protein (g)	79 ± 33	86.5 ± 18.7	58.8 ± 16.0
Fat (g)	67 ± 28	75.2 ± 13.3	65.9 ± 28.7
Fibre (g)	17.7 ± 5.2	14.5 ± 4.9	13.3 ± 5.7
Vitamin A (RE)	917 ± 505	894 ± 276	847 ± 425
Vitamin E (mg)	8.3 ± 8.8	7.2 ± 3.7	3.3 ± 3.3
Vitamin D (mcg)	2.6 ± 2.4	2.4 ± 1.7	2.5 ± 2.6
Vitamin C (mg)	128 ± 110	100 ± 64	46 ± 32
Thiamin (mg)	1.6 ± 0.9	1.5 ± 0.6	1.0 ± 0.4
Niacin (mg)	21.5 ± 11.9	24.5 ± 8.5	15.2 ± 6.3
Riboflavin (mg)	1.7 ± 1.0	1.8 ± 0.7	1.2 ± 0.7
Folate (mcg)	338 ± 213	271 ± 130	186 ± 113
Vitamin B6 (mg)	1.9 ± 1.2	1.8 ± 0.6	1.1 ± 0.6
Vitamin B12 (mcg)	3.0 ± 2.8	4.5 ± 1.9	2.1 ± 1.7
Calcium (mg)	887 ± 510	931 ± 223	695 ± 289
Iron (mg)	16 ± 7.8	17.3 ± 4.7	12.2 ± 5.2
Magnesium (mg)	223 ± 103	178 ± 43	127 ± 71
Zinc (mg)	9.5 ± 6.1	10.4 ± 4.6	5.1 ± 2.5
Sodium (mg)	3780 ± 1679	Not reported	Not reported
Potassium (mg)	2312 ± 1049	Not reported	Not reported

^aMullinix *et al.*, 2003 (Pre-season intakes)

^bClark *et al.*, 2003 (Pre-season intakes)

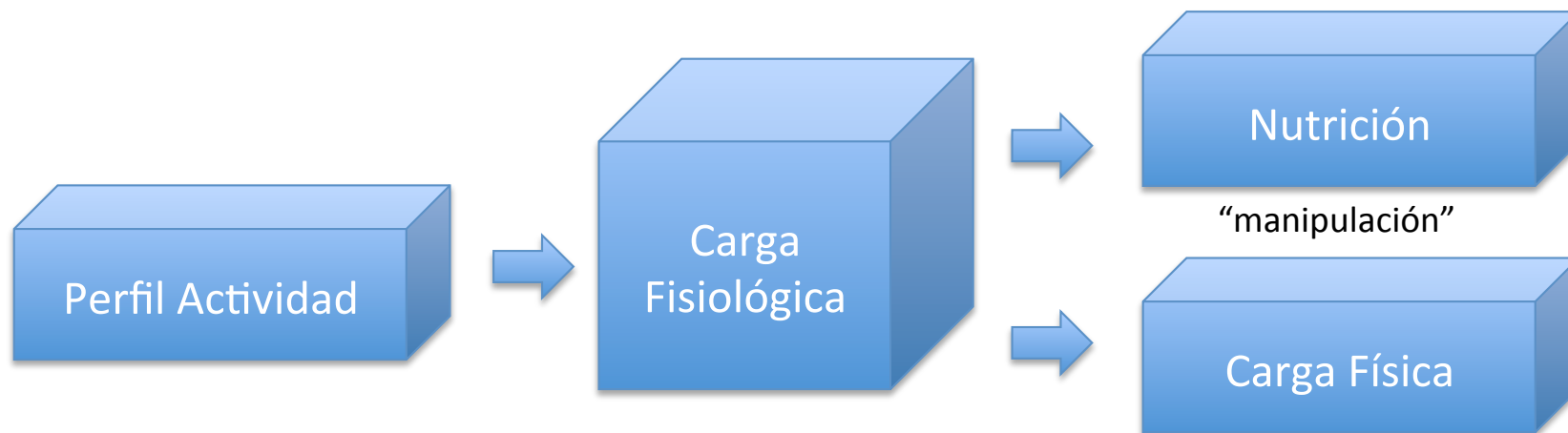
^cClark *et al.*, 2003 (Post-season intakes)



Rendimiento en Fútbol: Fisiología y papel de la Nutrición

Fútbol → Deporte más popular (200.000 profesionales y 200 millones aficionados)...

