

NUTRICIÓN DE PRECISIÓN EN LA FATIGA EN FUTBOLISTAS: UN CASO CLÍNICO SEGÚN LA METODOLOGÍA CARE

CARE guidelines for case reports: explanation and elaboration document

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Abstract

Background: Well-written and transparent case reports (1) reveal early signals of potential benefits, harms, and information on the use of resources; (2) provide information for clinical research and clinical practice guidelines, and (3) inform medical education. High-quality case reports are more likely when authors follow reporting guidelines. During 2011–2012, a group of clinicians, researchers, and journal editors developed recommendations for the accurate reporting of information in case reports that resulted in the CARE (CARE REport) Statement and Checklist. They were presented at the 2013 International Congress on Peer Review and Biomedical Publication, have been endorsed by multiple medical journals, and translated into nine languages.

Objectives: This explanation and elaboration document has the objective to increase the use and dissemination of the CARE Checklist in written and published case reports.

Article Design and Setting: Each item from the CARE Checklist is explained and accompanied by published examples. The explanations and examples in this document are designed to support the writing of high-quality case reports by authors and their critical appraisal by editors, peer reviewers, and readers.

Results and Conclusion: This article and the 2013 CARE Statement and Checklist, available from the CARE website [www.care-statement.org] and the EQUATOR Network [www.equator-network.org], are resources for improving the completeness and transparency of case reports. © 2017 Elsevier Inc. All rights reserved.

Keywords: Case report; Case study; EQUATOR network; Health research reporting guidelines; CARE guideline; Timeliness; N-of-1

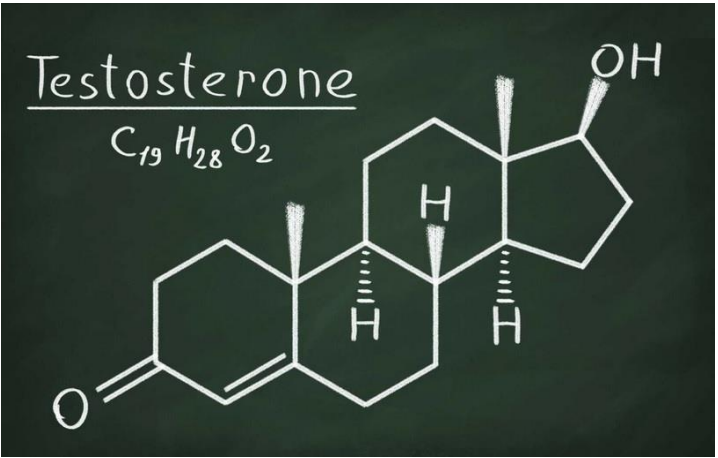
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Fenómeno complejo:



No existe una definición operacional estandarizada.

Fatiga

Cansancio

Privación sueño

1-"Disminución del rendimiento físico asociado a un aumento en la percepción de dificultad del desempeño de una actividad dada".

2-"Reducción de la capacidad del sistema músculo-esquelético para generar fuerza durante la ejecución de un ejercicio".

Abd-Elfattah HM, Abdelazeim FH, Elshennawy S. Physical and cognitive consequences of fatigue: A review. J Adv Res. 2015;6(3):351-8.

Experiencia subjetiva.



EMG

Etiología multifactorial.



Biomarcadores.

Fatiga



Cognitivo

Muscular

Propiocepción

Estados fisiopatológicos.

Trigger.



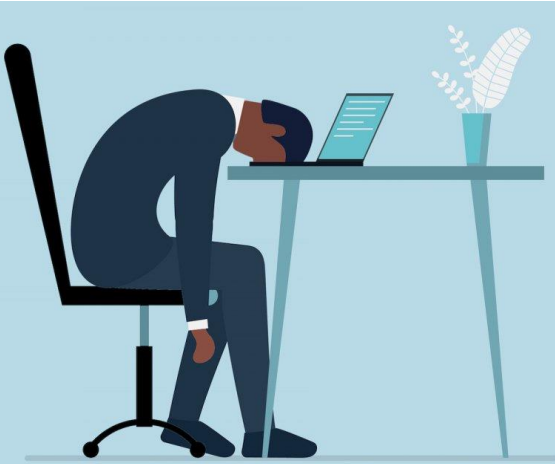
Capacidad atencional multitarea.



