

A man is swimming in clear, turquoise water. He is wearing dark sunglasses and has a life preserver around his waist. The life preserver is yellow and red. He is looking towards the camera with a slight smile. His right arm is extended forward, and his left arm is also extended. The water is splashing around him, and the overall scene is bright and sunny.

A man in a white tank top and red shorts is rowing a red boat on blue water, viewed from behind. The image has a decorative, jagged white border.



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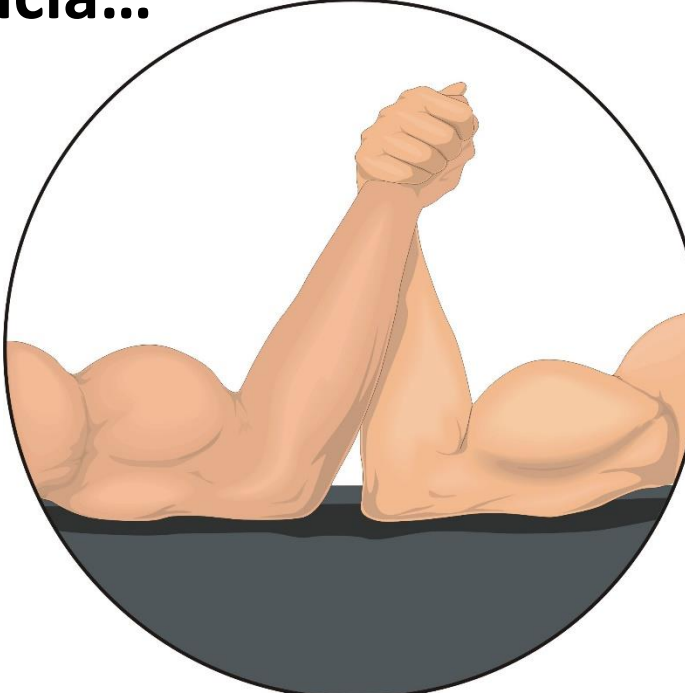
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- ☐ El concepto de mito
- ☐ El problema del fraude en la salud
- ☐ Evidencias de las investigaciones científicas



icla...

A circular illustration of a muscular arm flexing, showing the bicep and forearm muscles. The arm is rendered in a realistic style with shading to emphasize muscle definition. The hand is clenched into a fist, and the forearm is bent at the elbow. The background is a solid dark grey, and the entire scene is enclosed within a thin black circular border.

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➤ **“alfabetización informacional”:**

- NOTA.** De: "Información fraudulenta sobre salud en internet", por: B. Castelló-Zamora, 2010, *El Profesional de la Información*, 19(3), 292-295. Recuperado de la base de datos de EBSCOhost (Academic Search Premier).



➤ **Fundamentos científicos:**

- ⇒ **Método científico:**

- ◇ ***¿Cuál es la pregunta?, o identificar el problema***
- ◇ ***Consultar literatura para contestar la pregunta***
- ◇ ***Si no se puede contestar, desarrollar una hipótesis***
- ◇ ***Comprobar la hipótesis mediante un experimento***
- ◇ ***Analizar los datos y derivar conclusiones***
- ◇ ***Comunicar los resultados:***

NOTA. Adaptado de: *Exercise Physiology Integrating Theory and Application*. (pp. 5-6), por W. J. Kraemer, S. J. Fleck, y M. R. Deschenes, 2012, Philadelphia: Lippincott Williams & Wilkins. Copyright 2012 por: Lippincott Williams & Wilkins, a Wolte Kluwer business.



- **Intuición**
- **Tradición**
- **Ensayo y error (*trial and error*)**
- **Predisposición (*bias*)**
- **Autoridad**
- **Racionalización (razonamiento)**
- **Método empírico**
- **El mito**

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➤ **Posibles raíces:**

- **Solución:**

- NOTA.** Adaptado de: *Exercise Physiology Integrating Theory and Application*. (p. 9), por W. J. Kraemer, S. J. Fleck, y M. R. Deschenes, 2012, Philadelphia: Lippincott Williams & Wilkins. Copyright 2012 por: Lippincott Williams & Wilkins, a Wolte Kluwer business.



MITOS DEL EJERCICIO:

Identificar Sitios-Web

Basados en Evidencia Científica

- ❑ Estrategias/Recomendaciones:
 - Determinar si es legítimo y si contenido provee:
"Sobre Nosotros" (About Us), o secciones similares
 - Establecer si es precisa:
 - ¿Las recomendaciones siguen las guías de ACSM?
 - ¿Recomienda consultar un médico antes del programa?
 - Observar si existe información sobre:
los beneficios de actividad física?

NOTA. Adaptado de: *Resource Manual for Guidelines for Exercise Testing and Prescription*. 9na. ed.; (p. 779), por American College of Sports Medicine, 2014, Philadelphia: Lippincott Williams & Wilkins. Copyright 2014 por: American College of Sports Medicine



MITOS DEL EJERCICIO:

Identificar Sitios-Web

Basados en Evidencia Científica

❑ Estrategias/Recomendaciones:

➤ Cotejar la presencia de los siguientes criterios:

- Seguimiento de actividad física
- Gráficas de actividad física
- Establecimiento de metas
- Programa de ejercicio individualizado



NOTA. Adaptado de: *Resource Manual for Guidelines for Exercise Testing and Prescription*. 9na. ed.; (p. 779), por American College of Sports Medicine, 2014, Philadelphia: Lippincott Williams & Wilkins. Copyright 2014 por: American College of Sports Medicine



➤ **Cotejar la presencia de los siguientes criterios:**

- NOTA.** Adaptado de: *Resource Manual for Guidelines for Exercise Testing and Prescription*. 9na. ed.; (p. 779), por American College of Sports Medicine, 2014, Philadelphia: Lippincott Williams & Wilkins. Copyright 2014 por: American College of Sports Medicine



- ☐ Metodología del entrenamiento deportivo
- ☐ Procesos de calentamiento y enfriamiento
- ☐ Hora del día para entrenar
- ☐ Leyendas que comprometen la salud



➤ **Efectuar 15 minutos de ejercicios aeróbicos, 3 veces a la semana es suficiente para mejorar el componente cardiorrespiratorio**

- **Guías de y ejercicio y actividad física:**
 - **Fundamentadas en evidencias científicas:**
 - ⇒ **Delineamientos:**
 - ◇ **ACSM: 2017**
 - ◇ **USDDHHS: 2008**
 - ◇ **OMS: 2010**

PRESCRIPCIÓN DE EJERCICIO:
GUÍAS DE ACSM (2014)

Tabla 12: La Dosis del Ejercicio para el Desarrollo de la Aptitud Cardiorrespiratoria en Adultos aparentemente Saludables

COMPONENTE	GUÍA O DOSIS
Modo : (Tipo de Ejercicio)	► Descripción: ● Para la mayoría de los adultos: ◆ Como mínimo - <i>Intensidad Moderada</i>: Ejercicios Aeróbicos Rítmicos Ejercicios utilizando grandes grupos musculares que se mantengan continuamente (por un periodo prolongado) y rítmicamente, y que sean de naturaleza aeróbica. ● Grupos musculares grandes ● Que requiera poca o ninguna destreza motriz ● Individuos que posean adecuadas destrezas motrices y de aptitud física: ◆ Recomendación: Práctica de otros tipos de ejercicios y deportes que requieran: ● Altos niveles de capacidades motoras ● Óptimos niveles de aptitud física

NOTA. Adaptado de: *Guidelines for Exercise Testing and Prescription*. 9na. ed.; (pp. 162, 166-180), por American College of Sports Medicine, 2014, Philadelphia: Lippincott Williams & Wilkins. Copyright 2014 por: American College of Sports Medicine; *Resource Manual for Guidelines for Exercise Testing and Prescription*. 7ma. ed.; (pp. 466-479), por American College of Sports Medicine, 2014, Philadelphia: Lippincott Williams & Wilkins. Copyright 2014 por: American College of Sports Medicine.



PRESCRIPCIÓN DE EJERCICIO: *GUÍAS DE ACSM (2014)*

Tabla 12: La Dosis del Ejercicio para el Desarrollo de la Aptitud Cardiorrespiratoria en Adultos aparentemente Saludables

COMPONENTE	GUÍA O DOSIS
Modo : ➤ <i>Ejemplos:</i> (Tipo de Ejercicio)	● Grupo A: ◆ Descripción: Actividades de Tolerancia Aeróbicas/Cardiorrespiratorias Solo requieren mínimas capacidades motoras/aptitud física ◆ Población indicada: Adultos en general ◆ Ejemplos: Caminar, ciclismo recreativo, ejercicios aeróbicos acuáticos, baile de baja intensidad ● Grupo B: ◆ Descripción: Actividades de Tolerancia Aeróbicas/Cardiorrespiratorias ● Intensidad vigorosa ● Solo requieren mínimas capacidades motoras/aptitud física ◆ Población indicada: Adultos ● Físicamente activos ● Capacidad promedio de la aptitud física ◆ Ejemplos: Trotar, correr, remo, ejercicios aeróbicos de <i>spinning</i>, ejercicios con máquinas elípticas, ejercicios aeróbicos de escalón, baile rápido

NOTA. Adaptado de: *Guidelines for Exercise Testing and Prescription*. 9na. ed.; (pp. 162, 166-180), por American College of Sports Medicine, 2014, Philadelphia: Lippincott Williams & Wilkins. Copyright 2014 por: American College of Sports Medicine; **Resource Manual for Guidelines for Exercise Testing and Prescription**. 7ma. ed.; (pp. 466-479), por American College of Sports Medicine, 2014, Philadelphia: Lippincott Williams & Wilkins. Copyright 2014 por: American College of Sports Medicine.

Respiratorio en Adultos aparentemente Saludables

O DOSIS

Actividad Aeróbicas/Cardiorrespiratorias

adecuadas

medio

Entrenamiento

Ejercicio regular

Campana (fútbol), esquí de cuesta abajo,

(pp. 162, 166-180), por American College of Sports
American College of Sports Medicine; **Resource**
5-479), por American College of Sports Medicine,
College of Sports Medicine.



PRESCRIPCIÓN DE EJERCICIO: *GUÍAS DE ACSM (2014)*

Tabla 12: La Dosis del Ejercicio para el Desarrollo de la Aptitud Cardiorrespiratoria en Adultos aparentemente Saludables

COMPONENTE	GUÍA O DOSIS
Intensidad : (%, absoluto)	► Descripción: ● Para la mayoría de los adultos - <i>Moderada a Vigorosa</i>: ◆ Moderada: ● Por ciento de la frecuencia cardiaca máxima de reserva (%FC_{máx-resv}): 40 - 59% ● Por ciento del consumo de oxígeno de reserva (%VO_{2R}): 40 - 59% ● Por ciento de la frecuencia cardiaca máxima (%FC_{máx}): 64 - 76% ● Por ciento del consumo de oxígeno máximo (%VO_{2máx}): 46 - 63% ● Escala de la percepción del esfuerzo (RPE), o Borg Scale: 12 - 13 ● Equivalencia metabólica (MET): 3 - 5.9 ◆ Vigorosa: ● Por ciento de la frecuencia cardiaca máxima de reserva (%FC_{máx-resv}): 60 - 89% ● Por ciento del consumo de oxígeno de reserva (%VO_{2R}): 60 - 89% ● Por ciento de la frecuencia cardiaca máxima (%FC_{máx}): 77 - 95% ● Por ciento del consumo de oxígeno máximo (%VO_{2máx}): 64 - 90% ● Escala de la percepción del esfuerzo (RPE), o Borg Scale: 14 - 17 ● Equivalencia metabólica (MET): 6 - 8.7

NOTA. Adaptado de: *Guidelines for Exercise Testing and Prescription*. 9na. ed.; (pp. 162, 166-180), por American College of Sports Medicine, 2014, Philadelphia: Lippincott Williams & Wilkins. Copyright 2014 por: American College of Sports Medicine; *Resource Manual for Guidelines for Exercise Testing and Prescription*. 7ma. ed.; (pp. 466-479), por American College of Sports Medicine, 2014, Philadelphia: Lippincott Williams & Wilkins. Copyright 2014 por: American College of Sports Medicine.

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Historia en Adultos aparentemente Saludables

O DOSIS

Capacidad física - Liviana a Moderada:

- Capacidad máxima de reserva (%FC_{máx-resv}): 30 - 40%
- Capacidad de reserva (%VO_{2R}): 30 - 40%
- Capacidad máxima (%FC_{máx}): 57 - 64%
- Capacidad máxima (%VO_{2máx}): 37 - 45%
- Esfuerzo (RPE), o Borg Scale: 9 - 11
- Índice de esfuerzo: 2 - 2.9

Capacidad física de edad avanzada - Muy Liviana a Liviana:

- Capacidad máxima de reserva (%FC_{máx-resv}): ≤ 30%
- Capacidad de reserva (%VO_{2R}): ≤ 30%
- Capacidad máxima (%FC_{máx}): ≤ 57%
- Capacidad máxima (%VO_{2máx}): ≤ 37%
- Esfuerzo (RPE), o Borg Scale: ≤ 9
- Índice de esfuerzo: ≤ 2

162, 166-180), por American College of Sports
American College of Sports Medicine; **Resource Manual for**
American College of Sports Medicine, 2014, Philadelphia:
ne.



PRESCRIPCIÓN DE EJERCICIO: *GUÍAS DE ACSM (2014)*

Tabla 12: La Dosis del Ejercicio para el Desarrollo de la Aptitud Cardiorrespiratoria en Adultos aparentemente Saludables

COMPONENTE	GUÍA O DOSIS
Intensidad : (%, absoluto)	► Recomendaciones: ● Entrenamiento en intervalos: ◆ Propósitos - <i>Durante las sesiones de ejercicio, aumentar:</i> ● Volumen total ● Intensidad promedio del ejercicio

NOTA. Adaptado de: *Guidelines for Exercise Testing and Prescription*. 9na. ed.; (pp. 162, 166-180), por American College of Sports Medicine, 2014, Philadelphia: Lippincott Williams & Wilkins. Copyright 2014 por: American College of Sports Medicine; *Resource Manual for Guidelines for Exercise Testing and Prescription*. 7ma. ed.; (pp. 466-479), por American College of Sports Medicine, 2014, Philadelphia: Lippincott Williams & Wilkins. Copyright 2014 por: American College of Sports Medicine.

PRESCRIPCIÓN DE EJERCICIO: ***GUÍAS DE ACSM (2014)***

Tabla 12: La Dosis del Ejercicio para el Desarrollo de la Aptitud Cardiorrespiratoria en Adultos aparentemente Saludables

COMPONENTE	GUÍA O DOSIS
Duración : (minutos)	► Descripción: ● Para la mayoría de los adultos: ◆ Ejercicios aeróbicos continuos o discontinuos - <i>INTENSIDAD MODERADA</i>: ● Acumulación diaria: 30 - 60 minutos por día ● Acumulación semanal: ≥ 150 minutos por semana ◆ Ejercicios aeróbicos continuos o discontinuos - <i>INTENSIDAD VIGOROSA</i>: ● Acumulación diaria: 20 - 60 minutos por día ● Acumulación semanal: ≥ 75 minutos por semana ◆ Combinación - <i>INTENSIDAD MODERADA A VIGOROSA</i>: ● Acumulación diaria - <i>META</i>: Alcanzar los volúmenes prescritos para el ejercicio físico

NOTA. Adaptado de: *Guidelines for Exercise Testing and Prescription*. 9na. ed.; (pp. 162, 166-180), por American College of Sports Medicine, 2014, Philadelphia: Lippincott Williams & Wilkins. Copyright 2014 por: American College of Sports Medicine; **Resource Manual for Guidelines for Exercise Testing and Prescription**. 7ma. ed.; (pp. 466-479), por American College of Sports Medicine, 2014, Philadelphia: Lippincott Williams & Wilkins. Copyright 2014 por: American College of Sports Medicine.



PRESCRIPCIÓN DE EJERCICIO: *GUÍAS DE ACSM (2014)*

Tabla 12: La Dosis del Ejercicio para el Desarrollo de la Aptitud Cardiorrespiratoria en Adultos aparentemente Saludables

COMPONENTE	GUÍA O DOSIS
Duración : (minutos)	► Recomendaciones: ● Estrategias para acumular el tiempo del ejercicio: ◆ Una sola sesión de ejercicio continuo ◆ Entrenamiento en intervalo: <i>Cúmulo de sesiones cortas de ejercicios</i> ● PERIODOS o SESIONES de tiempo que definen a cada INTÉRVALO: ≥ 10 minutos a lo largo del día ● Duración del ejercicio - <i>Menor a lo recomendado:</i> ◆ Indicaciones - <i>Ciertas poblaciones:</i> ● Ejemplo: Participantes con claudicación intermitente

NOTA. Adaptado de: *Guidelines for Exercise Testing and Prescription*. 9na. ed.; (pp. 162, 166-180), por American College of Sports Medicine, 2014, Philadelphia: Lippincott Williams & Wilkins. Copyright 2014 por: American College of Sports Medicine; *Resource Manual for Guidelines for Exercise Testing and Prescription*. 7ma. ed.; (pp. 466-479), por American College of Sports Medicine, 2014, Philadelphia: Lippincott Williams & Wilkins. Copyright 2014 por: American College of Sports Medicine.

PRESCRIPCIÓN DE EJERCICIO: ***GUÍAS DE ACSM (2014)***

Tabla 12: La Dosis del Ejercicio para el Desarrollo de la Aptitud Cardiorrespiratoria en Adultos aparentemente Saludables

COMPONENTE	GUÍA O DOSIS
Frecuencia : (veces por semana)	► Descripción: ● Para la mayoría de los adultos: ◆ Intensidad MODERADA: 5 días por semana ◆ Intensidad VIGOROSA: 3 días por semana ◆ Intensidad MODERADA y VIGOROSA: ● Combinación semanal: 3 - 5 días por semana ► Excepciones: ● Para el caso de muy pocos individuos: "Guerreros de fin de Semana" ◆ 1 - 2 veces por semana: Esto no es recomendado para la mayoría de la población general adulta

NOTA. Adaptado de: *Guidelines for Exercise Testing and Prescription*. 9na. ed.; (pp. 162, 166-180), por American College of Sports Medicine, 2014, Philadelphia: Lippincott Williams & Wilkins. Copyright 2014 por: American College of Sports Medicine; *Resource Manual for Guidelines for Exercise Testing and Prescription*. 7ma. ed.; (pp. 466-479), por American College of Sports Medicine, 2014, Philadelphia: Lippincott Williams & Wilkins. Copyright 2014 por: American College of Sports Medicine.