- Físicos
- Técnicos
- Toma de decisiones / Psicología



Rendimiento en Fútbol: Fisiología y papel de la Nutrición

- Carácter Aeróbico “intermitente”: baja / alta intensidad
 - Fuerza → Potencia
 - Velocidad / Saltos
 - Lanzamientos / Golpeos
- (equilibrio / balance → lesiones)



Rendimiento en Fútbol: Fisiología y papel de la Nutrición

Carácter Aeróbico “intermitente”: baja / alta intensidad

DISTANCIA recorrida (km)	
Liga inglesa (n=370)	10,7
Liga danesa (n=23)	10,8
Liga italiana (n=18)	10,9
Liga española (n=300)	11,4

63,3
 $\text{VO}_{2\text{max}}$
($\text{ml} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$)

62,0

$\approx 70\%$
 $\text{VO}_{2\text{max}}$

1.000-1.200
kcal

2 $\rightarrow$ (>)12
 $\text{mmol} \cdot \text{l}^{-1}$

38,7-39-40°C



Rendimiento en Fútbol: Fisiología y papel de la Nutrición

- **Fuerza → Potencia**
- **Velocidad / Saltos**
- **Lanzamientos / Golpeos**

(equilibrio / balance → lesiones)

≈ 150-250
acciones
“anaeróbicas”

≈> 65%
FC_{max}

... fatiga ...



Requerimientos Nutricionales: Composición corporal

**Metab.
Rep.+Act**

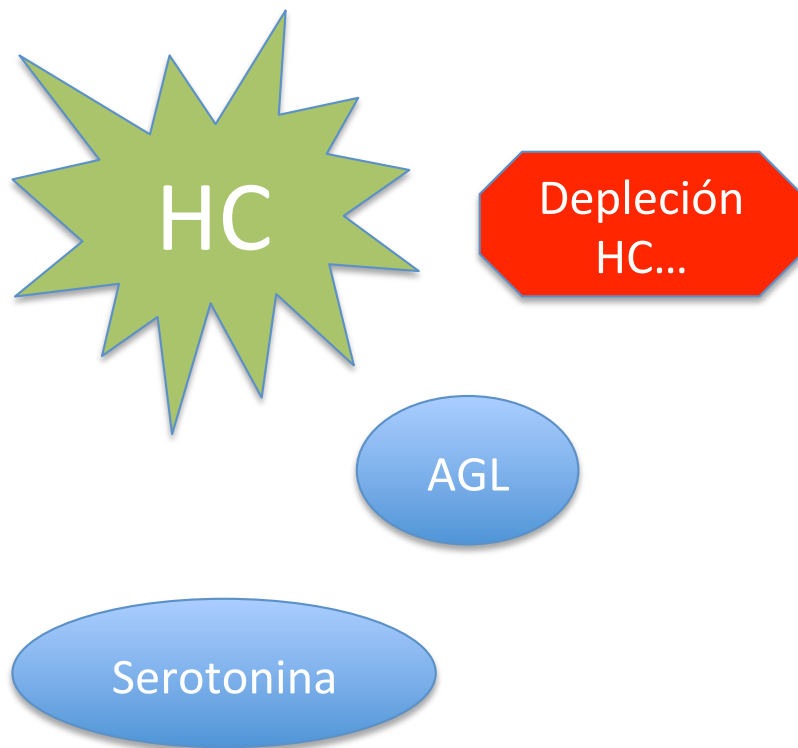
18,5 años
13,1 (menarquia)
60,8 kg
167 cm
22,2 IMC (kg/m²)

2111
↓ 111
kcal ?