IX JORNADAS NACIONALES DE
MEDICINA DEL DEPORTE
CONMOCIÓN CEREBRAL Y TRAUMATISMO
CRÁNEO-ENCEFÁLICO EN EL DEPORTE



27-28 de noviembre de 2020



INTRODUCCIÓN

Fenómeno.



Complejo.



Gradual.



**Tarea-dependiente
(especificidad).**

**Etiología
multifactorial.**



CNS.



-Reclutamiento
motoneuronas.
-Inhibición cortical.

Ejecutiva.



PNS.



-Capacidad
contráctil.
-Potencial Acción.

Motora.



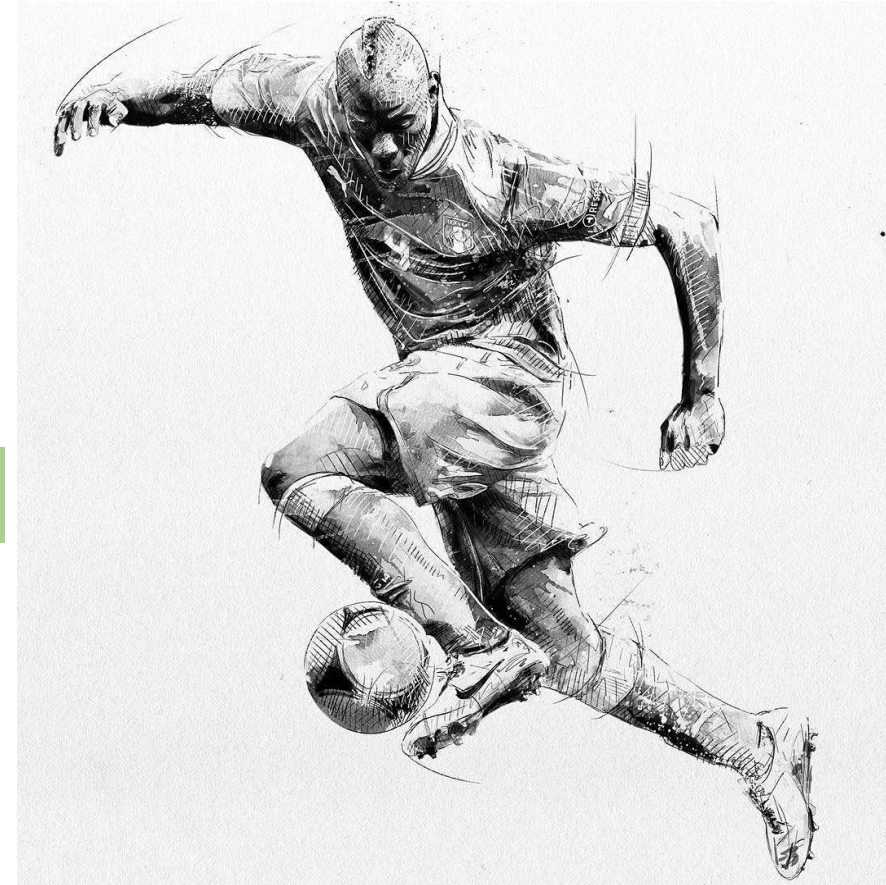
SMM.

Tipo tarea.

Etiología diferente

Mecanismos no completamente dilucidados.

FATIGA: CONCEPTO



Abd-Elfattah HM, Abdelazeim FH, Elshennawy S. Physical and cognitive consequences of fatigue: A review. J Adv Res. 2015;6(3):351-8.