PRESCRIPCIÓN DE EJERCICIO: ***GUÍAS DE ACSM (2014)***

Tabla 12: La Dosis del Ejercicio para el Desarrollo de la Aptitud Cardiorrespiratoria en Adultos aparentemente Saludables

COMPONENTE	GUÍA O DOSIS
Volumen : (Trabajo Total Semanal)	► Descripción: ● Para la mayoría de los adultos ◆ Producto de la Frecuencia, Intensidad y Duración: ● META: $\geq 500 - 1,000$ METs por minuto por semana ($\text{METs} \cdot \text{min} \cdot \text{sem}^{-1}$) ● ACTIVIDAD FÍSICA de intensidad Moderada: $1,000$ kcal por semana ($\text{kcal} \cdot \text{sem}^{-1}$) ● EJERCICIO de intensidad Moderada: ~ 150 minutos por semana ($\text{min} \cdot \text{sem}^{-1}$) ● Conteo de pedómetros: $\geq 5,400 - 7,900$ pasos por día ($\text{pasos} \cdot \text{d}^{-1}$) Combinar con recomendaciones actuales concerniente a la duración del ejercicio ● Para los aquellos adultos con una pobre aptitud física: ◆ Recomendación: MENOR volumen que el regular ● Población obesa - <i>Control de peso:</i> ◆ Recomendación: MAYOR volumen que el regular

NOTA. Adaptado de: *Guidelines for Exercise Testing and Prescription*. 9na. ed.; (pp. 162, 166-180), por American College of Sports Medicine, 2014, Philadelphia: Lippincott Williams & Wilkins. Copyright 2014 por: American College of Sports Medicine; **Resource Manual for Guidelines for Exercise Testing and Prescription**. 7ma. ed.; (pp. 466-479), por American College of Sports Medicine, 2014, Philadelphia: Lippincott Williams & Wilkins. Copyright 2014 por: American College of Sports Medicine.

PRESCRIPCIÓN DE EJERCICIO: ***GUÍAS DE ACSM (2014)***

Tabla 12: La Dosis del Ejercicio para el Desarrollo de la Aptitud Cardiorrespiratoria en Adultos aparentemente Saludables

COMPONENTE	GUÍA O DOSIS
Progresión : (Ajuste de Variables)	► Descripción - Como resultado del efecto de acondicionamiento físico (primeras 6-8 semanas): ● Ajuste gradual para el volumen del ejercicio (trabajo total) por sesión: ◆ Aumentar en intensidad, duración, frecuencia o combinación de las tres: ● HASTA: donde sea tolerable por el individuo ● HASTA: que se cumpla con la meta - Mantenimiento ► Ventajas: ● Promueve la adherencia, o apego, al programa de ejercicio ● Disminuye los riesgos para: ◆ Lesiones musculoesqueletales ◆ Emergencias médicas de tipo cardiaco

NOTA. Adaptado de: *Guidelines for Exercise Testing and Prescription*. 9na. ed.; (pp. 162, 166-180), por American College of Sports Medicine, 2014, Philadelphia: Lippincott Williams & Wilkins. Copyright 2014 por: American College of Sports Medicine; *Resource Manual for Guidelines for Exercise Testing and Prescription*. 7ma. ed.; (pp. 466-479), por American College of Sports Medicine, 2014, Philadelphia: Lippincott Williams & Wilkins. Copyright 2014 por: American College of Sports Medicine.



RECOMENDACIONES ACTUALES DE: *ACTIVIDAD FÍSICA PARA ADULTOS*



ACTIVIDAD FÍSICA



Guías para ADULTOS:

RECOMENDACIONES



2008

**PHYSICAL ACTIVITY GUIDELINES FOR AMERICANS
(USDHHS, 2008)**



Principios:

DOSIS



Cuantificación de las variables:



INTENSIDAD

- ▶ **Moderada (3-5.9 METs):**
≥ 150 min/semana
- ▶ **Vigosa (≥ 6 METs):**
≥ 75 min/semana
- ▶ **Combinación:**
Moderada y Vigosa



DURACIÓN

(Tiempo: Acumulativo)
(Sesiones: 10 min/Intervalo)

- ▶ *≥ 150 min/semana*
(Intensidad Moderada)
- ▶ *≥ 75 min/semana*
(Intensidad Vigosa)
- ▶ **Beneficios Mayores:**
 - ◉ *≥ 300 min/semana*
(Intensidad Moderada)
 - ◉ *≥ 150 min/semana*
(Intensidad Vigosa)

FRECUENCIA

- ▶ **Dispersado a lo largo**
de la semana
- ▶ **Fortaleza Muscular:**
≥ 2 días/semana



MODO

- ▶ **Actividades Físicas Diarias:**
Aeróbicas
- ▶ **Actividades para Desarrollo:**
Fortaleza Muscular





➤ **La mejor hora para efectuar los ejercicios es en la mañana**

➤ **Los beneficios de ejercicio se obtiene a cualquier hora del día que se entrena:**

- ⇒ **Ritmos circadianos:**



Review article

Circadian rhythms in exercise performance: Implications for hormonal and muscular adaptation

Weipeng Teo ¹✉, Michael J. Newton ¹ and Michael R. McGuigan ^{2,3}

¹ School of Exercise, Biomedical and Health Sciences, Edith Cowan University, Joondalup, Western Australia, ² New Zealand Academy of Sport North Island, Auckland, New Zealand, ³ Sport Performance Research Institute New Zealand, Auckland University of Technology, Auckland, New Zealand

Abstract

Almost all physiological and biochemical processes within the human body follow a circadian rhythm (CR). In humans, the suprachiasmatic nucleus regulates sleep-wake cycle and other daily biorhythms in line with solar time. Due to such daily physiological fluctuations, several investigations on neuromuscular performance have reported a distinct CR during exercise. Generally, peak performances have been found to occur in the early evening, at approximately the peak of core body temperature. The increase in core body temperature has been found to increase energy metabolism, improve muscle compliance and facilitate actin-myosin crossbridging. In addition, steroidal hormones such as testosterone (T) and cortisol (C) also display a clear CR. The role of T within the body is to maintain anabolism through the process of protein synthesis. By contrast, C plays a catabolic function and is involved in the response of stress. Due to the anabolic and catabolic nature of both T and C, it has been postulated that a causal relationship may exist between the CR of T and C and muscular performance. This review will therefore discuss the effects of CR on physical performance and its implications for training. Furthermore, this review will examine the impact of muscular performance on CR in hormonal responses and whether could variations in T and C be potentially beneficial for muscular adaptation.

Key words: Diurnal variation, steroidal hormones, neuromuscular adaptation.

tions of biological processes govern many of our habits and actions, and also influence the activities that we perform during the day. Many physiological functions associated with athletic performance have also been shown to follow a specific CR (Winget et al., 1985). Functions such as resting levels of sensorimotor, perceptual, and cognitive performance and several neuromuscular, behavioural, cardiovascular, and metabolic variables have been found to occur in the early evening, in line with peak body temperature rhythm (Cappaert, 1999).

Apart from diurnal variations in physiological systems, the preferential for daytime or nighttime activities is another important psychological factor that must be considered when studying CR in exercise performance. Such a concept has long been recognized with Kleitman (1949) documenting that some people have the consistent preference for daytime activities whilst others have the preference for nighttime activities. The contrasting time preference between individuals (commonly known as 'chronotypes') have been shown to differ in various physiological rhythms such as sleep-wake patterns, biorhythms (ie. core temperature and hormones), sleep inertia, food intake rhythms and maximal oxygen consumption during exercise (Baehr et al., 2000; Hill et al., 1988; Kerkhof, 1985). Due to the wide spectrum of morning-evening preferential, it is believed that this trait reflects the underlying



➤ **Es más importante desarrollar la tolerancia cardiorrespiratoria, o aeróbica, que la aptitud muscular**

➤ **El entrenamiento muscular ayuda al aeróbico:**

- **Fundamentadas en evidencias científicas:**
 - ⇒ **Asisten en la salud ósea - *Prevención de osteoporosis*:**
 - ⇒ **Incorporadas en las guías de actividad física y ejercicio:**
 - ◇ **USDDHHS: 2008** ◇ **AHA: 2007**
 - ◇ **ACSM: 2017**

RECOMENDACIONES ACTUALES DE: *ACTIVIDAD FÍSICA PARA ADULTOS*

Tabla 4: (continuación) Variables Fundamentales Involucradas en el Enfoque de la Actividad Física (Aeróbicas) y Desarrollo de la Aptitud Muscular para Adultos Saludables

COMPONENTE	RECOMENDACIÓN
Frecuencia : (minutos)	▶ Actividades físicas de naturaleza aeróbicas: ● Incorporación diaria de actividades físicas de tipo aeróbicas: ◆ Dispersadas a lo largo de la semana ▶ Actividades físicas dirigidas a desarrollar la fortaleza muscular: ● ≥ 2 días por semana ● Intensidad de estos tipos de actividades: Moderada o alta ● Músculos esqueléticos entrenados: Grupos musculares principales ● Series (sets): 1 - 3 ● Repeticiones: 8 - 12
Modo : (Tipo de Actividad Física)	▶ Actividades Físicas diarias: Aeróbicas ▶ Actividades para el desarrollo de la fortaleza muscular:

NOTA. Adaptado de: "2008 Physical Activity Guidelines for Americans", por: U. S. Department of Health and Human Services, 2008. Recuperado de <http://www.health.gov/paguidelines/pdf/paguide.pdf>

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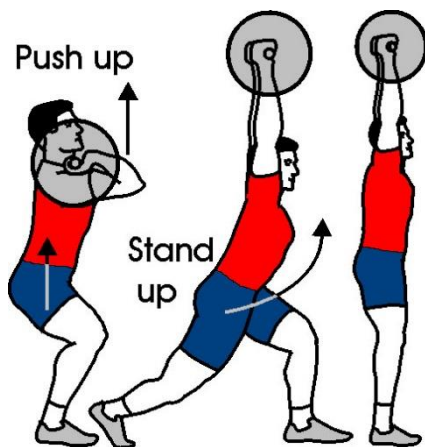
Population	Resistance Training		Flexibility Training	
	Sets; Reps	Stations/Devices*	Frequency	Goal
Healthy/sedentary adults				
2007 AHA Scientific Statement	1 set; 8–12 reps for persons <50–60 y of age; 10–15 reps at reduced levels of resistance for persons 50–60 y of age	8–10 exercises	2–3 d/wk	Stretching the major muscle or tendon groups, 2–3 d/wk
2006 ACSM Guidelines ¹¹⁰	1 set; 8–12 reps (range, 3–20 reps) performed at a moderate rep duration ($\approx$ 3 s concentric, $\approx$ 3 s eccentric)	8–10 exercises	2–3 nonconsecutive d/wk	Static stretching, major muscle tendon units a minimum of 2–3 d/wk; stretch to the ROM at a point of tightness, 15–30 s/stretch, 2–4 reps/stretch
Elderly persons				
2001 American Geriatrics Society ¹²¹	Low: 40% 1-RM; 10–15 reps Moderate: 40%–60% 1-RM; 8–10 reps High: >60% 1-RM; 6–8 reps	Not specified	2–3 d/wk	3–5 stretches/key muscle group; hold for 20–30 s; 3–5 d/wk
Cardiac patients				
2007 AHA Scientific Statement	1 set; 10–15 reps	8–10 exercises	2–3 d/wk	Stretching the major muscle or tendon groups, 2–3 d/wk
2004 AACVPR guidelines ¹¹¹	1 set; 12–15 reps	6–8 exercises	2–3 d/wk	
2006 ACSM guidelines ¹¹⁰	1 set; 10–15 reps	8–10 exercises	2–3 d/wk	

*Minimum 1 exercise per major muscle group, for example, chest press, shoulder press, triceps extension, biceps curl, pull-down (upper back), lower-back extension, abdominal crunch/curl-up, quadriceps extension or leg press, leg curls (hamstrings), and calf raise.

NOTA. Reproducido de: "Resistance exercise in individuals with and without cardiovascular disease: 2007 update: a scientific statement from the American Heart Association Council on Clinical Cardiology and Council on Nutrition, Physical Activity, and Metabolism. *Circulation*," por M. A. Williams, W. L. Haskell, P. A. Ades, E. A. Amsterdam, V. Bittner, B. A. Franklin, M. Gulianick, S. T. Laing, y K. J. Stewart, 2007, *Circulation*, **116**(5), p. 578. doi:10.1139/H10-079. Recuperado de <http://circ.ahajournals.org/content/116/5/572.full.pdf+html>

- Resistance training should be performed
 - In a rhythmical manner at a moderate to slow controlled speed
 - Through a full range of motion, avoiding breathholding and straining (Valsalva maneuver) by exhaling during the contraction or exertion phase of the lift and inhaling during the relaxation phase
 - Alternating between upper- and lower-body work to allow for adequate rest between exercises
- The initial resistance or weight load should
 - Allow for and be limited to 8–12 repetitions per set for healthy sedentary adults or 10–15 repetitions at a low level of resistance, for example, $<40\%$ of 1-RM, for older (>50 – 60 y of age), more frail persons, or cardiac patients
 - Be limited to a single set performed 2 d/wk
 - Involve the major muscle groups of the upper and lower extremities, eg, chest press, shoulder press, triceps extension, biceps curl, pull-down (upper back), lower-back extension, abdominal crunch/curl-up, quadriceps extension or leg press, leg curls (hamstrings), and calf raise

NOTA. Reproducido de: "Resistance exercise in individuals with and without cardiovascular disease: 2007 update: a scientific statement from the American Heart Association Council on Clinical Cardiology and Council on Nutrition, Physical Activity, and Metabolism. *Circulation*," por M. A. Williams, W. L. Haskell, P. A. Ades, E. A. Amsterdam, V. Bittner, B. A. Franklin, M. Gulanick, S. T. Laing, y K. J. Stewart, 2007, *Circulation*, **116**(5), p. 578. doi:10.1139/H10-079. Recuperado de <http://circ.ahajournals.org/content/116/5/572.full.pdf+html>



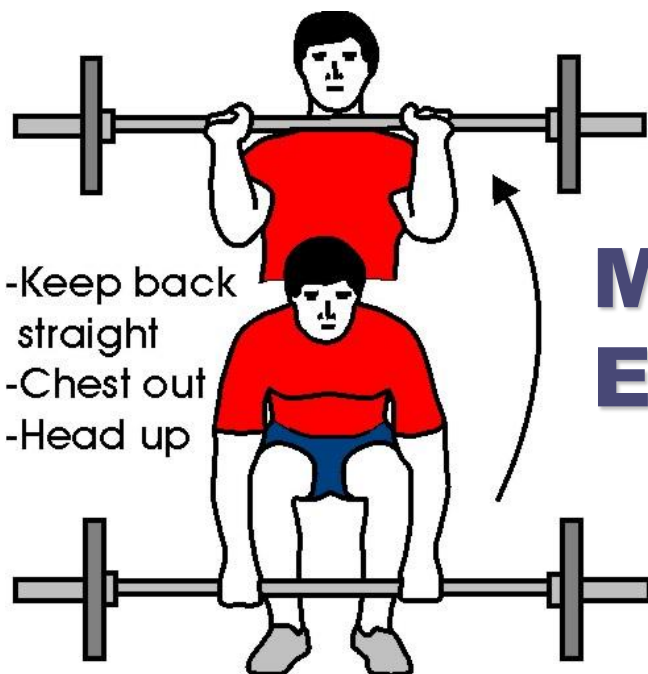
METODOLOGÍA DEL ENTRENAMIENTO FÍSICO

❑ Mito:

- El entrenamiento con resistencias disminuye la flexibilidad

❑ Realidad:

- Ausencia de ejercicios de flexibilidad:
Induce estos problemas de flexibilidad
 - Fundamentadas en evidencias científicas:
 - ⇒ Incrementar flexibilidad en algunas articulaciones:
 - ◇ Poblaciones sedentarias y envejecientes:
Con niveles iniciales bajos de flexibilidad



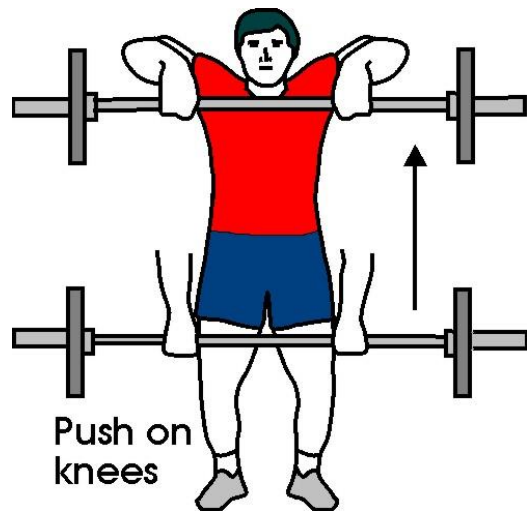
METODOLOGÍA DEL ENTRENAMIENTO FÍSICO

❑ Evidencias de Estudios Científicos:

➤ Entrenamiento con resistencias: *Conjuntamente con un regimen de flexibilidad*

• Efecto:

- ⇒ No altera el nivel inicial de flexibilidad
- ⇒ No inhibe el desarrollo de la flexibilidad



METODOLOGÍA DEL ENTRENAMIENTO FÍSICO

❑ Mito:

➤ Entrenamiento con resistencias:

- Ejercicios que pueden aumentar el arco de movimiento:
 - ⇒ Sentadilla (squat)
 - ⇒ Arranque (snatch)
 - ⇒ Cargada de potencia (power clean) y
 - ⇒ Sentadilla frontal (front squat)
 - ⇒ Peso muerto con rodillas extendidas (stiff-leg deadlift)
 - ⇒ Embestida (Lunge)
 - ⇒ Otras



Journal of Strength and Conditioning Research, 2006, 20(3), 634–642
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RESISTANCE TRAINING AND DETRAINING EFFECTS ON FLEXIBILITY PERFORMANCE IN THE ELDERLY ARE INTENSITY-DEPENDENT

IOANNIS G. FATOUROS,¹ ANTONIOS KAMBAAS,¹ IOANNIS KATRABASAS,³ DIAMANDA LEONTISINI,¹ ATHANASIOS CHATZINIKOLAOU,¹ ATHANASIOS Z. JAMURTAS,² IOANNIS DOUROUDOS,¹ NIKOLAOS AGGELOUSIS,¹ AND KIRIAKOS TAXILDARIS¹

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ABSTRACT. Fatouros, I.G., A. Kambas, I. Katrabasas, D. Leontisini, A. Chatzinikolaou, A.Z. Jamurtas, I. Douroudos, N. Aggelousis, and K. Taxildaris. Resistance training and detraining effects on flexibility performance in the elderly are intensity-dependent. *J. Strength Cond. Res.* 20(3):634–642, 2006.—The present investigation attempted to determine whether resistance exercise intensity affects flexibility and strength performance in the elderly following a 6-month resistance training and detraining period. Fifty-eight healthy, inactive older men (65–78 yrs) were randomly assigned to 1 of 4 groups: a control group (C, $n = 10$), a low-intensity resistance training group (LI, $n = 14$, 40% of 1 repetition maximum (1RM)), a moderate-intensity resistance training group (MI, $n = 12$, 60% of 1RM), or a high-intensity resistance training group (HI, $n = 14$, 80% of 1RM). Subjects in exercise groups followed a 3 days per week, whole-body (10 exercises, 3 sets per exercise) protocol for 24 weeks. Training was immediately followed by a 24-week detraining period. Strength (bench and leg press 1RM) and range of motion in trunk, elbow, knee, shoulder, and hip joints were measured at baseline and during training and detraining. Resistance training increased upper- (34% in LI, 48% in MI, and 75% in HI) and lower-body strength (38% in LI, 53% in MI, and 63% in HI) in an intensity-dependent manner. Flexibility demonstrated an intensity-dependent enhancement (3–12% in LI, 6–22% in MI, and 8–28% in HI). Detraining caused significant losses in strength (70–98% in LI, 44–50% in MI, and 27–29% in HI) and flexibility (90–110% in LI, 30–71% in MI, and 23–51% in HI) in an intensity-dependent manner. Results indicate that resistance training by itself improves flexibility in the aged. However, intensities greater than 60% of 1RM are more effective in producing flexibility gains, and strength improvement with resistance training is also intensity-dependent. Detraining seems to reverse training strength and flexibility gains in the elderly in an intensity-dependent manner.

KEY WORDS. flexibility, resistance training, detraining, elderly, strength

have been associated with muscle disuse and with soft tissue restraints such as collagen alterations, mechanical stress, disuse, and degenerative diseases (2), and are related to a deterioration of functional abilities (5, 17) and health status (17) of older individuals. This leads to dysfunction and inability to perform everyday activities such as getting up from a chair, walking, and climbing stairs (5). To the contrary, increasing muscular activity might slow the rate of flexibility loss in older adults (51) while improving several musculoskeletal disorders (43). Previous investigations have reported that older persons who maintain high levels of muscular strength and flexibility rarely participate in long-term health care programs (22).

Resistance training has been linked to significant improvement in health- and performance-related parameters in the elderly, such as muscle force, endurance, body composition, bone quality, postural stability, fall prevention, and quality of life (2, 12). However, there is limited information regarding strength training's effects on flexibility in the elderly. When weights were combined with stretching exercises, joints' passive range of motion was significantly enhanced (46). Most studies that examined the effects of training on flexibility have employed stretching exercises in their training protocol, making it difficult to distinguish the independent effects of resistance training on flexibility changes. Only 2 previous studies have examined the independent effects of resistance training on flexibility; these studies indicated that 16 weeks of weight training increased range of motion in several joints of older men, possibly because of an improvement in muscle strength after 16 weeks of training (3, 14). It has been suggested that resistance exercises enhance the tensile strength of tendons and ligaments,

INTERACTION BETWEEN RESISTANCE TRAINING AND FLEXIBILITY TRAINING IN HEALTHY YOUNG ADULTS

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KEY WORDS. physical training, range of motion, skeletal muscle, strength

Despite their practical relevance and potential interaction, there have been few systematic studies dealing with the combined effects of flexibility and resistance training (9, 10, 14, 15). Although these previous publications have provided relevant information, they presented methodological limitations, such as lack of control groups and evaluation of strength or flexibility of a limited number of movements. The present study involved 4 different groups of young volunteers in a longitudinal design, with the purpose of describing the interaction between resistance training and flexibility training. The tested hypothesis was that only limited cross-effects would occur between resistance and flexibility training, i.e., that increases in muscle strength and flexibility are developed only by specific training programs.

The present study sought to determine the separate and



METODOLOGÍA DEL ENTRENAMIENTO FÍSICO



❑ Mito:

- La Flexibilidad es principalmente genética, y muy poco desarrollo se espera mediante el entrenamiento

❑ Realidad:

- Existen otros factores entrenables contribuyen:
Mejora con el entrenamiento regular
- Fundamentadas en evidencias científicas:
 - ⇒ Ejercicios crónicos de estiramiento estático - *6-12 semanas*:
 - ◇ Aumenta el arco de movimiento:
 - Por más de 10 grados, o
 - Por más de 18 %

Improves Exercise

Improves Exercise

[illegible]

ing on the flexibility

METODOLOGÍA DEL ENTRENAMIENTO FÍSICO

❑ Mito:

- Hacer ejercicios con fiebre alivia la enfermedad

❑ Realidad:

- Los estados pirogénicos requieren reposo:
Puede acelerar la deshidratación y emergencias cardiacas
- Fundamentadas en evidencias científicas:
 - ⇒ Ejercicios agudos con fiebre:
 - ◇ Incrementa el estado de deshidratación
 - ◇ Aumenta el riesgo de:
 - Enfermedades relacionada con el calor:
 - ▶ Calambres ▶ Agotamiento ▶ Choque por calor



METODOLOGÍA DEL ENTRENAMIENTO FÍSICO

❑ Evitar hacer ejercicios estando enfermo:

➤ Algunas enfermedades puede:

- Causar deshidratación:

Reduce el volumen sanguíneo circulatorio

- Predisponen al individuo a:

Arritmias cardíacas

- Puede agravar otros problemas de salud

➤ Recomendaciones:

- Con ejercitarse cuando los individuos:

⇒ Se sienten enfermos

⇒ Perciben una fatiga poco usual

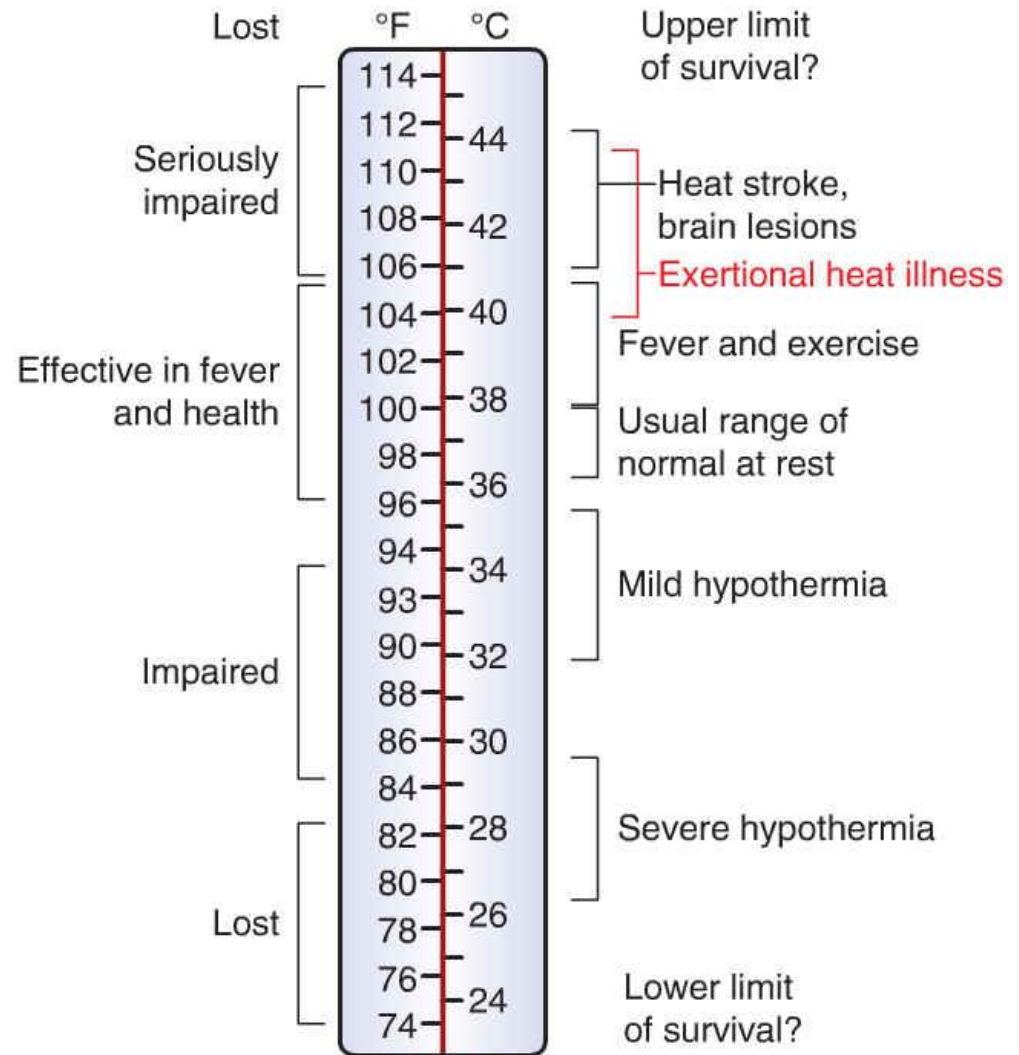
NOTA. Tomado de: “Design and Implementation of Exercise Training Regimens,” Por M. M. Dehn, & C. B. Mullins, 1984. En *Rehabilitation of the Coronary Patient*. 2da. ed., (p. 342), por N. K. Wenger, & H. K. Hellerstein (Eds.), 1984, New York: John Wiley & Sons. Copyright 1984 John Wiley & Sons, Inc.

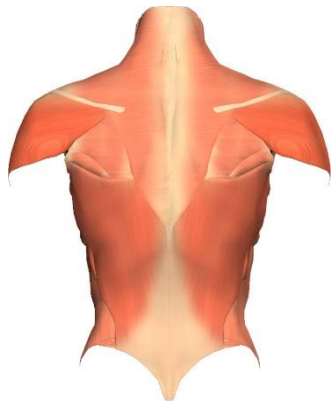


Thermal Regulation

Condition

Rango de la Temperatura Interna y su Asociación con Enfermedades Vinculadas con el Calor o el Frío





ENTRENAMIENTO MÚSCULOS ESTABILIZADORES DEL NUCLEO (CORE)

❑ Mito:

- Los músculos locales (Ej: multifido) pueden ser entrenados de forma independiente de los músculos globales (Ej: erectores de la espina)

❑ Realidad - *Evidencia Científica*:

- Todos los ejercicios para el tronco:
 - Involucran la activación de los grupos musculares:
 - » Locales, y » Globales
- Músculos específicamente activados:
 - Determinantes:
 - » Posición del cuerpo, y » Fuerza de gravedad



ENTRENAMIENTO MÚSCULOS ESTABILIZADORES DEL NUCLEO (CORE)

❑ Mito:

- Existen ciertos músculos que son más importantes para la estabilización del núcleo, que otros (Ej: transverso abdominal)

❑ Realidad - *Evidencia Científica*:

- La estabilización del complejo lumbo-abdominal:
 - Se obtiene a través de:
 - ⇒ La activación coordinada de diversos músculos de la región media (core) del tronco:
 - ◇ No existe un grupo muscular mejor que otro:
 - Que contribuya más de 30% para la estabilidad del núcleo:
sin importar el tipo de ejercicio

**A PER
FOR C**

by Jeffrey M. Willardson, Ph.D.

LEARNING OBJECTIVES

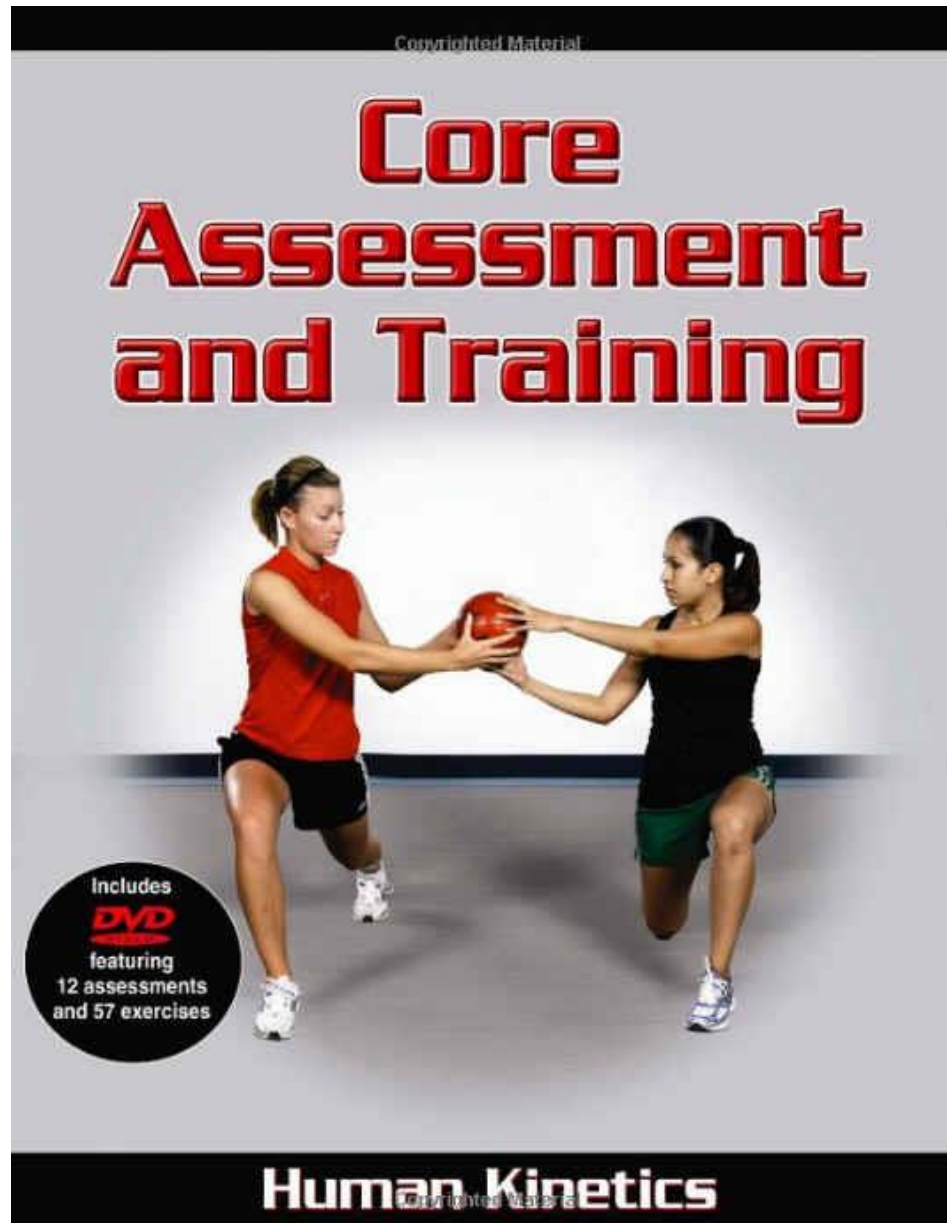
- Understand the importance of core stability exercises for healthy individuals.
- Understand how to perform resistance exercises for the development of muscular endurance, muscular strength, and muscular power in the core musculature.
- Understand the potential advantages and disadvantages of performing resistance exercises on unstable equipment (*e.g.*, Swiss ball, wobble board, and balance disc).