31 kcal/
(**<47-60**)
kg/día

CHICAS	"Control"	Gimnasia	Fútbol
Densidad corporal (g/cm ³)	1,041	1,058	1,044
C.M.Oseo (cont.min.) (g)	2715	2486	2916
MG (%)	26,4	17,5	25,8
MG (kg)	15,9	9,1	15,8
MLG (kg)	43,2	42,6	45,1
MBaj (MJ/día)*	5,55	5,59	5,58
IE-GE (MJ/día)	-0,18	-3,19	-0,47

Carga / Disponibilidad de HC



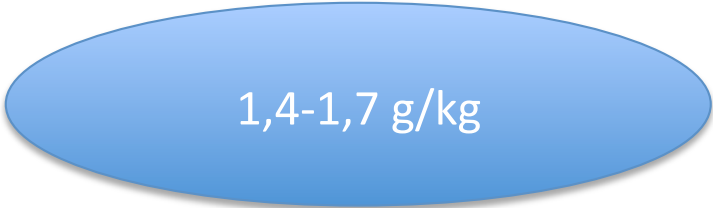
	"Alta "	"Baja "
Glucógeno muscular ANTES del partido	100%	50%
Glucógeno muscular MITAD del partido	40%	7%
Glucógeno muscular FINAL del partido	10%	0%
DISTANCIA recorrida (1ªp)	6,1 km	5,6 km
DISTANCIA recorrida (2ªp)	5,9 km	4,1 km
ANDANDO (%)	27	50
SPRINT (%)	24	15



Carga / Disponibilidad de PROTEÍNAS



Proteínas



1,4-1,7 g/kg



1,3 g/kg (Mullinix et al., 2003)
1,4 g/kg (Clark et al., 2003)





Balance de
líquidos +
electrolitos

Hidratación

Peso Corporal

Nutrition and hydration concerns of the female football player

Ronald J Maughan, Susan M Shirreffs

Br J Sports Med 2007;41(Suppl 1):i60-i63. doi: 10.1136/bjsm.2007.036475

Table 1 Physical characteristics and energy intake of female football players during training. Values are mean (SD)

Study	Population	Data collection	Age (years)	Body mass (kg)	Body mass index (kg/m ²)	Energy (MJ)	Energy (kJ/kg)
Fogelholm <i>et al</i> ⁶	Finnish national league players (n=12)	7-day food diary (household measures)	19 (2)	61 (6)	22.2 (1.8)	9.0 (1.7)	147
Clark <i>et al</i> ⁷	US collegiate players (n=13)	3-day food diary (household measures) before and after the season	20 (1)	62 (5)	22.5	9.6 (1.3) 7.8 (2.2)	155 126
Gropper <i>et al</i> ⁸	US collegiate players (n=15)	3-day food diary (household measures)	19 (1)	59 (5)	20.6 (1.4)	8.5 (2.5)	143
Mullinix <i>et al</i> ⁹	US national U21 team players	3-day food diary (household measures)	19 (1)	60 (7)	21.8 (1.6)	8.1 (0.1)	135



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Fuerza- Masa ósea

Table 1b. Characteristics in different age group (mean $\pm$ SD)