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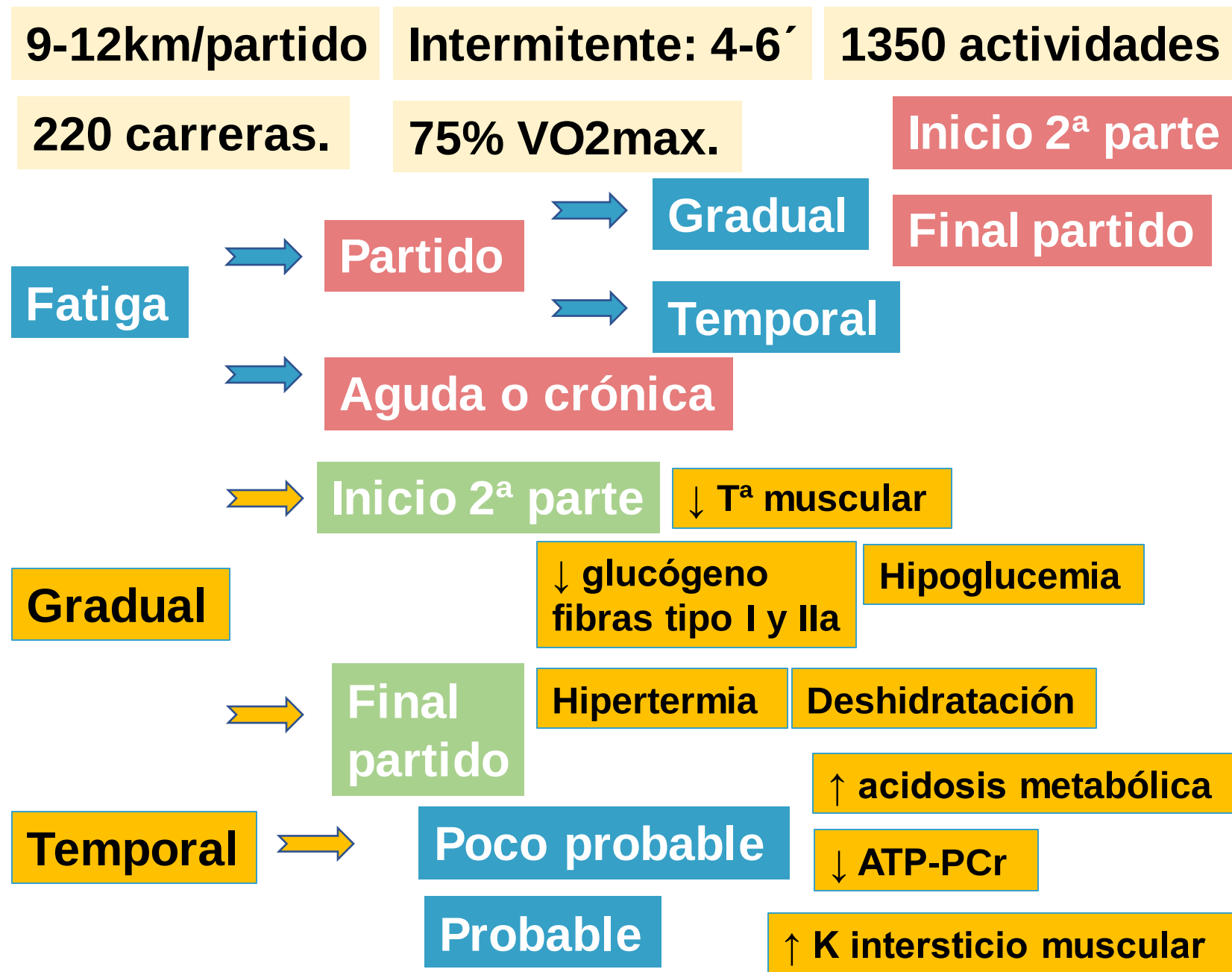
27-28 de noviembre de 2020



Mohr M, Krstrup P, Bangsbo J. Fatigue in soccer: a brief review. J Sports Sci. 2005;23(6):593-9.



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INTRODUCCIÓN

PERFIL HORMONAL: TESTOSTERONA

TESTOSTERONA TOTAL (TT):



No biológicamente activa.

TESTOSTERONA
LIBRE (FT) (2%)



TESTOSTERONA-
Albúmina (50%)



TESTOSTERONA-
SHBG (44%)



TESTOSTERONA-
otras proteínas (2%)

Testosterone

$C_{19}H_{28}O_2$



TESTOSTERONA BIODISPONIBLE (BioT):



Biológicamente activa.