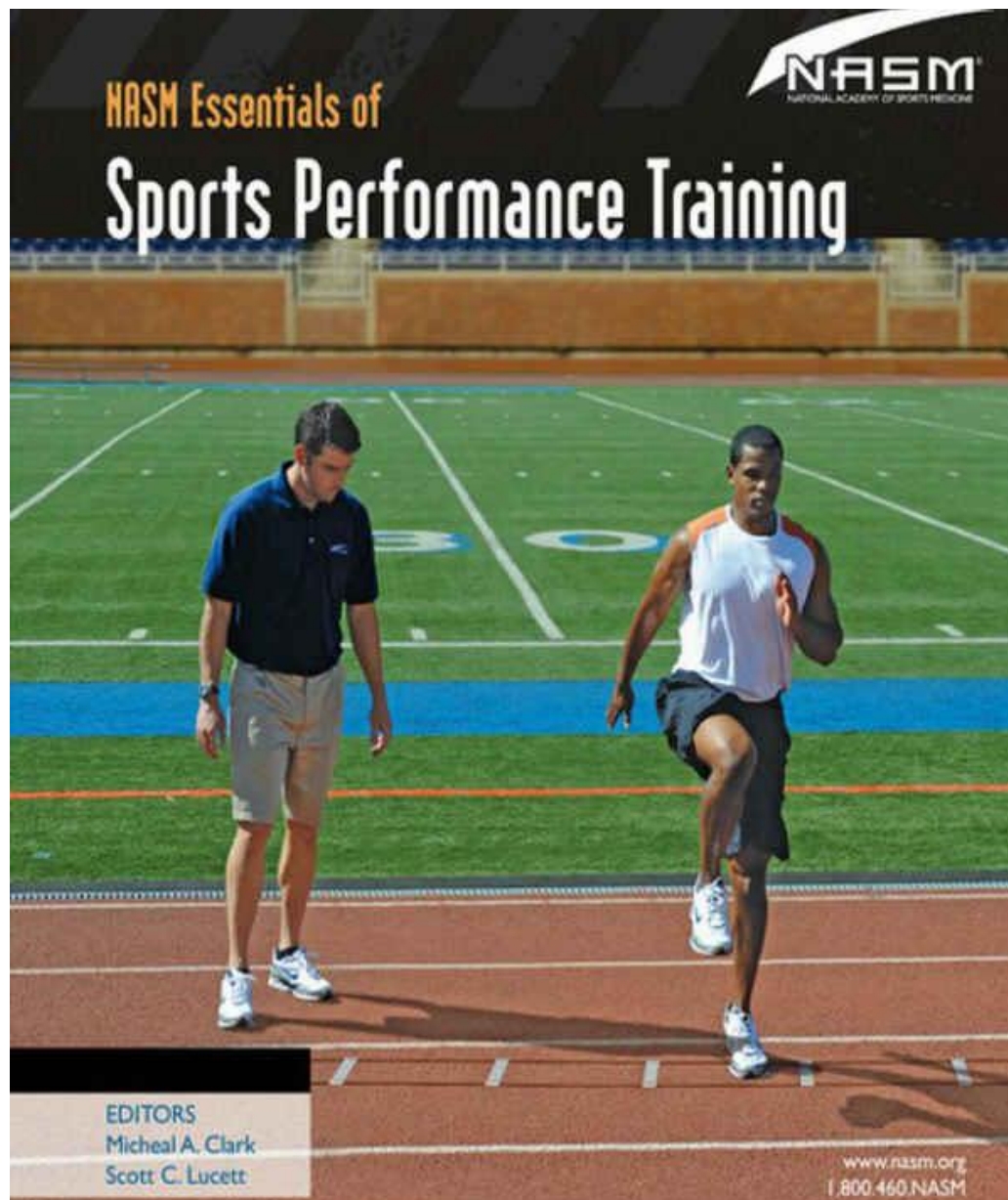
Key words:

Resistance Training, Strength, Power, Muscular Endurance, Stability

For example, the squat is now commonly performed with each foot supported on a balance disc, and the chest press is now commonly performed while lying supine on a Swiss ball (5,6). The use of unstable equipment can make training fun and motivating and has been proven effective to increase core muscle activity. However, the use of this equipment does have limitations; for example, the lighter loads and lower movement velocities typical of exercises performed on unstable equipment make them best suited for development of core muscular endurance (7).

Development of this characteristic is beneficial for all individuals and may contribute to improvements in functional capacity, which allows for improved execution of most daily activities





Core Training Concepts for Performance Enhancement



Understand the importance of the core musculature and its relationship to performance enhancement.

Rationalize the importance of core training for improving sports performance and injury prevention.

Design a systematic core training program for athletes at any level of training.



- **Es obligatorio matricularte en un gimnasio, o contratar un entrenador personal, para poder lograr un nivel elevado de aptitud física**

➤ **Se puede iniciar con:**
 » *Actividad físicas* » *Disminuir el tiempo sentado*

- **Importante – Ser consistente:**
» *Actividad físicas* » *Ejercicios regulares*



CALENTAMIENTO Y ENFRIAMIENTO

❑ Mito:

- Se debe estirar estáticamente antes de iniciar el estímulo del ejercicio

❑ Realidad:

- El estiramiento estático es más efectivo durante la fase de enfriamiento de la sesión de ejercicio:
 - Fundamentadas en evidencias científicas:
 - ⇒ El estiramiento estático agudo (> 60 segundos [60-90 s]):
 - ◇ Realizado durante la fase del enfriamiento:
 - ▣ Antes de un ejercicio físico o competencia deportiva:
 - ▶ Disminuye el rendimiento físico:
Fundamentado en pruebas de valoración

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Effect of Acute Static Stretch on Maximal Muscle Performance: A Systematic Review

ANTHONY D. KAY^{1,2} and ANTHONY J. BLAZEIVICH²

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Western Australia, AUSTRALIA

ABSTRACT

KAY, A. D., and A. J. BLAZEIVICH. Effect of Acute Static Stretch on Maximal Muscle Performance: A Systematic Review. *Med. Sci. Sports Exerc.*, Vol. 44, No. 1, pp. 154–164, 2012. **Introduction:** The benefits of preexercise muscle stretching have been recently questioned after reports of significant poststretch reductions in force and power production. However, methodological issues and equivocal findings have prevented a clear consensus being reached. As no detailed systematic review exists, the literature describing responses to acute static muscle stretch was comprehensively examined. **Methods:** MEDLINE, ScienceDirect, SPORTDiscus, and Zetoc were searched with recursive reference checking. Selection criteria included randomized or quasi-randomized controlled trials and intervention-based trials published in peer-reviewed scientific journals examining the effect of an acute static stretch intervention on maximal muscular performance. **Results:** Searches revealed 4559 possible articles; 106 met the inclusion criteria. Study design was often poor because 30% of studies failed to provide appropriate reliability statistics. Clear evidence exists indicating that short-duration acute static stretch (<30 s) has no detrimental effect (pooled estimate = -1.1%), with overwhelming evidence that stretch durations of 30–45 s also imparted no significant effect (pooled estimate = -1.9%). A sigmoidal dose–response effect was evident between stretch duration and both the likelihood and magnitude of significant decrements, with a significant reduction likely to occur with stretches ≥ 60 s. This strong evidence for a dose–response effect was independent of performance task, contraction mode, or muscle group. Studies have only examined changes in eccentric strength when the stretch durations were >60 s, with limited evidence for an effect on eccentric strength. **Conclusions:** The detrimental effects of static stretch are mainly limited to longer durations (≥ 60 s), which may not be typically used during preexercise routines in clinical, healthy, or athletic populations. Shorter durations of stretch (<60 s) can be performed in a preexercise routine without compromising maximal muscle performance. **Key Words:** MUSCLE STRENGTH, WARM-UP, FORCE REDUCTION, PREPERFORMANCE STRETCH

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The full version of
this article appears
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BMJ 2002;325:168-70

Effects of stretching before and after exercising on muscle soreness and risk of injury: systematic review

Rob D Herbert, Michael Gabriel

Abstract

Objective To determine the effects of stretching before and after exercising on muscle soreness after exercise, risk of injury, and athletic performance.

Method Systematic review.

Data sources Randomised or quasi-randomised studies identified by searching Medline, Embase, CINAHL, SPORTDiscus, and PEDro, and by recursive checking of bibliographies.

Main outcome measures Muscle soreness, incidence of injury, athletic performance.

Results Five studies, all of moderate quality, reported sufficient data on the effects of stretching on muscle soreness to be included in the analysis. Outcomes seemed homogeneous. Stretching produced small and statistically non-significant reductions in muscle soreness. The pooled estimate of reduction in muscle soreness 24 hours after exercising was only 0.9 mm on a 100 mm scale (95% confidence interval - 2.6 mm to 4.4 mm). Data from two studies on army recruits in military training show that muscle stretching before exercising does not produce useful reductions in injury risk (pooled hazard ratio 0.95, 0.78 to 1.16).

Conclusions Stretching before or after exercising does not confer protection from muscle soreness. Stretching before exercising does not seem to confer a practically useful reduction in the risk of injury, but

the generality of this finding needs testing. Insufficient research has been done with which to determine the effects of stretching on sporting performance.

Introduction

Many people stretch before or after engaging in athletic activity. Usually the purpose is to reduce muscle soreness after exercising, to reduce risk of injury, or to improve athletic performance.¹⁻⁷

This systematic review synthesises research findings of the effects of stretching before and after exercising on delayed onset muscle soreness, risk of injury, and athletic performance.

Methods

Inclusion and exclusion criteria

The review included English language randomised or quasi-randomised studies that investigated the effects of any stretching technique, immediately before or after exercising, on delayed onset muscle soreness, risk of injury, or athletic or sporting performance. Studies were included only if stretching was conducted before or after exercising.

Search strategy

Relevant studies were identified by searching Medline (1966 to February 2000), Embase (1988 to February 2000), CINAHL (1982 to January 2000), SPORTDiscus

Does Stretching Improve Performance?

A Systematic and Critical Review of the Literature

Objective: The purpose of this article was to evaluate the clinical and basic science evidence surrounding the hypothesis that stretching improves performance.

Main Results: Of the 23 articles examining the effects of an acute bout of stretching, 22 articles suggested that there was no benefit for the outcomes isometric force, isokinetic torque, or jumping height. There was 1 article that suggested improved running economy. Of 4 articles examining running speed, 1 suggested that stretching was beneficial, 1 suggested that it was detrimental, and 2 had equivocal results. Of the 9 studies examining the effects of regular stretching, 7 suggested that it was beneficial, and the 2 showing no effect examined only the performance test of running economy. There were none that suggested that it was detrimental.

(Clin J Sport Med 2004;14:267-273)

Because of the nature of research, we can never test actual competition performance with appropriate scientific rigor. Therefore, we rely on tests of performance that relate directly or indirectly to sport performance. The closer the test is to the performance required, the more relevant the test. For example, running speed over 50 m would be considered very relevant if the race distance interested in was 50 m, and less relevant if the race distance interested in was 1000 m. In addition, running speed in a race is dependent on force generated, speed of contraction, running economy, and psychology. Therefore, results from tests of only 1 of these (e.g., only force, only running economy) have to be interpreted with caution. That being said, some sports can often be categorized as a combination of single activities. In basketball, both speed and jump height are direct skills that affect the ability to perform, and in this case, results of performance tests become very relevant measures of



Smith, Sargis | 1007

SHOULD ATHLETES STRETCH BEFORE EXERCISE?

Karl B. Fields, MD

Director of Family Medicine Residency and Sports Medicine Fellowship

Moses Cone Health System, Greensboro, NC

Professor and Associate Chairman

University of North Carolina Department of Family Medicine

Sports Science Library

SSE #104: Should Athletes Stretch Before Exercise?

Karl B. Field, MD; Craig M. Burnwoth, MD; Martha Delaney, MA

SHOULD ATHLETES STRETCH BEFORE EXERCISE?

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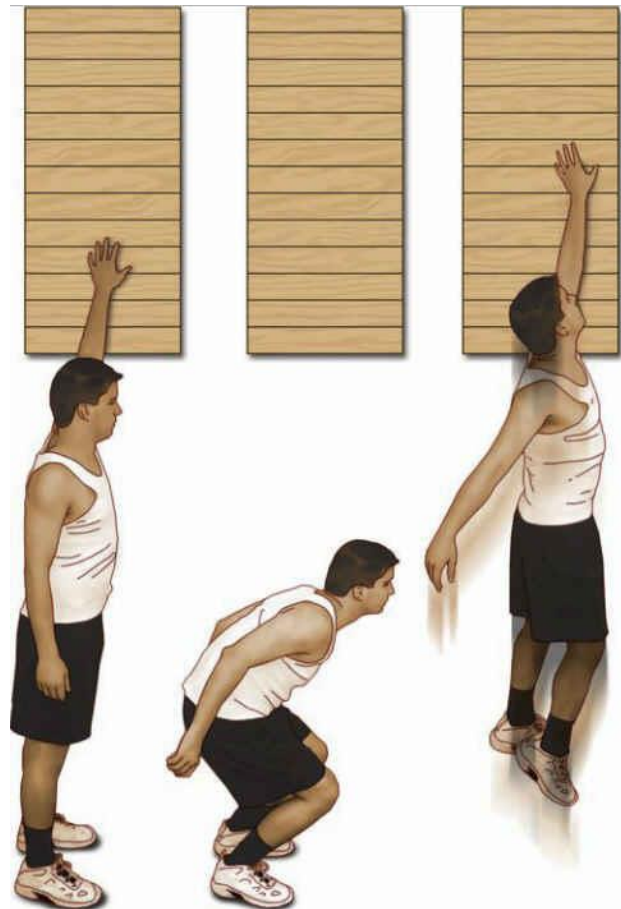
Administrative Director, Greensboro Area Health Education Center

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Greensboro, NC



EFECTOS AGUDOS ADVERSOS DEL ESTIRAMIENTO ESTÁTICO: SOBRE LA EJECUTORIA FÍSICO-DEPORTIVA



➤ Impide la producción de la fuerza/potencia:

● Para las contracciones:
isométricas y concéntricas

➤ Isométricas

➤ Concéntricas

➤ Compromete la generación de una fuerza explosiva:

● Ejecutoria de los saltos:

➤ Medido por el:

■ Salto Vertical:

Prueba de potencia muscular

NOTA. Reproducido de: *Exercise Physiology: Nutrition, Energy, and Performance*. 7ma. ed.; (p. 372), por W. D. McArdle, F. I. Katch, & V. I. Katch, 2010, Philadelphia: Lippincott Williams & Wilkins. Copyright 2010 por Lippincott Williams & Wilkins, a Wolters Kluwer business.



EFECTOS AGUDOS ADVERSOS DEL ESTIRAMIENTO ESTÁTICO: SOBRE LA EJECUTORIA FÍSICO-DEPORTIVA



➤ **Disminuye el tiempo en:**

🟣 **Carreras de velocidad:**

➤ **Medido por:**

■ **Evaluaciones anaeróbicas:**

🟣 ***Tres pruebas rápidas de:
20 metros cada una***

➤ **Reduce la actividad:**

🟣 **Electromiográfica, en los:**

➤ **Músculos esqueléticos:
*Activos***

EFFECTOS AGUDOS FAVORABLES DEL CALENTAMIENTO ACTIVO: SOBRE LA EJECUTORIA FÍSICO-DEPORTIVA



▶ **Estimula activación:**

● **Función neuromuscular:**

▶ **Resultado:**

■ **Mejora generación:**

● ***Potencia muscular:***

✓ **Incrementa efectividad:**

➡ ***Ejecutoria del:***

● ***Ejercicio físico***

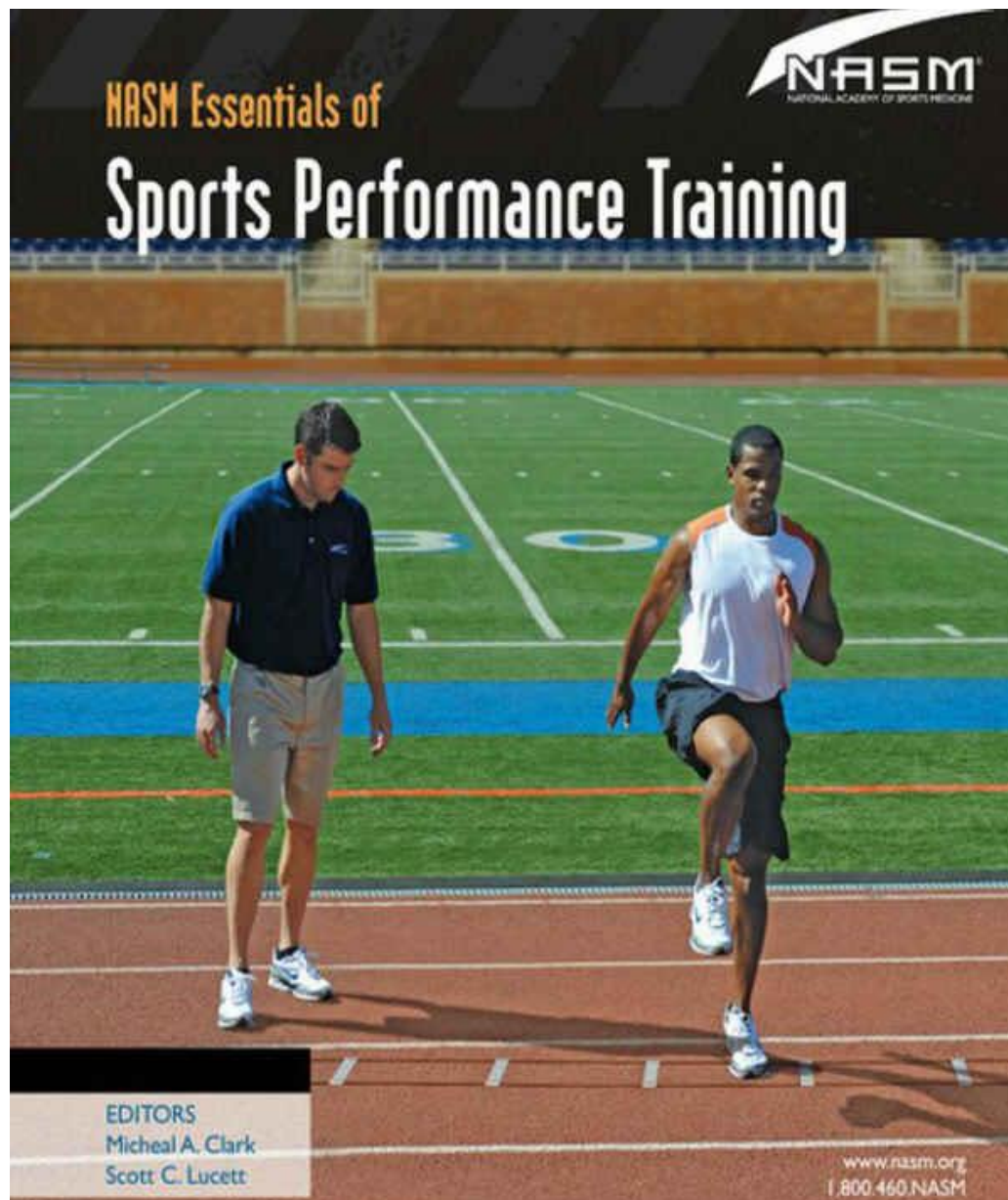
● ***Destreza deportiva***

A man in a white short-sleeved shirt and dark shorts is performing a pull-up on a red metal frame. He is holding a stack of books or papers against the frame, and his body is suspended in the air. The background is a dark, textured wall.