Measurement	≤ 16 years		>16 years	
	Soccer players (n = 23)	Nonactives (n = 18)	Soccer players (n = 28)	Nonactives (n = 23)
Age (years)	14.9 $\pm$ 0.6	14.9 $\pm$ 0.5	17.4 $\pm$ 0.7	17.2 $\pm$ 0.8
Height (cm)	165.2 $\pm$ 4.2	165.4 $\pm$ 6.5	166.8 $\pm$ 4.3	167.4 $\pm$ 4.6
Weight (kg)	57.3 $\pm$ 6.2	57.3 $\pm$ 6.5	61.9 $\pm$ 3.9	59.0 $\pm$ 5.7
BMI (kg/m ²)	21.0 $\pm$ 1.8	20.9 $\pm$ 1.7	22.3 $\pm$ 1.6 ^a	21.1 $\pm$ 1.9
Fat mass (kg)	14.0 $\pm$ 3.5 ^b	19.5 $\pm$ 4.7	16.5 $\pm$ 3.2 ^a	19.2 $\pm$ 4.2
Lean body mass (kg)	40.9 $\pm$ 3.3 ^c	35.4 $\pm$ 2.9	42.7 $\pm$ 2.2 ^c	37.3 $\pm$ 3.0
Menarche (age)	13.1 $\pm$ 0.9	12.8 $\pm$ 1.0	12.9 $\pm$ 1.0	12.8 $\pm$ 0.9
Time since menarche (year)	2.0 $\pm$ 1.1	2.0 $\pm$ 1.1	4.4 $\pm$ 1.2	4.4 $\pm$ 1.3

^a $P < 0.05$; ^b $P < 0.01$; ^c $P < 0.001$

Table 2a. Bone mineral density (g/cm²) for the whole groups, mean $\pm$ SD

Skeletal site	Soccer players n = 51	Nonactives n = 41	Percent difference soccer players– nonactives
Total body	1.15 $\pm$ 0.06 ^a	1.12 $\pm$ 0.06	2.7
Head	2.09 $\pm$ 0.17	2.14 $\pm$ 0.14	–2.3
Lumbar spine (L2–L4)	1.21 $\pm$ 0.12 ^b	1.14 $\pm$ 0.11	6.1
Femoral neck, dominant	1.10 $\pm$ 0.13 ^c	1.00 $\pm$ 0.08	10.0
Femoral neck, nondominant	1.09 $\pm$ 0.12 ^c	1.00 $\pm$ 0.09	9.0
Ward's triangle, dominant	1.10 $\pm$ 0.16 ^c	1.00 $\pm$ 0.11	10.0
Ward's triangle, nondominant	1.10 $\pm$ 0.15 ^c	1.00 $\pm$ 0.11	10.0
Trochanter, dominant	0.99 $\pm$ 0.12 ^c	0.85 $\pm$ 0.07	16.5
Trochanter, nondominant	1.01 $\pm$ 0.12 ^c	0.88 $\pm$ 0.09	14.8

Difference between groups (%)

^a $P < 0.05$; ^b $P < 0.01$; ^c $P < 0.001$

Table 2b. Differences in bone mineral density (g/cm²) between the soccer players and the nonactives in different age groups

Skeletal site	≤ 16 years		>16 years	
	Soccer players (n = 23)	Nonactives (n = 18)	Soccer players (n = 28)	Nonactives (n = 23)
Total body	1.12	1.11	1.18 ^b	1.13
Head	2.01	2.11	2.16	2.16
Lumbar spine (L2–L4)	1.14	1.11	1.27 ^b	1.16
Femoral neck, dominant	1.07	1.01	1.13 ^c	1.00
Femoral neck, nondominant	1.06	1.00	1.12 ^c	1.00
Ward's triangle, dominant	1.08	1.01	1.12 ^b	0.99
Ward's triangle, nondominant	1.05	0.99	1.13 ^b	1.01
Trochanter, dominant	0.98 ^c	0.85	0.99 ^c	0.85
Trochanter, nondominant	0.99 ^b	0.87	1.02 ^c	0.88