TESTOSTERONA LIBRE (FT)



TESTOSTERONA-albúmina

INTRODUCCIÓN

PERFIL HORMONAL: TESTOSTERONA

MÉTODOS ANALÍTICOS FT:

Diálisis en equilibrio (ED)

Índice Andrógenos Libre (FAI)

Ultrafiltración Centrífuga (CU)

Radioinmunoensayo (RIA)

GOLD STANDARD FT:

Diálisis en equilibrio (ED).

Ultrafiltración Centrífuga (ED).

Caro

Tiempo

Personal cualificado

Diver MJ; Clinical Science Reviews Committee of the Association for Clinical Biochemistry. Analytical and physiological factors affecting the interpretation of serum testosterone concentration in men. Ann Clin Biochem. 2006;43(Pt 1):3-12.

ECUACIONES PREDICCIÓN CFT:

Sodergard et al. (1982)

Vermeulen et al. (1999)

Emadi-Konjin et al. (2003)

Morris et al. (2004)

Ly et al. (2005)

Vermeulen et al. (1999)

bioT (mol/L) $\{ (k_{at} \times [albumin] \times [FT]) / (1 + k_{at} \times [FT]) \} + [FT]$
FT (mol/L) $\{-b + \sqrt{(b^2 + 4a[TT])} / 2a, \text{ in which}$
 $a = k_{at} + k_t + (k_{at} \times k_t) ([SHBG] + [albumin] - [T])$
 $b = 1 + k_t [SHBG] + k_{at} [albumin] - (k_{at} + k_t) [T]$

de Ronde W, van der Schouw YT, Pols HA, Gooren LJ, Muller M, Grobbee DE, et al. Calculation of bioavailable and free testosterone in men: a comparison of 5 published algorithms. Clin Chem. 2006;52(9):1777-84.

Vermeulen A, Verdonck L, Kaufman JM. A critical evaluation of simple methods for the estimation of free testosterone in serum. J Clin Endocrinol Metab. 1999; 84(10):3666-72.

INTRODUCCIÓN

TESTOSTERONA



Señal anabólica

CORTISOL



Señal catabólica

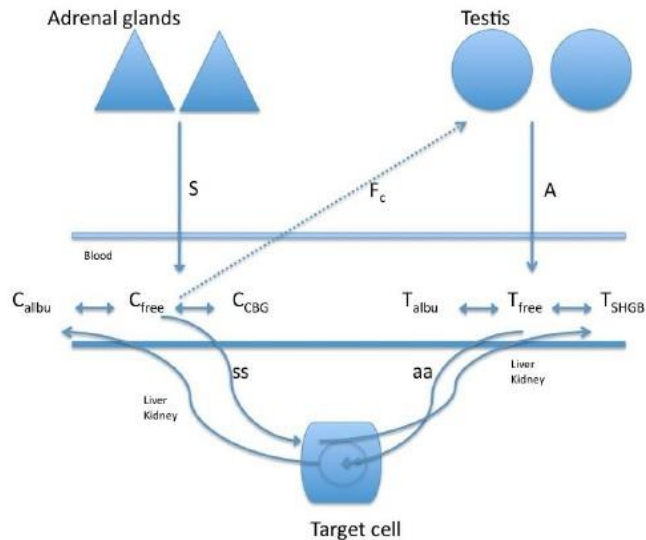


Fig. (2). Interaction between free and bound fractions of testosterone and cortisol (based on Molina [38], 2010 and Cumming [34], 1986). S: cortisol production rate. C_{free} : free cortisol (biologically active). C_{CBG} : cortisol + cortisol binding globulin. C_{albu} : cortisol + albumin. ss: output of free cortisol to cells + metabolism. A: testosterone production rate. T_{free} : free testosterone (biologically active). T_{SHBG} : testosterone + sex hormone-binding globulin. T_{albu} : testosterone + albumin. aa: output of free testosterone to cells + metabolism. F_c : cortisol's inhibitory effect.