Facilita la fuerza explosiva:

➤ Mejora ejecutorias:

► Tennis de campo:

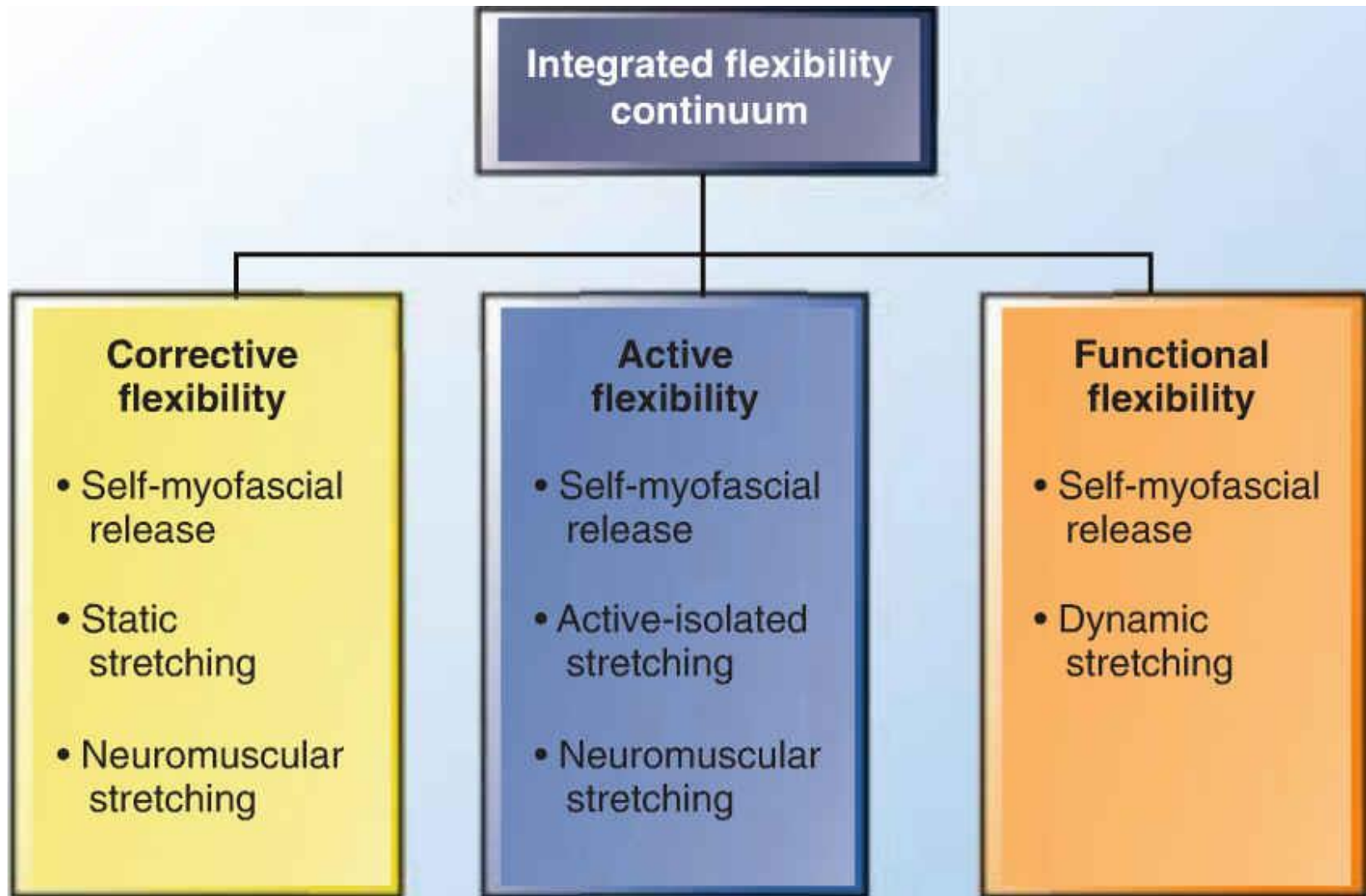


Flexibility Training for Performance Enhancement



Perform and instruct appropriate flexibility techniques for given situations.

FLEXIBILIDAD FUNCIONAL O INTEGRADA: *CONTINUO: Tipos de Estiramientos*





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FLEXIBILIDAD FUNCIONAL O INTEGRADA: *ESTIRAMIENTO DINÁMICO: Rotación con Bola Medicinal*



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FLEXIBILIDAD FUNCIONAL O INTEGRADA: ***ESTIRAMIENTO DINÁMICO: Levantar Bola Medicinal y dejar Caer***



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FLEXIBILIDAD FUNCIONAL O INTEGRADA: *ESTIRAMIENTO DINÁMICO: "Lunge" Lateral con Alcanzar*



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FLEXIBILIDAD FUNCIONAL O INTEGRADA: *ESTIRAMIENTO DINÁMICO: "Lunge" de Viraje con Alcanzar*



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FLEXIBILIDAD FUNCIONAL O INTEGRADA: *ESTIRAMIENTO DINÁMICO: Caminado con Banda Elástica*



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FLEXIBILIDAD FUNCIONAL O INTEGRADA: *ESTIRAMIENTO DINÁMICO: Escorpión*



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NOTA. Reproducido de: *NASM' Essentials of Sports Performance*. (p. 144), por M. A. Clark, & S. C. Lucett, 2010, Philadelphia: Lippincott Williams & Wilkins. Copyright 2010 por Lippincott Williams & Wilkins, a Wolters Kluwer business.



FLEXIBILIDAD FUNCIONAL O INTEGRADA: *ESTIRAMIENTO DINÁMICO: Torsión Rusa sobre Balón Sueco*



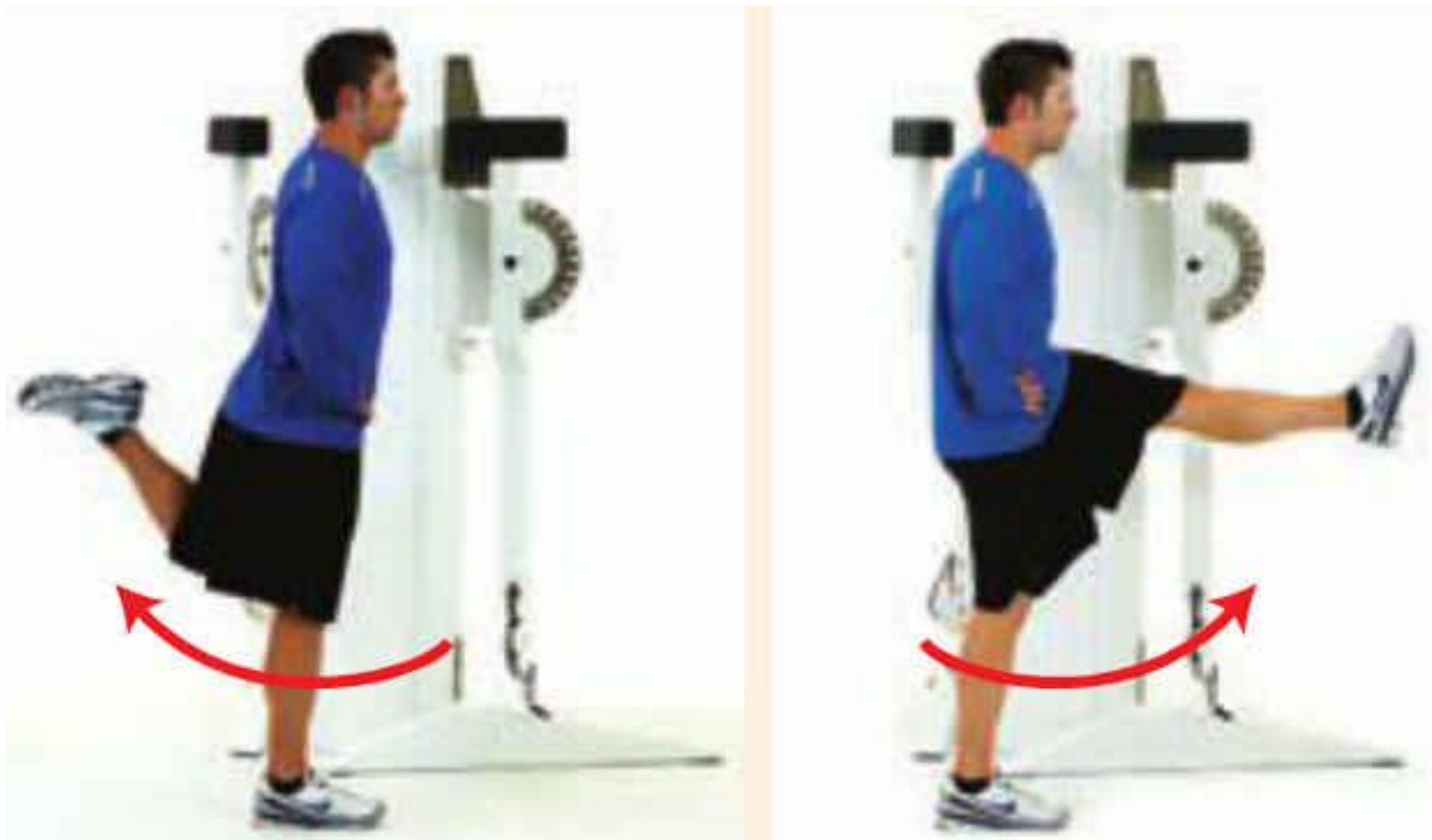
NOTA. Reproducido de: *NASM' Essentials of Sports Performance*. (p. 144), por M. A. Clark, & S. C. Lucett, 2010, Philadelphia: Lippincott Williams & Wilkins. Copyright 2010 por Lippincott Williams & Wilkins, a Wolters Kluwer business.



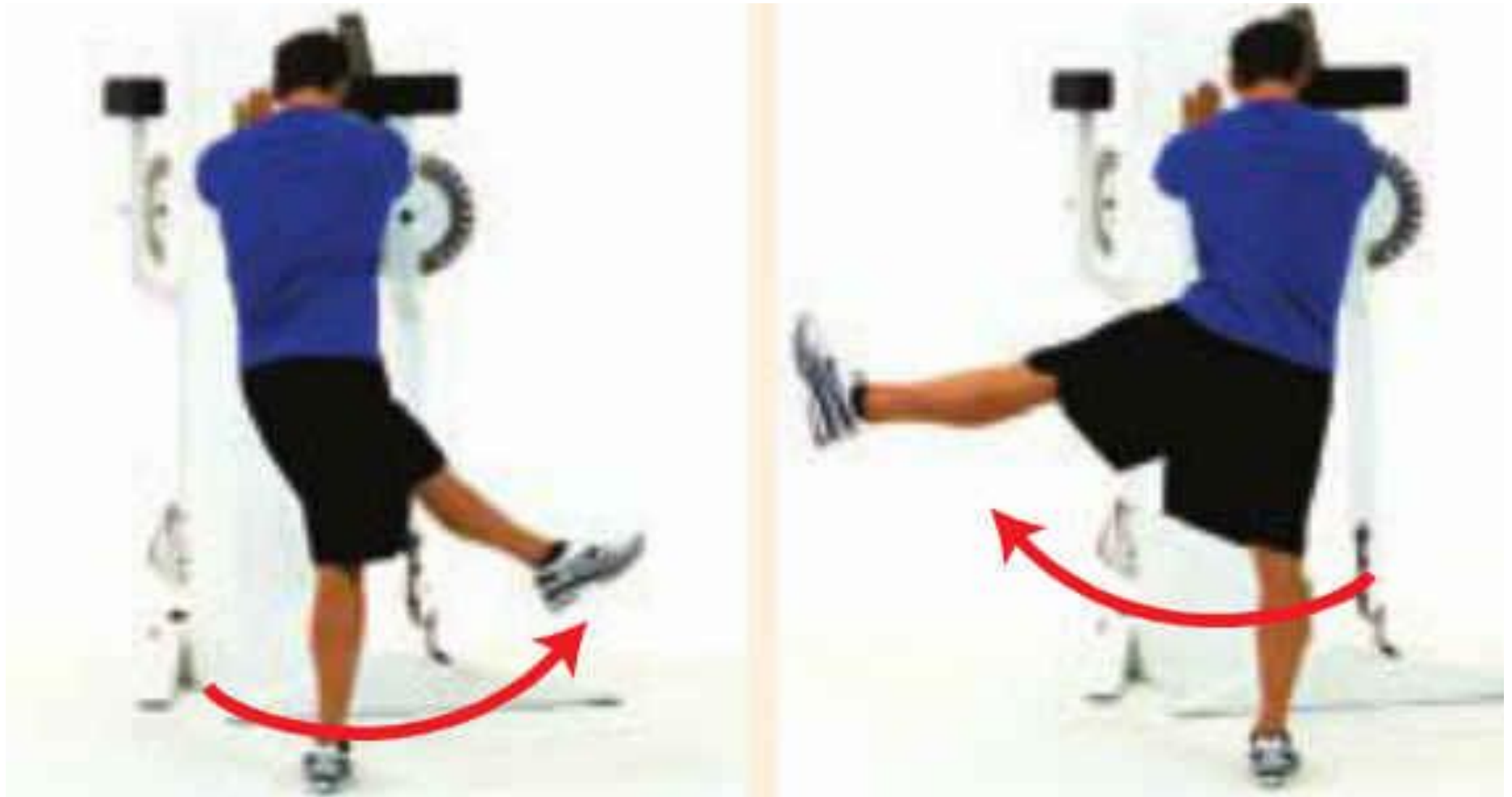
NOTA. Reproducido de: *NASM' Essentials of Sports Performance*. (p. 144), por M. A. Clark, & S. C. Lucett, 2010, Philadelphia: Lippincott Williams & Wilkins. Copyright 2010 por Lippincott Williams & Wilkins, a Wolters Kluwer business.



FLEXIBILIDAD FUNCIONAL O INTEGRADA: *ESTIRAMIENTO DINÁMICO: Oscilación Piernas, Frente y Atrás*



NOTA. Reproducido de: *NASM' Essentials of Sports Performance*. (p. 144), por M. A. Clark, & S. C. Lucett, 2010, Philadelphia: Lippincott Williams & Wilkins. Copyright 2010 por Lippincott Williams & Wilkins, a Wolters Kluwer business.



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www.acsm.org

ACSM's Foundations of **STRENGTH TRAINING AND CONDITIONING**



NICHOLAS RATAMESS



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CHAPTER

10

Warm-Up and Flexibility

Objectives

After completing this chapter, you will be able to:

- Discuss the physiological effects of a warm-up and the importance of warming up for injury prevention and performance enhancement
- Design general and specific warm-ups
- Discuss factors that affect flexibility
- Describe different modalities of stretching
- Discuss flexibility training guidelines and design a flexibility training program
- Discuss the importance of including a cooldown following a workout



General warm-up

Specific warm-up (sprinting)

Specific warm-up (leg workout)

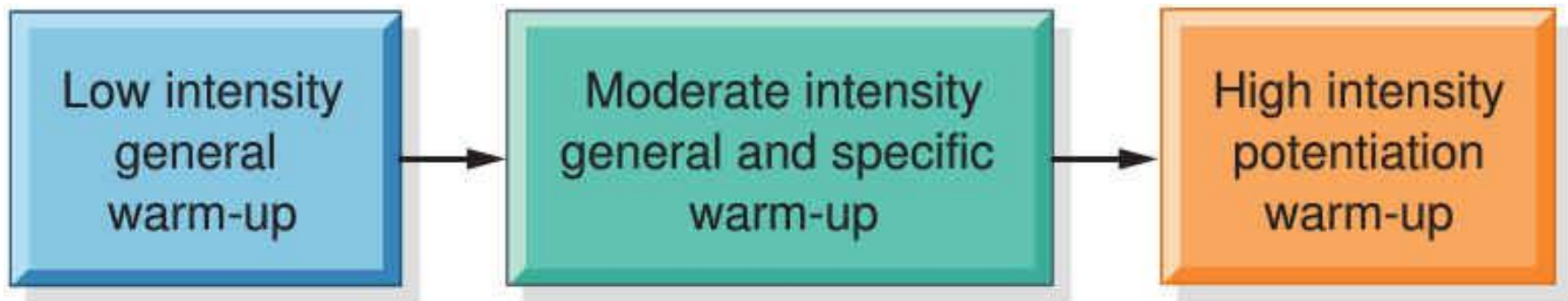
Light to moderate
sets of the squat



CALENTAMIENTO Y FLEXIBILIDAD:

CALENTAMIENTO: Continuo/Flujo

**** Potenciación Pos-Activación ****





➤ **Concepto:**

- ⇒ **En un arco de movimiento completo:**

NOTA. Adaptado de: *ACSM's Foundations of Strength Training and Conditioning*. (p. 170), por N. Ratamess, 2012, Philadelphia: Lippincott Williams & Wilkins. Copyright 2012 por American College of Sports Medicine.