Mean and P -values

^b $P < 0.01$; ^c $P < 0.001$



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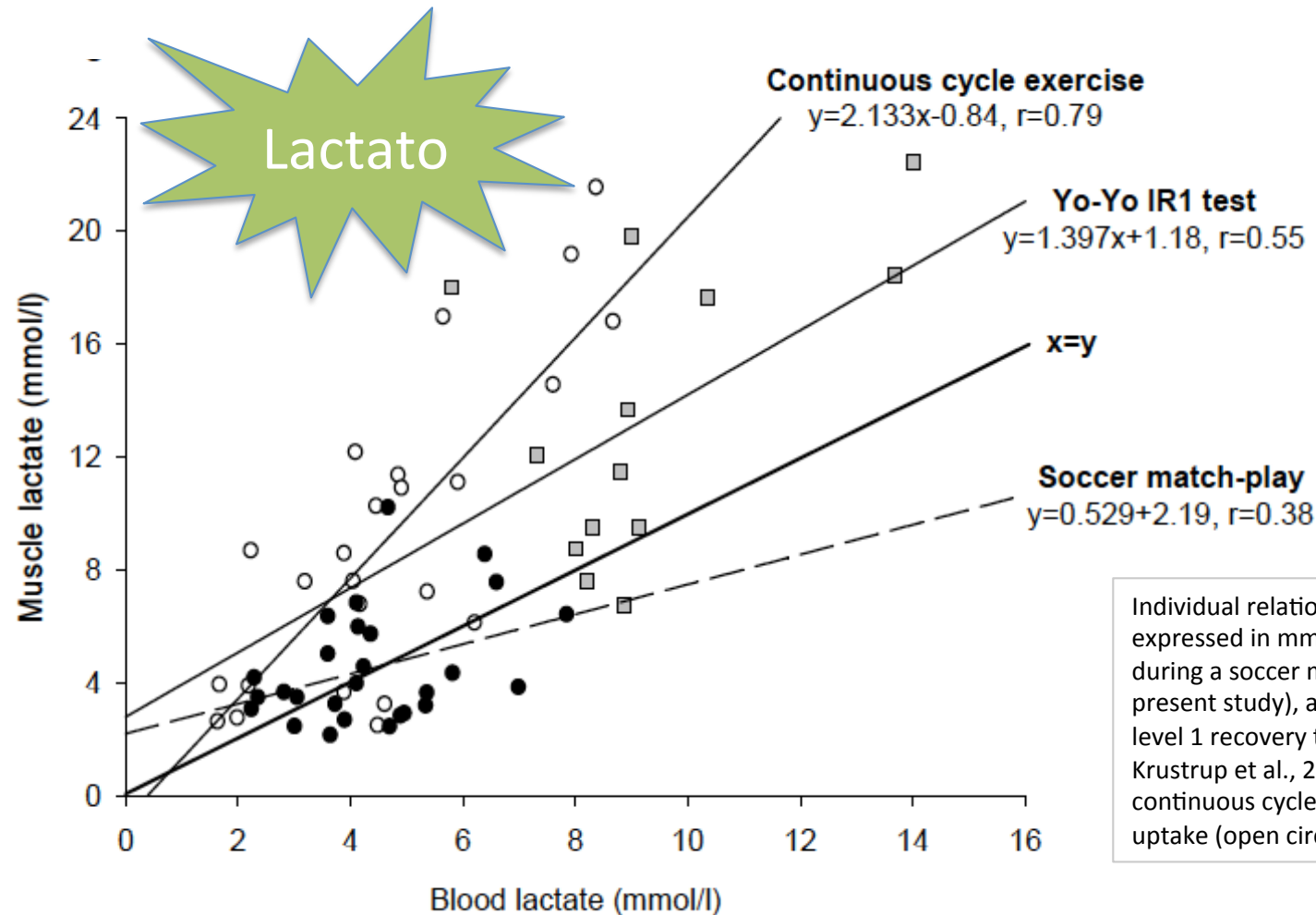
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Söderman et al., 2000

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Individual relationship between muscle lactate, expressed in mmol/l cell water, and blood lactate, during a soccer match (filled circles; data from the present study), at exhaustion in the Yo-Yo intermitten level 1 recovery test (filled squares; data from Krstrup et al., 2003) as well as after 20 min of continuous cycle exercise at 80% of maximal oxygen uptake (open circles; data from Krstrup et al. 2004).