De Luccia TPB. Use of the Testosterone/Cortisol Ratio Variable in Sports. The Open Sports Sciences Journal. 2016; 9: 104-13.

Ratio TT/ CORTISOL



Biomarcador sobreentrenamiento en el deporte.

ALBUMINA

4,6 g/dL. (3,0 - 5,0 g/dL.)

TESTOSTERONA TOTAL

3,23 ng/mL (0,00 - 10,50 ng/mL)

CORTISOL BASAL

15,70 mcg/dL

Mañana (8-9 h.)

5,0 - 25,0 mcg/dL

Tarde (18-20 h.)

2,5 - 12,5 mcg/dL.

VALORACIÓN DE SEX HORMONE BINDING GLOBULIN (SHBG)

EN SUERO POR INMUNOLUMINISCENCIA

Resultado

38,6 nmol/L

Observaciones: Valores de referencia indicativos

Niños 14,4 - 229,0 nmol/L

Hombres 13,5 - 71,4 nmol/L

Mujeres 19,8 - 155,2 nmol/L

Embarazo (3er trimestre) 200,0 - 644,0 nmol/L

Webs cálculos CFT y BioT:

<http://www.issam.ch/freetesto.htm>

<http://www.pctag.uk/testosterone-calculator/>

<https://www.omnicalculator.com/health/free-testosterone>

Hormonas/Unidades	ng/ml	nmol/l	µg/dl	g/dl
TT	3,23	11,2	0,32	
SHBG		38,6		
Albumina				4,6
CFT*	0,06	0,196 (1,75%)		
bioT**	1,42	4,91 (43,8% TT)		
Cortisol			15,7	

TT: Total Testosterone, SHBG: Sex Hormone Binding Globulin, CFT: Calculated Free Testosterone; bioT: bioavailable Testosterone.

* Vermeulen A et al: $CFT=f(TT, SHBG, albúmina)$

**Vermeulen A et al: $bioT=f(albúmina, CFT)$

Tabla. Valores hormonales basales del futbolista profesional de Primera División.

DISCUSIÓN

Table 1 Percentile distribution of TT, CFT, CBT and ST.

	1	2.5	5	10	25	50	75	90	95	97.5	99
TT (nmol/L)	8.7	9.8	10.7	11.8	15.0	18.6	22.4	27.6	28.8	33.3	35.1
FT (nmol/L)	0.1	0.22	0.24	0.28	0.34	0.38	0.50	0.59	0.66	0.79	0.84
CBT (nmol/L)	4.3	4.9	5.7	6.7	8.5	9.7	12.7	15.4	17.7	19.2	23.4
ST (nmol/L)	0.16	0.19	0.20	0.22	0.27	0.35	0.40	0.52	0.64	0.68	0.69

TT, total testosterone; CFT, calculated free testosterone; CBT, calculated bioavailable testosterone; ST, salivary testosterone. P_{2.5}, P₅₀ and P_{97.5} values are shown in bold.

1ª División liga italiana.

TABLE II.—FTCR values of soccer players observed in the two seasons. Each capital letter corresponds to an individual player.

	July 2001	November 2001	January 2002	March 2002
FTCR values observed in the 2001/2002 season				
A	1.28	0.85	0.78	0.95
B	0.71	1.16	1.09	1.28
C	0.69	0.84	0.65	0.67
D	1.19	1.73	1.26	1.17
E	1.24	0.79	0.71	0.69
F	0.89	0.62	0.55	0.61
G	1	0.97	0.87	0.89
H	0.62	0.9	0.69	0.9
I	1.03	1.24	1.57	1.52
L	4.6	1	1.11	1.22
M	0.66	0.62	0.66	0.65
N	0.89	0.79	0.75	1.26
O	2.29	0.79	1.21	0.85
P	0.95	0.81	0.79	0.71
Q	0.76	0.76	0.64	0.65
R	1.18	1.14	1.68	1.82
S	1.32	0.89	1.03	1.22
T	1.5	1	1.12	1.02
U	2.08	1.48	1.29	1.57
V	1.17	0.96	0.53	0.66
Z	1.02	1.24	1.1	1.35