➤ **Caraterísticas:**

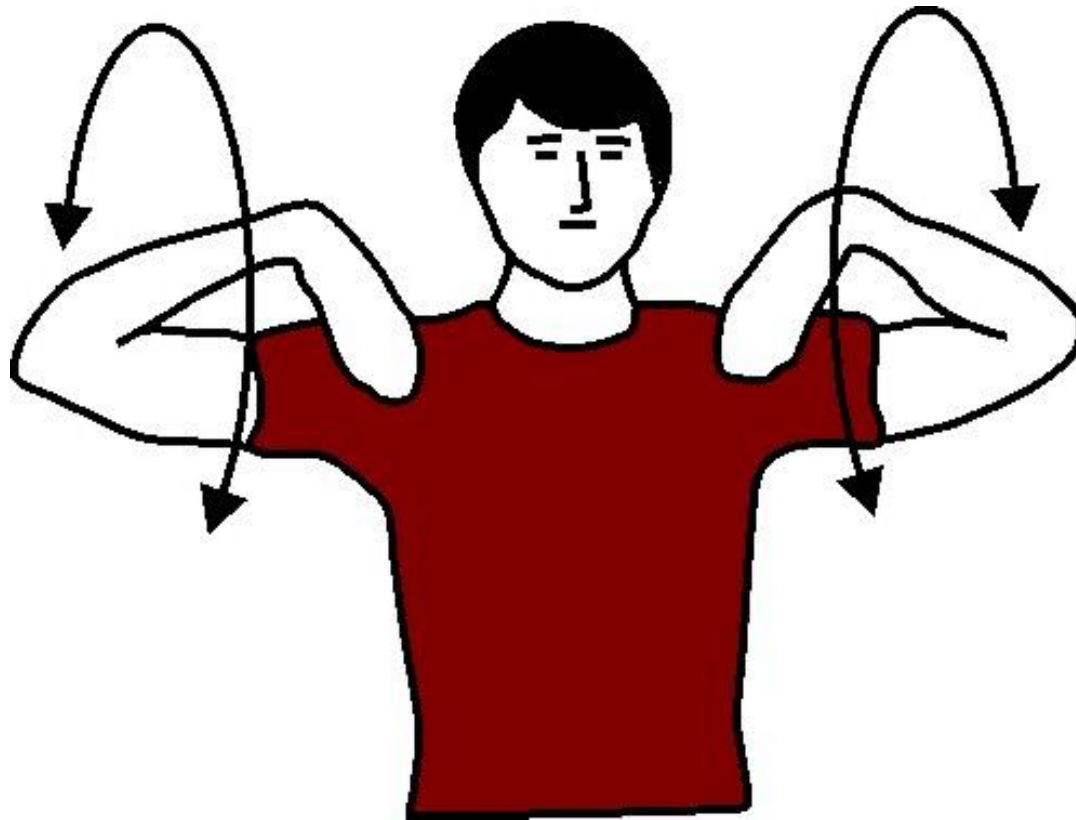
- ⇒ **Movimientos específicos:**

NOTA. Adaptado de: *ACSM's Foundations of Strength Training and Conditioning*. (p. 170), por N. Ratamess, 2012, Philadelphia: Lippincott Williams & Wilkins. Copyright 2012 por American College of Sports Medicine.



CALENTAMIENTO Y FLEXIBILIDAD: *ESTIRAMIENTO DINÁMICO* ** Ejemplos **

❑ Círculos con los brazos, hacia al frente y hacia atrás:





CALENTAMIENTO Y FLEXIBILIDAD: *ESTIRAMIENTO DINÁMICO* ** Ejemplos **

❑ Círculos con el tronco, desde ahorcajadas:

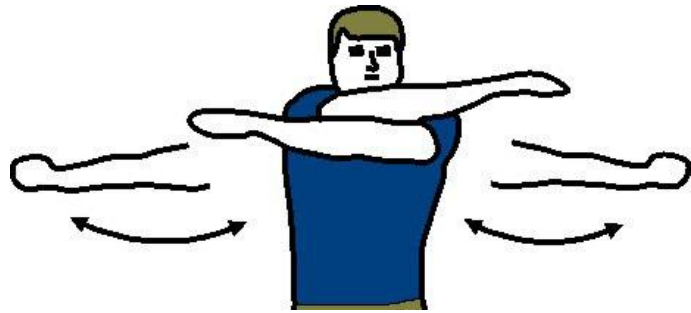




CALENTAMIENTO Y FLEXIBILIDAD: *ESTIRAMIENTO DINÁMICO* ** Ejemplos **

❑ Caminata, levantando los rodillas:



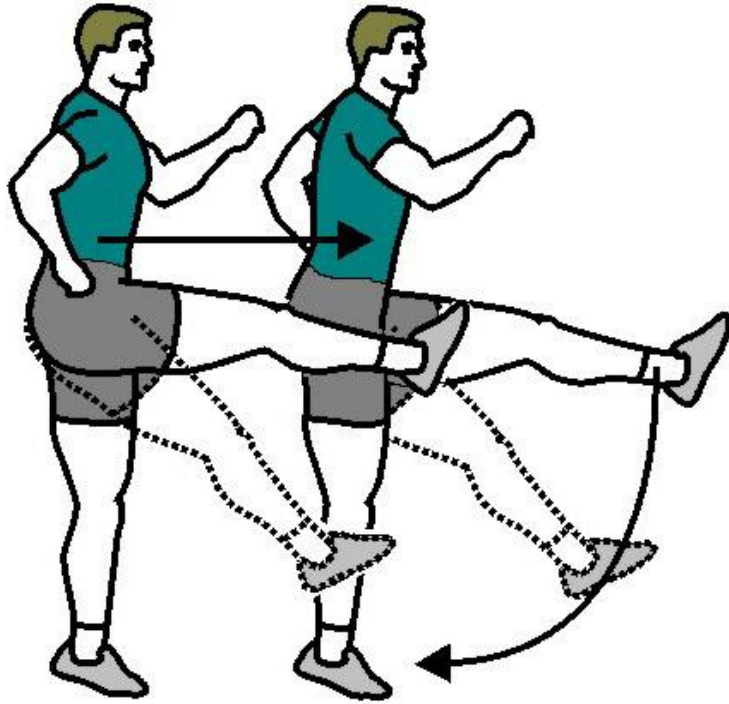


CALENTAMIENTO Y FLEXIBILIDAD

❑ Estiramiento Dinámico:

➤ Elemento esencial para:

- El calentamiento, previo a un
 - ⇒ *Ejercicio físico, o*
 - ⇒ *Competencia deportiva*



CALENTAMIENTO Y FLEXIBILIDAD

❑ Estiramiento Dinámico:

➤ Ventajas/beneficios:

- Calentamiento simultaneo de:

⇒ Varios grupos musculares:

Incrementa la eficiencia del calentamiento



► **Indicaciones:**

⇒ **Regiones con alta tensión muscular, o sobreactivas:**

■ **Sostener: 20-30 segundos**

No afecta el rendimiento físico-deportivo



► **Indicaciones:**

- ### ◇ Duración para cada estiramiento estático:

► **Luego de un ejercicio aeróbico:**

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CALENTAMIENTO Y ENFRIAMIENTO

❑ Estiramiento Estático Crónico:

➤ Indicaciones:

- **FUERA** del contexto del calentamiento:

⇒ Frecuencia – *3 a 5 veces por semana:*

◇ Ventaja/beneficio:

- ▣ Mayor capacidad absorber energía músculos esqueléticos:
Previene riesgo para lesiones

School of Human Movement and Exercise Science, University of Western Australia, Crawley, Western Australia, Australia

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1. Active Warm Up	484
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- ☐ El Ejercicio y la embarazada
- ☐ Entrenamiento con resistencias en mujeres
- ☐ Entrenamiento con resistencias en prepúberes
- ☐ Adaptaciones del ejercicio crónico sobre el sueño



EL EJERCICIO DURANTE EL EMBARAZO

❑ Mito:

- La mujer embarazada puede abortar su bebé si realiza ejercicios

❑ Realidad – *Evidencias Científicas:*

- Está indicado un programa de ejercicios para embarazadas
 - Se requiere seguir unas guías de precaución:
 - ⇒ American College of Obstetrics and Gynecology [ACOG]:
Exercise during Pregnancy and the Postpartum Period

ACOG

Committee on
Obstetric Practice

Reaffirmed 2009

This document reflects emerging clinical and scientific advances as of the date issued and is subject to change. The information should not be construed as dictating an exclusive course of treatment or procedure to be followed.

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Committee Opinion



Number 267, January 2002

Exercise During Pregnancy and the Postpartum Period

ABSTRACT: *The physiologic and morphologic changes of pregnancy may interfere with the ability to engage safely in some forms of physical activity. A woman's overall health, including obstetric and medical risks, should be evaluated before prescribing an exercise program. Generally, participation in a wide range of recreational activities appears to be safe during pregnancy; however, each sport should be reviewed individually for its potential risk, and activities with a high risk of falling or those with a high risk of abdominal trauma should be avoided during pregnancy. Scuba diving also should be avoided throughout pregnancy because the fetus is at an increased risk for decompression sickness during this activity. In the absence of either medical or obstetric complications, 30 minutes or more of moderate exercise a day on most, if not all, days of the week is recommended for pregnant women.*

by Shelby Scott, M.D., FACS

With overweight and obesity on the rise in America, it is of utmost importance that all people maintain or increase their current level of physical activity. This also is true for pregnant women.

of Sports Medicine (ACSM) and U.S. Centers for Disease Control and Prevention (CDC) guidelines for physical activity in adults: at least 30 minutes of moderate physical

activity on most, if not all, days of the week.

With more than 30 years of active pregnant women from which to make a more educated opinion

Impact of Physical Activity during Pregnancy and Postpartum on Chronic Disease Risk

In 1985, the American College of Obstetricians and Gynecologists (ACOG) provided recommendations for exercise during pregnancy that were conservative, based on limited evidence available at that time (4). For example, women were told not to perform intense activity continuously for more than 15 minutes per session, and limit their heart rate to 140 beats·min⁻¹. Following these original ACOG guidelines, research over the past 20 years has

DISEÑO Y PLANIFICACIÓN DE PROGRAMAS DE EJERCICIOS: *MUJERES EMBARAZADAS*

** Recomendaciones de Actividad Física **

☐ Frecuencia:

- *3 veces/semana:*
- *Preferiblemente todos los días*

☐ Intensidad:

- **Moderada:**
 - $\% \text{VO}_2\text{R}$: *40 - 60%*
 - Percepción del Esfuerzo: *12 - 14 (en una escala de 6 al 20)*
 - Prueba de hablar

☐ Duración: *15 - 30 minutos*

☐ Tipo/Modo: *Actividad Aeróbica*





DISEÑO Y PLANIFICACIÓN DE PROGRAMAS DE EJERCICIOS: **MUJERES: EMBARAZADAS**

**** Modificaciones de las Zonas para la FCE ****

TABLE 36-2. Modified Heart Rate Target Zones for Moderate-Intensity Aerobic Exercise in Pregnancy Based on Maternal Age and Weight Status (Body Mass Index) (36,37,88)

BMI ($\text{kg} \cdot \text{m}^{-2}$)	Age (yr)	Fitness Level	HR Range (bpm)
<25	<20	Any	140–155
		Low	129–144
		Active	135–150
		Fit	145–160
	30–39	Low	128–144
		Active	130–145
≥ 25	20–29	Any	102–124
	30–39	Any	101–120

NOTA. Tomado de: *Resource Manual for Guidelines for Exercise Testing and Prescription*. 9na. ed.; (p. 567), por American College of Sports Medicine, 2014, Philadelphia: Lippincott Williams & Wilkins. Copyright 2014 por: American College of Sports Medicine



ENTRENAMIENTO CON RESISTENCIAS EN MUJERES

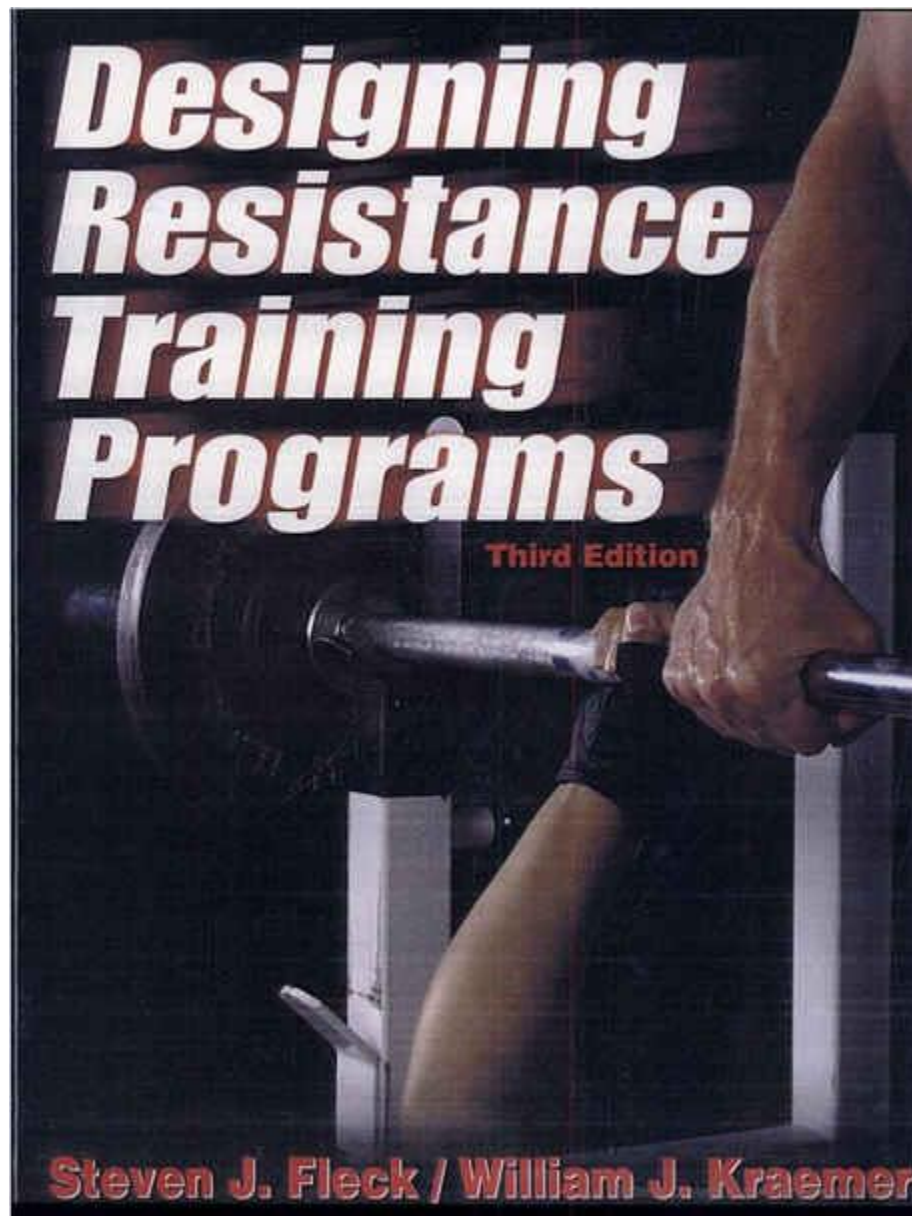
❑ Mito:

- El entrenamiento con pesas en mujeres, resulta en el desarrollo de músculos grandes, lo cual induce una pérdida de su imagen femenina

❑ Realidad – *Evidencias Científicas:*

- La cantidad de testosterona no es suficiente para el desarrollo muscular marcado:
 - El promedio de los músculos de las mujeres *no ocasionan una hipertrofia excesiva*
 - ⇒ Circunferencias corporales:
 - ◇ No cambian ◇ Alteraciones reducidas
 - ⇒ Disminución en el tejido adiposo







ENTRENAMIENTO CON RESISTENCIAS EN PREPÚBERES

❑ Mito:

- El entrenamiento con pesas en niños, puede estancar el crecimiento lineal

❑ Realidad – *Evidencias Científicas:*

- El entrenamiento con resistencias en prepúberes:
Cuando se programa apropiadamente
 - Estimula la placa epifisaria
 - Incrementa la fortaleza muscular:
 - ⇒ Mecanismos:
 - ◇ Principalmente – *Adaptación neurológica*
 - ◇ Muy poca – *Hipertrofia muscular*

NOTA. Información de: "Strength Training Effects in Prepubescent Boys", por: J. A. Ramsay, C. J. R. Blimkie, K. Smith, S. Garner, J. MacDougall, & D. G. Sale, 1990, *Medicine and Science in Sports and Exercise*, 22(5), 605-614.



❑ Entrenamiento con resistencias en niños

- NOTA.** Información de: "Adaptive Responses of Bone to Physical Activity", por: B. P Conroy, W. J. Kraemer, C. M, Maresh, & G. P. Dalsky, 1992, *Medicine, Exercise, Nutrition, and Health*, 1(), 64-74.