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Fig. 2a

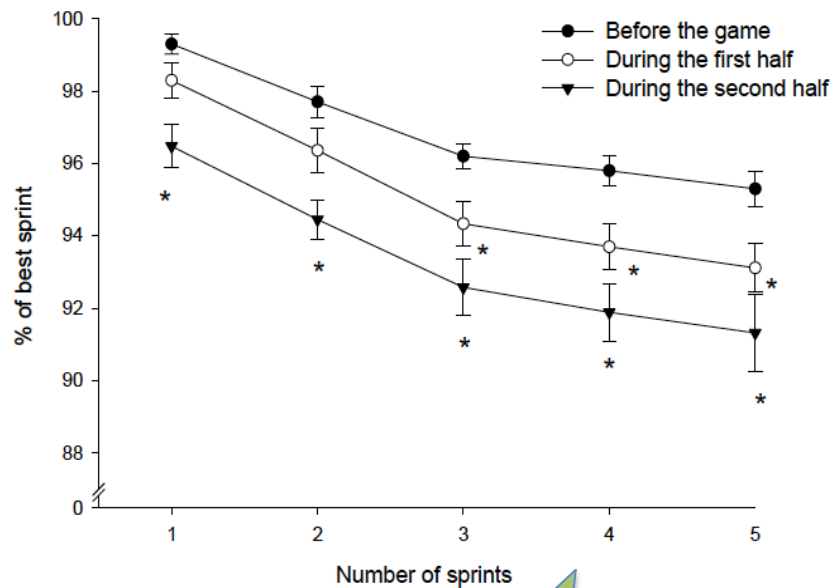
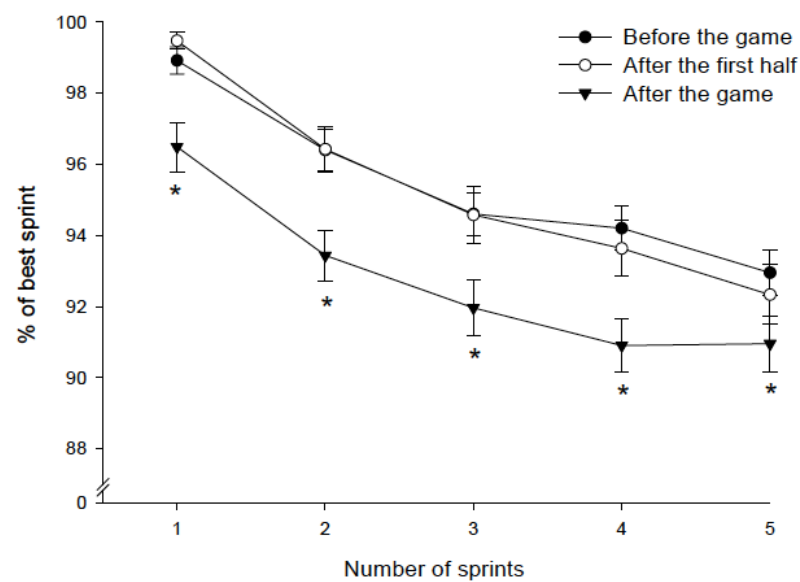


Fig. 2b



% Mejor sprint
(5x30 m)

Sprint time (% of the best sprint) of five 30-m sprints separated by a 25-s period of recovery (Data are means $\pm$ SEM):

a) Before the game (filled circles), after the first (open circles) and second (filled triangles) half.

b) Before the game (filled circles), after an intense period in the first (open circles) and second half (filled triangles).