July 2002-September 2002 December 2002-January 2003-March 2003

FTCR values observed in

E	1.81	0.41	0.51	0.71	0.6
F	1	0.37	0.4	0.59	0.72
I	1.09	1.05	0.68	0.85	1.03
L	1.69	1.26	2.21	1.13	0.85
X	1.53	0.78	1.16	0.81	0.64
Y	1.19	1.23	0.73	0.78	1.17
V	1.29	0.68	0.67	0.79	0.61
R	1.07	0.96	0.99	0.9	1.07
K	0.92	0.8	0.63	0.59	2.17
W	1.11	0.47	0.65	0.47	0.67
J	0.88	0.77	0.46	1.26	0.58

Banfi G, Dolci A. Free testosterone/cortisol ratio in soccer: usefulness of a categorization of values. *J Sports Med Phys Fitness*. 2006;46(4):611-6.

TT=3,23 nmol/l=323 ng/dl=0,323 µg/dl

Cortisol=15,7 µg/dl

González-Sánchez V, Moreno-Pérez O, García de Guadiana L, Sánchez-Pellicer P, Alfayate R, Mauri M, et al. Reference ranges for serum and salivary testosterone in young men of Mediterranean region. *Endocrinol Nutr*. 2015;62(1):4-10.

TT=11,2 nmol/l; CFT=0,196 nmol/l; BioT=4,91 nmol/l

1ª División liga griega.

Table 4

Hormone concentrations and their ratio value (means ± SEM).

Parameter	Pre re-building	Post re-building	Mid-season	End season
T (µg/dL)	5.90 ± 0.38	6.59 ± 0.36	6.62 ± 0.38	5.82 ± 0.34 ^{b,c}
C (µg/dL)	19.18 ± 1.22	18.16 ± 0.95	23.67 ± 0.57 ^{a,b}	19.71 ± 0.95 ^c
T/C	0.33 ± 0.03	0.37 ± 0.03 ^a	0.28 ± 0.02 ^{a,b}	0.30 ± 0.02

Abbreviations: T = testosterone; C = cortisol.

^a $p < 0.05$, compared with the values at pre re-building period.

^b $p < 0.05$, compared with the values at post re-building period.

^c $p < 0.05$, compared with the values at mid-season period.

Michailidis Y. Stress hormonal analysis in elite soccer players during a season. *J Sport & Health Sci*. 2014; 3: 279-83.

Ratio TT/cortisol=0,021

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Review
Glutamine as an Anti-Fatigue Amino Acid in Sports Nutrition

9 male soccer players.	18.4 ± 1.1 yr	3.5 g of glutamine peptide + 50 g of maltodextrin or only 50 g of maltodextrin administered 30 min before the exercise.	Improvement in the time and distance and reduced feelings of fatigue after supplementation with glutamine peptide and carbohydrate.
16 male amateur soccer players.	24 ± 3.7 yr	Supplementation before, during and immediately after exercise with: 1—multi-ingredient supplement containing 53 g of carbohydrate, 14.5 g of protein, 1.2 g of lipid, 5 g of glutamine and 1.5 g of L-carnitine-L-tartrate, 2—69.5 g of carbohydrate or 3—placebo: low kcal beverage.	Multi-ingredient supplement attenuated fatigue perception without improving performance. One hour after the intermittent test, plasma myoglobin levels were lower when administering the multi-ingredient supplement and carbohydrate compared to placebo, whereas carbohydrate supplementation elicited lower neutrophil and monocytes concentrations than multi-ingredient and placebo.

Glutamina

100 mg/kg/día

REVIEW
Effect of fenugreek extract supplement on testosterone levels in male: A meta-analysis of clinical trials

Phytotherapy Research. 2020;1–6.