ENTRENAMIENTO CON RESISTENCIAS EN PREPÚBERES

❑ Entrenamiento con resistencias – Pospúberes: *Inicios de la adolecencia*

➤ Adaptaciones musculares:

- Aumento en la fortaleza muscular, vía:

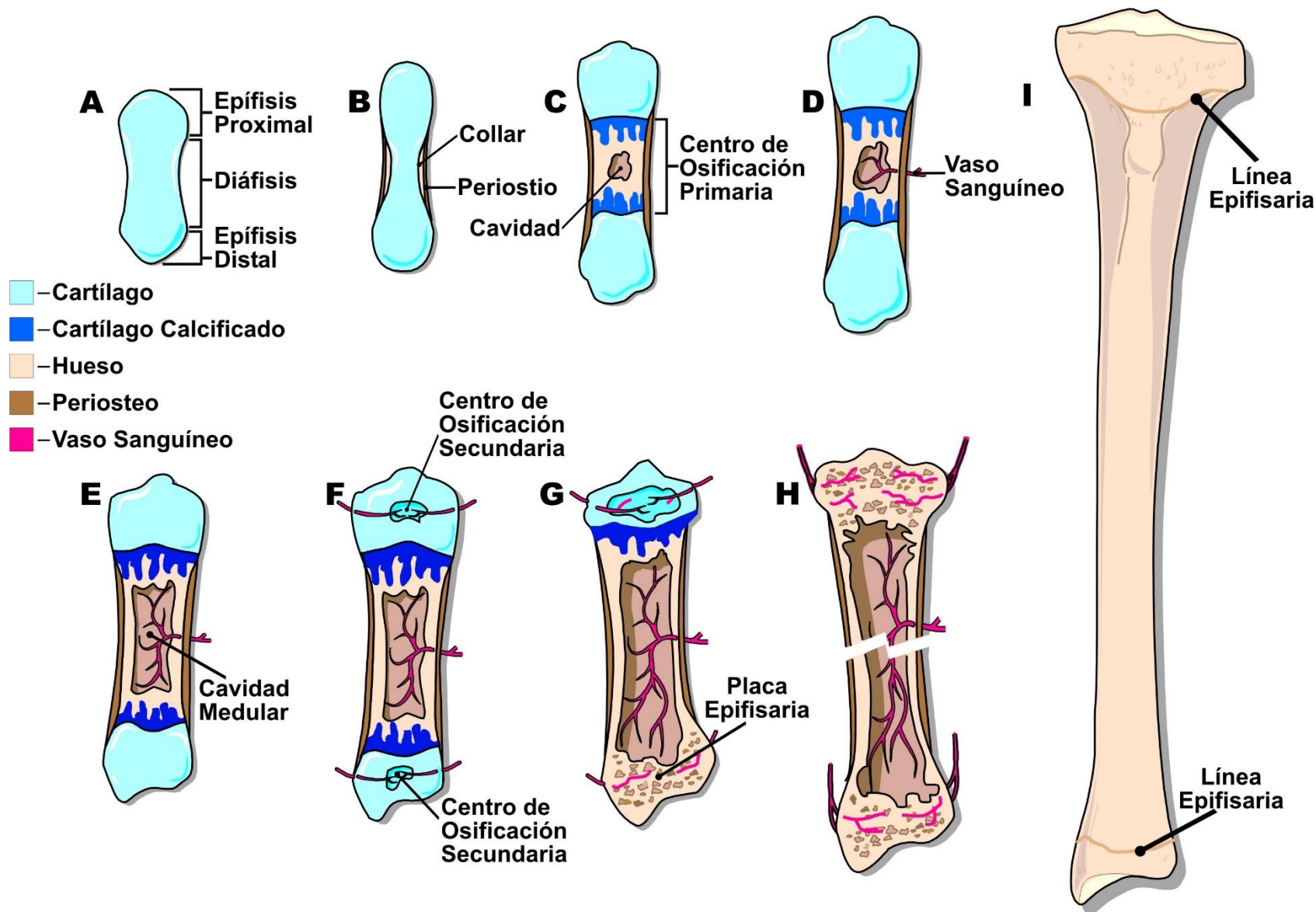
⇒ Hipertrofia muscular:

◇ Principalmente – *Cambios hormonales*:

■ Testosterona ■ Hormona de crecimiento

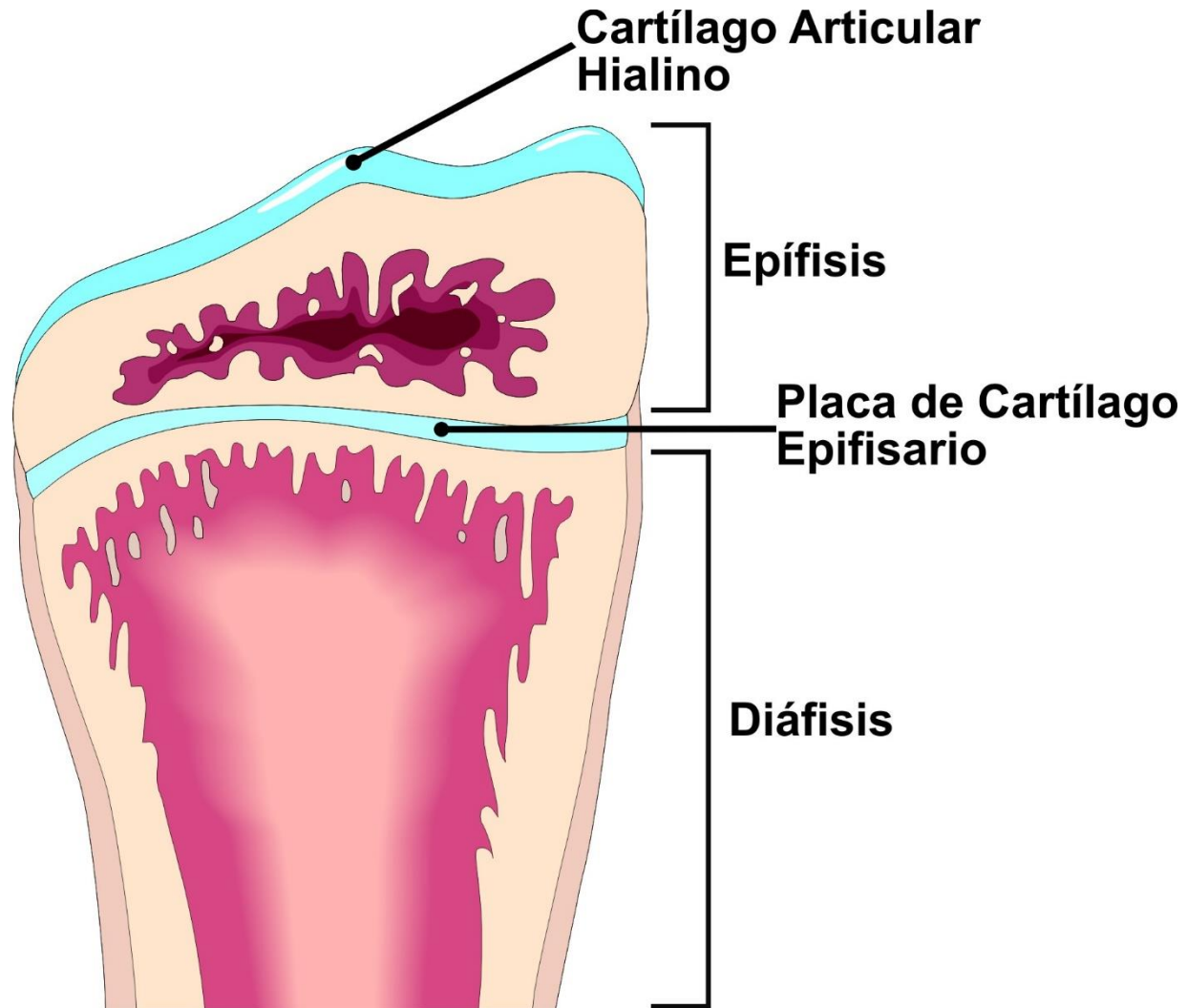
NOTA. Adaptado de: *Strength Training for Young Athletes: Safe and Effective Exercise for Performance*. 2da. ed., (pp. 15-16), por W. J. Kraemer, & S. J. Fleck, 2005, Champaign, IL: Human Kinetics. Copyright 2005 por William J. Kraemer and Steven J. Fleck.

OSIFICACIÓN ENDOCONDRAL DE LA TIBIA





CENTROS DE CRECIMIENTO LINEAL EN LOS HUESOS LARGOS: *PLACA DE CARTÍLAGO EPIFISARIO*



erstanding permit.

SECOND EDITION

STRENGTH TRAINING FOR YOUNG ATHLETES



William J. Kraemer, PhD
Steven J. Fleck, PhD

TABLE 4-1 GUIDELINES FROM THE NATIONAL ASSOCIATION FOR SPORT AND PHYSICAL EDUCATION

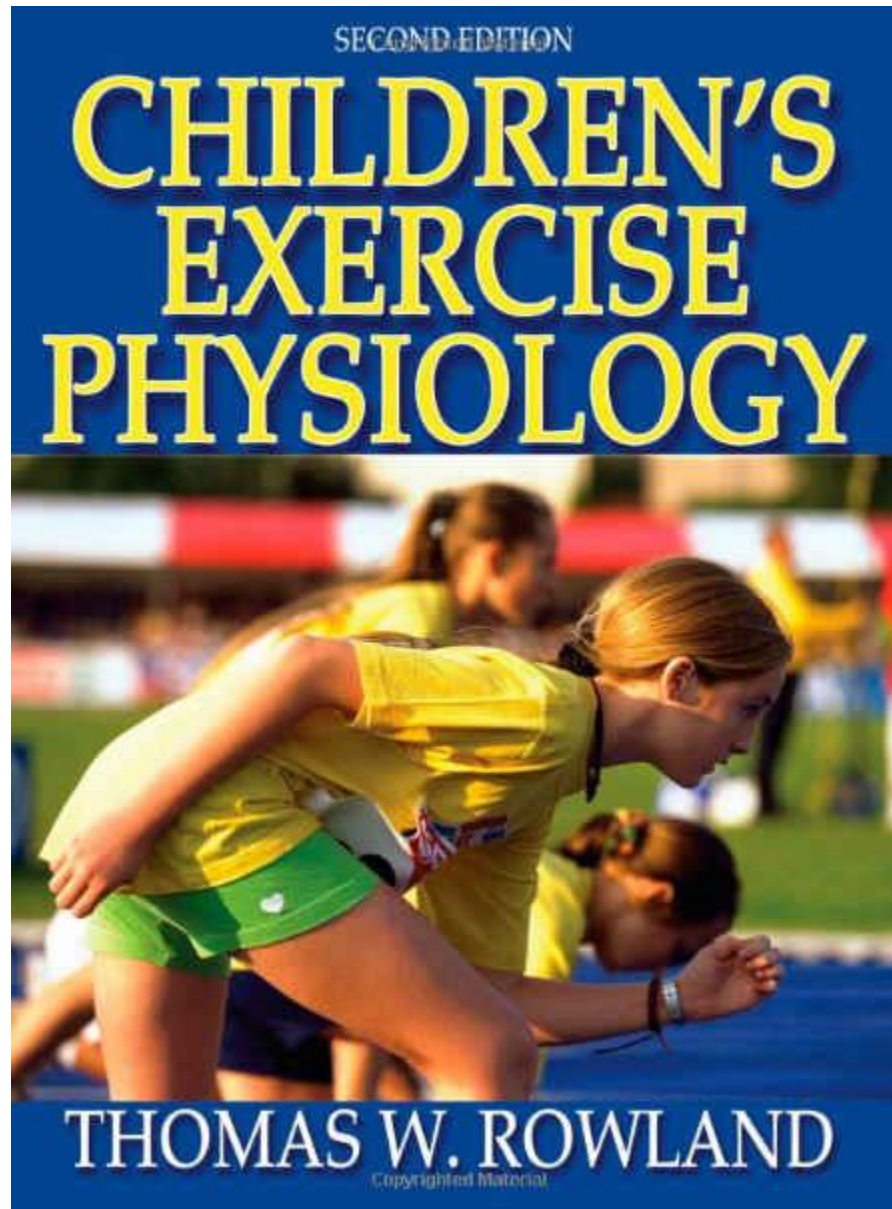
Infants	No minimum; encourage activity that develops motor skills.
Toddlers	1.5 hours; encourage 30 minutes of structured activity plus 60 minutes of unstructured activity.
Preschoolers	2 hours; encourage 60 minutes of structured activity plus 60 minutes of unstructured activity.
School-age children	≥1 hour; encourage bouts of activity lasting 15 minutes or more.

NOTA. Reproducido de: *Exercise for Special Populations*. (p. 99), por P. Williamson, 2011, Philadelphia: Lippincott Williams & Wilkins. Copyright 2011 por: Lippincott Williams & Wilkins, a Wolte Kluwer business.

*** Recomendaciones de Actividad Física ***

-

NOTA. Tomado de: *Resource Manual for Guidelines for Exercise Testing and Prescription*. 9na. ed.; (p. 569), por American College of Sports Medicine, 2014, Philadelphia: Lippincott Williams & Wilkins. Copyright 2014 por: American College of Sports Medicine





ADAPTACIONES DEL EJERCICIO CRÓNICO SOBRE EL SUEÑO

❑ Mito:

- Las personas que realizan ejercicios con regularidad, requieren menos horas de sueño, en comparación con los individuos sedentarios

❑ Realidad:

- El ejercicio crónico facilita el sueño:
 - Fundamentadas en evidencias científicas:
 - ⇒ Los individuos que practican ejercicios con frecuencia:
 - ◇ Inducen un efecto favorable para el sueño:
en comparación con las personas inactivas
 - ▣ Se duermen:
 - ▶ Más rápido ▶ Por más tiempo, y ▶ Más profundo



❑ Hallazgos Científicos:

➤ **El ejercicio:**

- **Mejora la calidad del sueño:**

Para todas las edades

➤ **Efectos del ejercicio crónico:**

- **Entrenamiento aeróbico y con resistencias:**

Mejora la calidad del sueño



➤ **Efectos del ejercicio agudo:**

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➤ **Efectos del ejercicio crónico:**

⇒ **Dispone de un efecto moderadamente positivo:**

■ **En adultos de:**

- ▶ **Edad media, y:**
- ▶ **Adultos mayores (sobre 40 años de edad)**



CONTROL DE PESO

- ☐ Control de peso mediante deshidratación
- ☐ Reducción de grasa localizada
- ☐ Procesos de recuperación



CONTROL DE PESO MEDIANTE DESHIDRATACIÓN



❑ Mito:

- Para perder peso (MC) hay que sudar mucho

❑ Realidad:

- Se pierde MC al metabolizar más lípidos:
 - Fundamentadas en evidencias científicas:
 - ⇒ Las grasas como sustratos - *Menor que 30% VO_2 máx:*
 - ◇ Es más importantes crear un déficit calórico:
1 lb grasa = 3500 calorías
 - ⇒ Perder líquidos resulta en deshidratación: *60% H_2O cuerpo:*
 - ◇ Ocasiones problemas relacionados con el calor:
 - Calambres ■ Agotamiento ■ Choque por calor

A colorful illustration of a bowl of salad. The bowl is filled with green lettuce leaves, red tomatoes, yellow cucumbers, and a yellow dressing. Two wooden salad tongs are shown lifting some of the salad. The bowl is brown and has a textured surface.



Consumo Calórico



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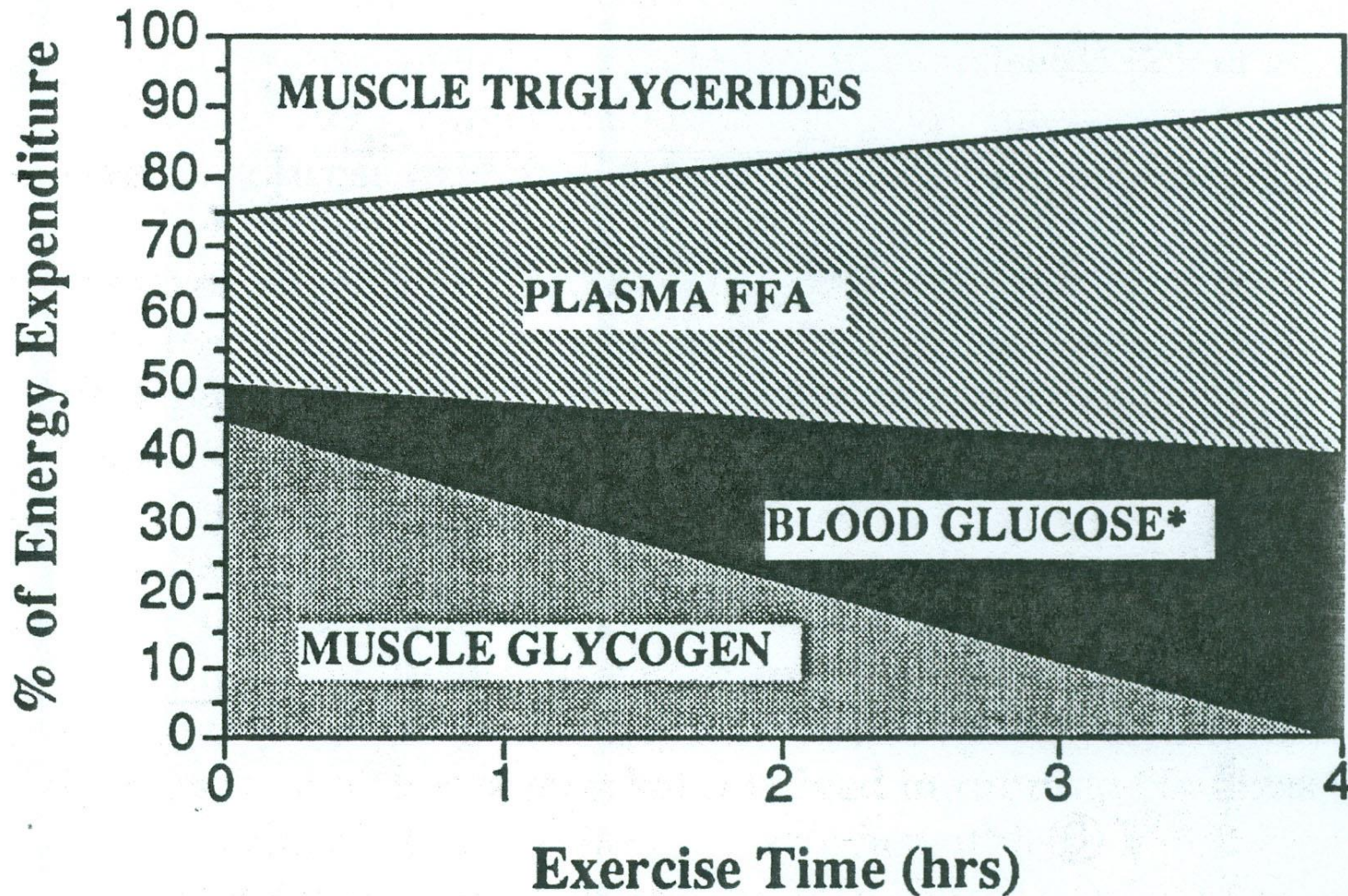


SUSTRATO ENERGÉTICO METABOLIZADO PREFERENCIA SEGÚN LA: *Intensidad del Ejercicio*

INTENSIDAD	COMBUSTIBLE METABÓLICO UTILIZADO
< 30% $\text{VO}_2\text{máx}$	Principalmente las Reservas Musculares de Grasa
40 - 60% $\text{VO}_2\text{máx}$	Se Utilizan Equitativamente las Grasas y los CHO
75% $\text{VO}_2\text{máx}$	Principalmente los CHO
80% $\text{VO}_2\text{máx}$	Cerca del 100% de los CHO

NOTA. Adaptado de: *The Sports Medicine Fitness Course*. (p. 141), por N. Ratamess, 1986, Palo Alto, CA: Bull Publishing Co.. Copyright 1986 por Bull Publishing Co.