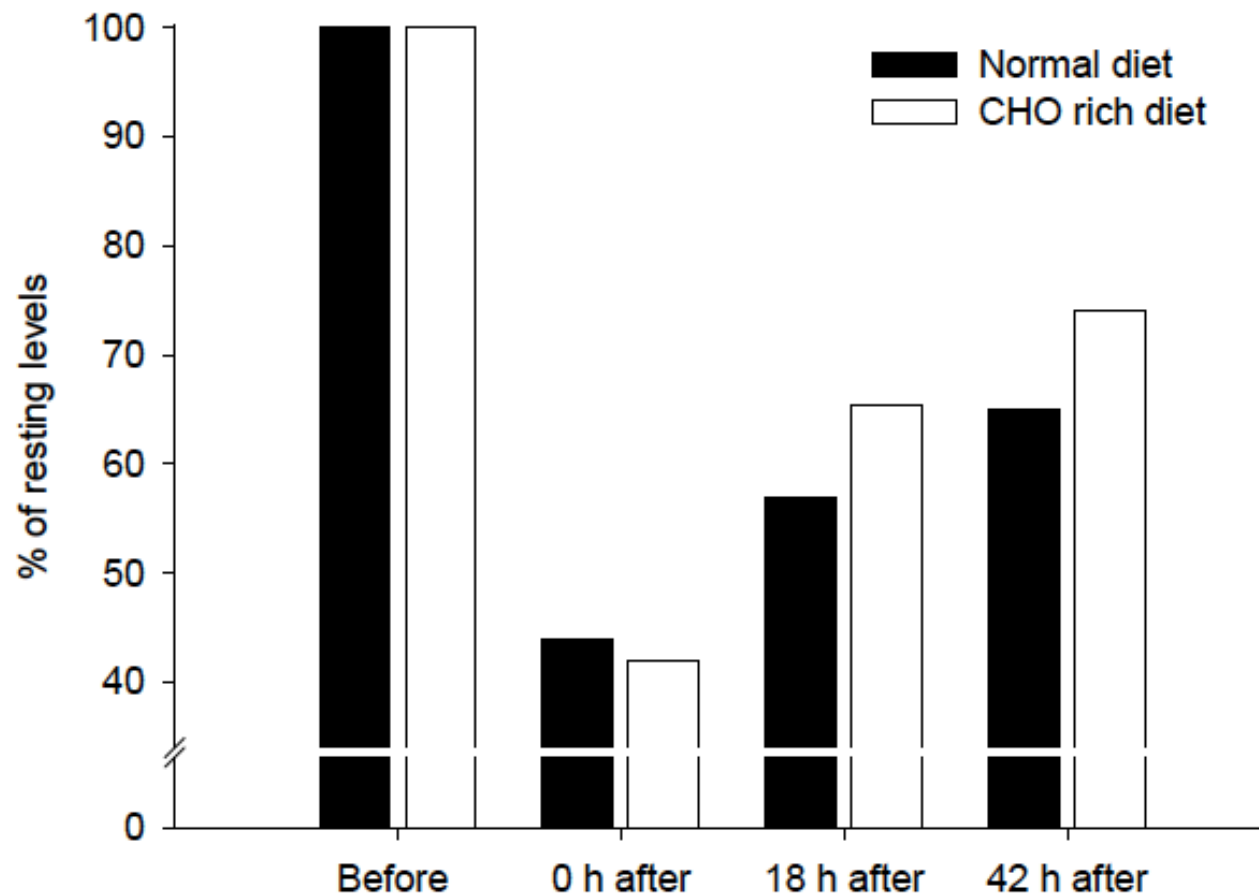


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Glucógeno
muscular

1-2 entº/
dia

Muscle glycogen levels (expressed in relation to pre-game level) after a competitive soccer game. Biopsies were obtained from the vastus lateralis muscle 0, 18 and 42 h after a game on two occasions, with a normal diet (filled bars) and a diet high in carbohydrates (open bars).



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