TABLE 1 Characteristics of the studies included

Author (year)	Country	Subject	Mean age (year)	Number of participants (intervention/ control)	Fenugreek type and dose (Intervention)	Placebo type and dose (Control)	Duration (weeks)
Guo (2018)	Albany	Healthy male athletes	24.02	12/12	Furosap capsules 250 mg/day	NR 250 mg/day	12
Rao (2016)	Australia	Healthy male	55.6	47/50	Fenugreek seed extract 600 mg/day	NR	12
Wankhede et al. (2016)	India	Healthy male	22.04	29/26	glycoside fraction of fenugreek seeds 2*300 mg/day	di-calcium phosphate	8
Wilborn (2010)	USA	Resistance-trained men	21	17/13	Fenugreek capsule 500 mg/day	Maltodextrin 500 mg/day	8

Fenogreco

500 mg/día

Effect of coenzyme Q10 supplementation on fatigue: A systematic review of interventional studies Complementary Therapies in Medicine 43 (2019) 181–187



Japan	8M/9F	37.5 ± 9.9	2 × 8 d	RCT-Cross over	Healthy subjects	–	VAS	100 & 300	0.01	Fatigue reduced significantly with 300 mg/d of Q10
Iran	16M	21.87 ± 1.58	1 m	RCT	Healthy subjects	FFQ, 24-h recall, food record	FI	300	> 0.05	NS
Korea	51 (M & F)	42.6 ± 11.25	3 m	RCT	Healthy subjects	–	FSS	200	0.28	NS
Turkey	15 M	19.9 ± 0.9	2 × 2 m	RCT-Cross over	Healthy subjects	–	FI	100	> 0.05	NS

Ubiquinol

250 mg/día

THE JOURNAL OF ALTERNATIVE AND COMPLEMENTARY MEDICINE
Volume 20, Number 12, 2014, pp. 901–908

An Alternative Treatment for Anxiety: A Systematic Review of Human Trial Results Reported for the Ayurvedic Herb Ashwagandha (*Withania somnifera*)

130 (35 female, 95 male)	60 d	Standardized WS root and leaf extract (WSE); 125-mg and 250-mg coded hard-gelatin capsules	125 mg/d, 250 mg/d, 500 mg/d	Standardized to minimum of 8% withanolide glycosides and 32% oligosaccharides, maximum withaferin A	Sensoril® (Natree, Inc.) Essentra (NutraGenesis, LLC)	Product derived from withaferin A and corresponding withanolide glycoside-predominant, genetically uniform chemotype, cultivated in central and northern provinces of India	Placebo twice per day	Significant dose-dependent decrease in mean sum mHAM-A score ($p < 0.001$)
81 (51 female, 30 male)	12 wk (84 d)	Herb WS prepared from the root (Swiss ashwagandha); 300-mg supplements	600 mg/d with counseling	Standardized to 1.5% withanolides	Not given	WS root and leaf material processed using water-based extraction protocol and assessed using high-performance thin-layer chromatography analysis	PT: CBT+ placebo	Final BAI scores decreased by 56.5% in NC group and 30.5% in PT group ($p < 0.001$)
64 (23 female, 41 male)	60 d	High-concentration full-spectrum WS root extract capsules; 300-mg capsules	600 mg/d after food and with water	Standardized to at least 5% withanolide content	KSM-66 WS extract (Ixoreal Biomed)	Extract from Hyderabad, India. Extract drawn only from roots of WS plant, no other parts. Produced by unique extraction process, based on principles of "green chemistry," without using alcohol or any synthetic solvents	Placebo twice per day	Greater improvement in BAI for NC versus PT ($p = 0.003$) Greater decrease in PSS (44.0% versus 5.5%; $p < 0.0001$), GHQ-28 and DASS ($p < 0.0001$), and cortisol (27.9% versus 7.9%; $p = 0.002$) for WS versus placebo

Ashwagandha

500 mg/día



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CONCLUSIONES

Cognitiva

Física

- No existe una definición operacional de fatiga.

Propiocepción

- Nutrición de precisión



Descripción detallada del fenotipo.

- Bioquímica sanguínea



Cribado fatiga futbolista.

Albúmina

TT

SHBG

Cortisol



CFT

BioT

- Estudios con un diseño metodológico robusto que monitoricen los valores de CFT y BioT a lo largo temporada en relación a la fatiga.

Glutamina

100 mg/kg/día

Fenogreco

500 mg/día

Ubiquinol

250 mg/día

Ashwagandha

500 mg/día

21 días

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