UTILIZACIÓN RELATIVA DE LOS PRINCIPALES CUATRO SUSTRATOS: DURANTE UN EJERCICIO PROLONGADO: 65-75% del VO_2 máx



NOTA. Reproducido de: "Fuels for Sports Performance," por E. F. Coyle. En *Optimizing Sports Performance. Perspectives in Exercise Science and Sports Medicine*, Vol. 10. (p. 111), por D. R. Lamb, & R. Murray (Eds.), 1997, Carmel, IN: Cooper Publishing Group. Copyright 1997 por Cooper Publishing Group.

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Regulation of endogenous fat and carbohydrate metabolism in relation to exercise intensity and duration

J. A. ROMIJN, E. F. COYLE, L. S. SIDOSSIS, A. GASTALDELLI,
J. F. HOROWITZ, E. ENDERT, AND R. R. WOLFE

Metabolism Unit, Shriners Burns Institute and Departments of Anesthesiology and of Surgery, University of Texas Medical Branch, Galveston 77550; Human Performance Laboratory, Department of Kinesiology and Health, The University of Texas at Austin, Austin, Texas 78712; and Department of Endocrinology, Academisch Medisch Centrum, University of Amsterdam, 1105 AZ Amsterdam, The Netherlands

Romijn, J. A., E. F. Coyle, L. S. Sidossis, A. Gastaldelli, J. F. Horowitz, E. Endert, and R. R. Wolfe.

Regulation of endogenous fat and carbohydrate metabolism in relation to exercise intensity and duration. *Am. J. Physiol.* 265 (Endocrinol. Metab. 28): E380–E391, 1993.—Stable isotope tracers and indirect calorimetry were used to evaluate the regulation of endogenous fat and glucose metabolism in relation to exercise intensity and duration. Five trained subjects were studied during exercise intensities of 25, 65, and 85% of maximal oxygen consumption ($\dot{V}O_{2\max}$). Plasma glucose tissue uptake and muscle glycogen oxidation increased in relation to exercise intensity. In contrast, peripheral lipolysis was stimulated maximally at the lowest exercise intensity, and fatty acid release into plasma decreased with increasing exercise intensity. Muscle triglyceride lipolysis was stimulated only at higher intensities. During 2 h of exercise at 65% $\dot{V}O_{2\max}$ plasma-derived substrate oxidation progressively increased over time, whereas muscle glycogen and triglyceride oxidation decreased. In recovery from high-intensity exercise, although the rate of lipolysis immediately decreased, the rate of release of fatty acids into plasma increased, indicating release of fatty acids from previously hydrolyzed triglycerides. We conclude that, whereas carbohydrate availability is regulated directly in relation to exercise intensity, the regulation of lipid metabolism seems to be more complex.

mass spectrometry; stable isotopes; free fatty acids; muscle triglycerides; muscle glycogen

the adipose tissue during different exercise intensities is unknown.

Fat oxidized by working muscle is derived not only from plasma FFA but also from muscle triglycerides. Utilization of muscle triglycerides may account for a considerable portion of energy requirements, especially in trained subjects (19, 20), but the rate of utilization of muscle triglycerides has not been quantified at different exercise intensities.

The aim of the present study was to determine the quantitative effects of exercise intensity and duration on endogenous FFA mobilization and utilization. We hypothesized that lipolysis within adipocytes is stimulated maximally during very-low-intensity exercise, since peripheral lipolysis is very sensitive to minimal sympathetic stimulation (4), whereas lipolysis of triglycerides within muscle and thus muscle triglyceride oxidation may be stimulated at higher exercise intensities. To put the data of FFA metabolism into the perspective of overall energy substrate metabolism, whole body carbohydrate metabolism was evaluated simultaneously.

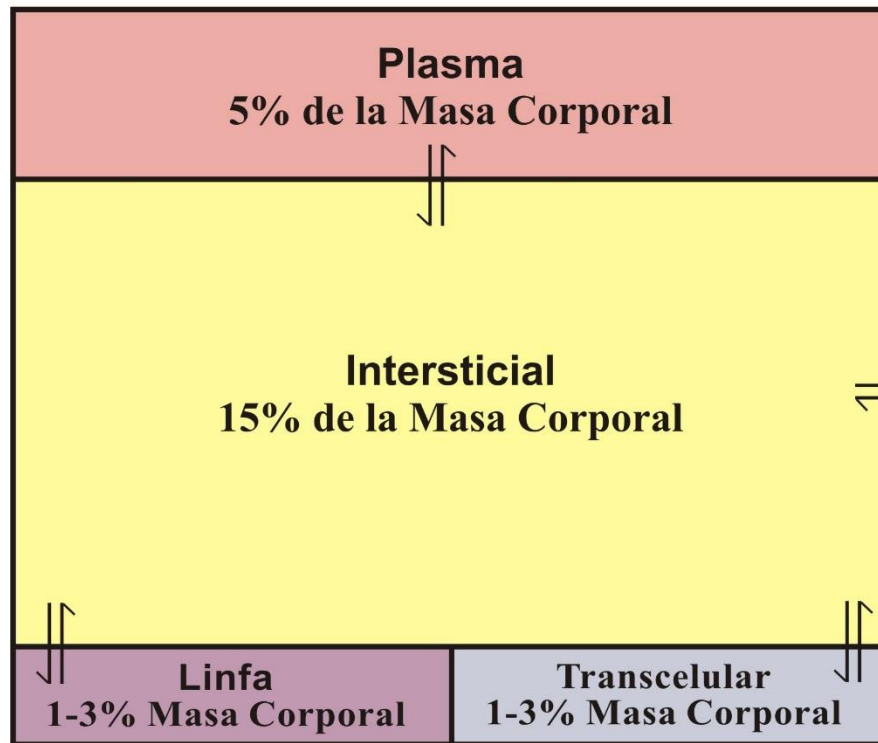
Central to achieving the aim of the present study, it was necessary to quantify fat and carbohydrate oxidation during high-intensity exercise. Indirect calorimetry has previously been thought to be inaccurate due to



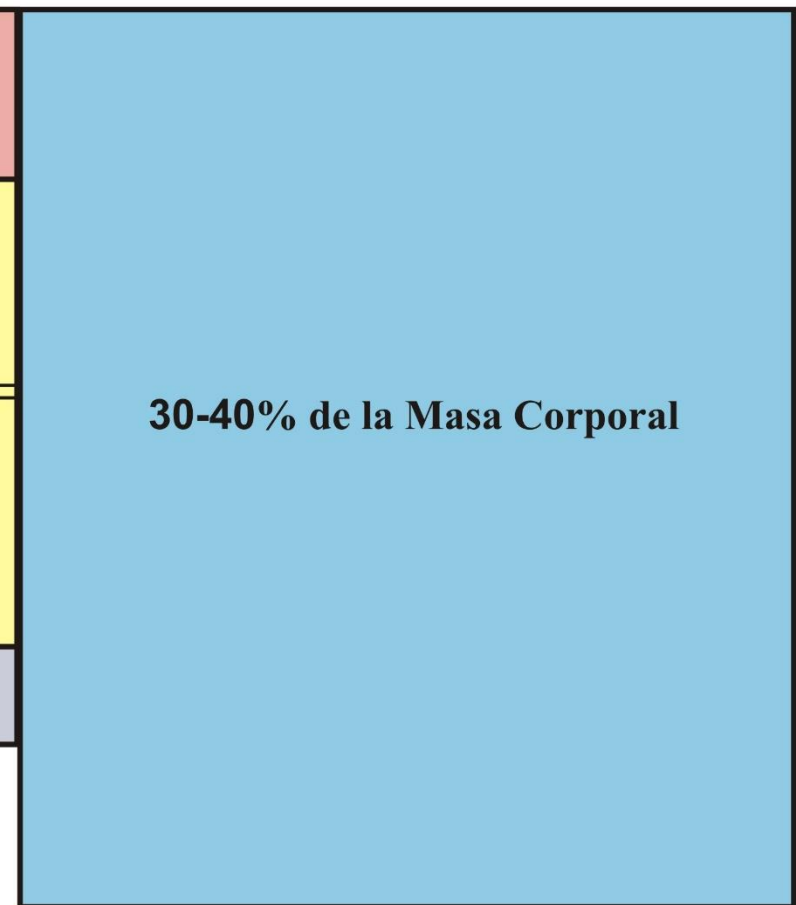
COMPARTIMIENTOS DE LÍQUIDOS EN EL CUERPO

DISTRIBUCIÓN: Extracelular e Intracelular

COMPARTIMIENTO DEL LÍQUIDO EXTRACELULAR



COMPARTIMIENTO DEL LÍQUIDO INTRACELULAR

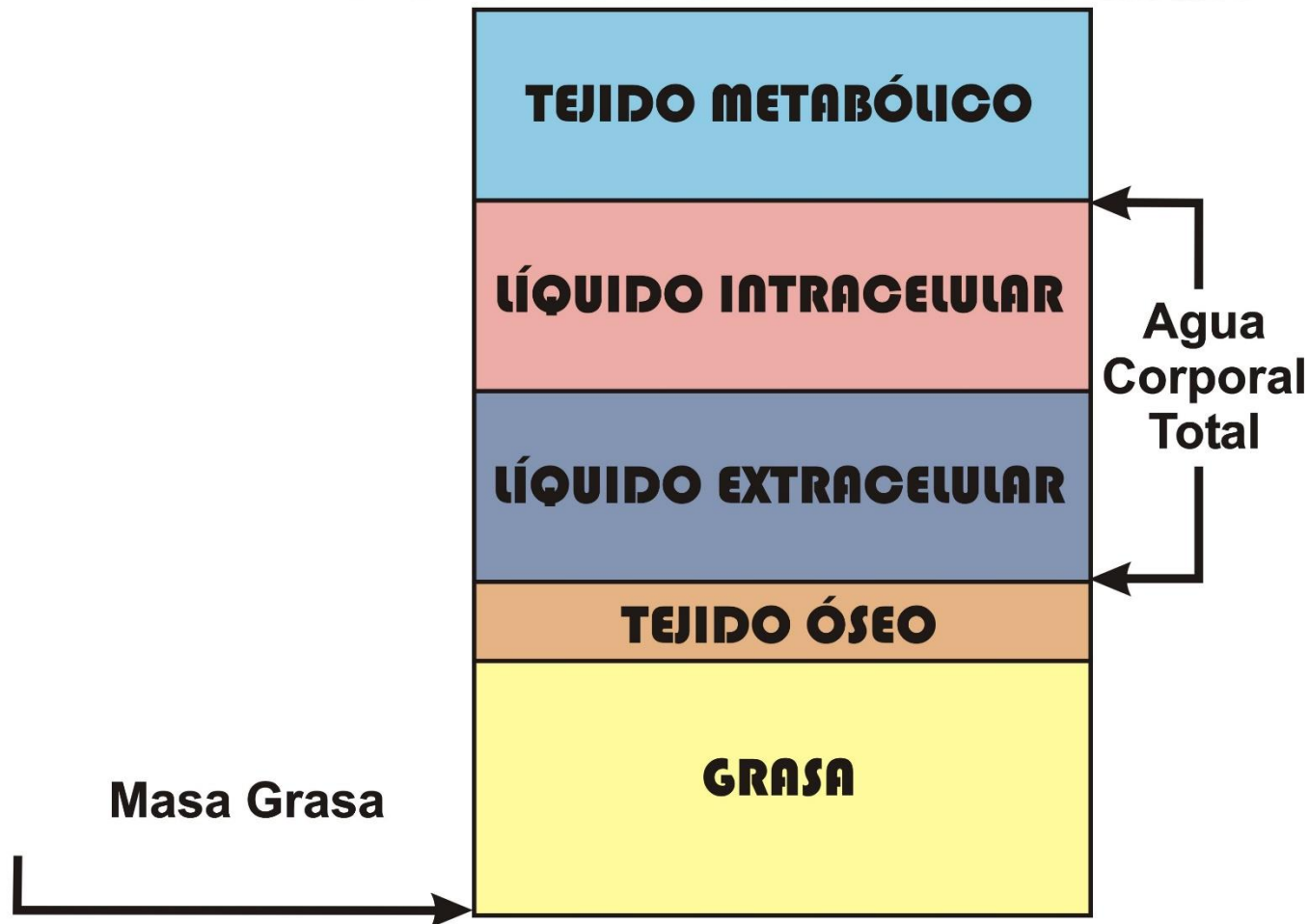




COMPARTIMIENTOS DE LÍQUIDOS EN EL CUERPO

RELACIÓN: Masa Corporal y Agua

RELACIÓN ENTRE MASA CORPORAL Y AGUA



Modelo de Cinco Compartimientos

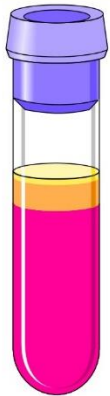
COMPARTIMIENTOS/LÍQUIDOS DEL CUERPO
(60% de la Masa Corporal es Agua)

Citoplasma
(Célula Normal)
Sarcoplasma
(Célula Muscular)

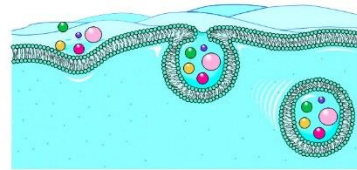
LÍQUIDO EXTRACELULAR
(Fuera de las Células)

LÍQUIDO INTRACELULAR
(Dentro de las Células)

Plasma
(Porción Líquida Sangre)

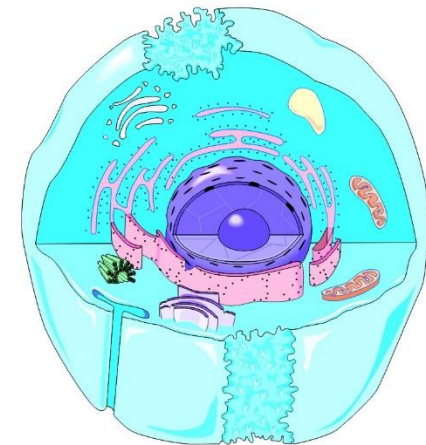
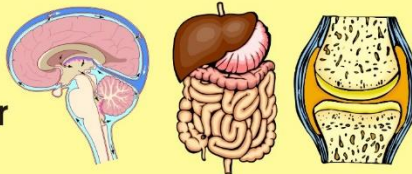


Líquido INTERSTICIAL/TISULAR
(Entre Células/Tejidos)



Líquido TRANSCELULAR

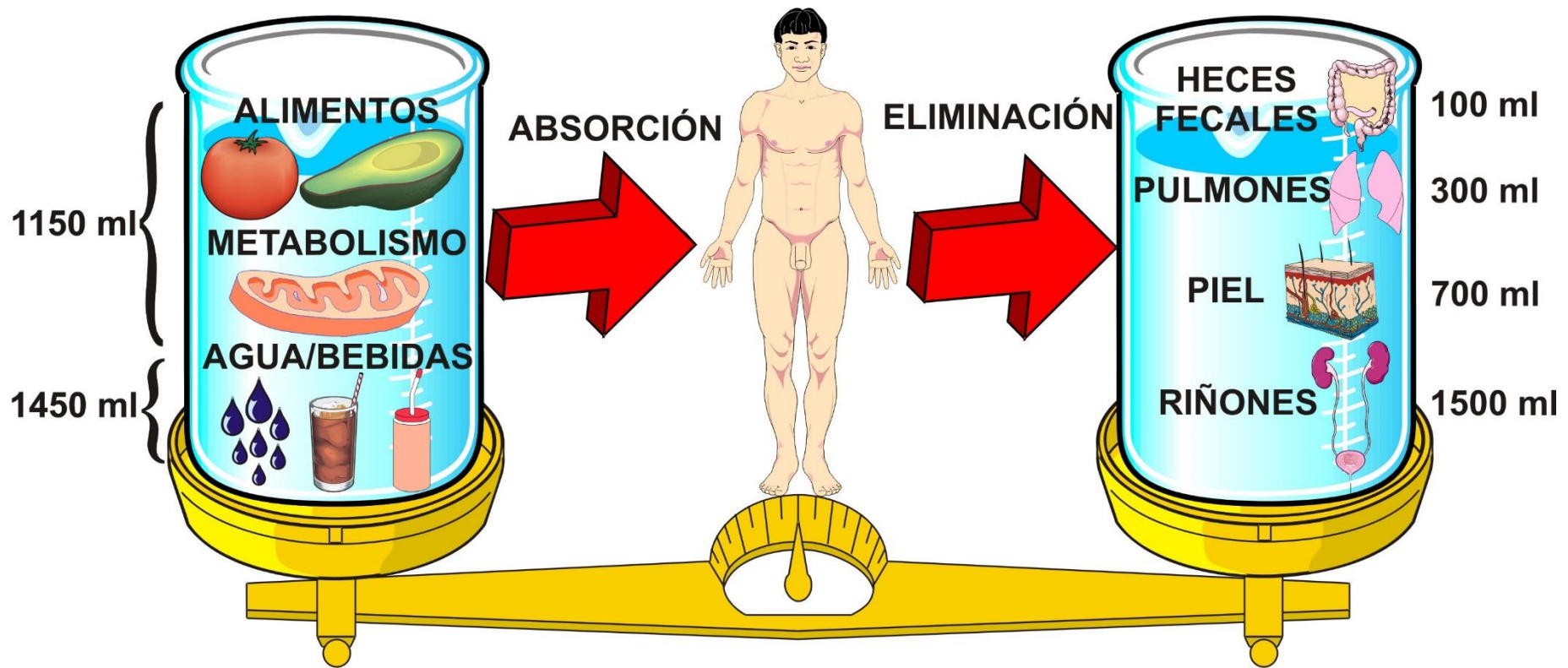
- Líquido Cerebroespinal (encefaloaraquídeo)
- Líquido Secreciones Sistema Gastro-Intestinal
- Líquido Sinovial
- Líquido Pleural
- Líquido Intra-Ocular
- Líquido Peritoneal





LÍQUIDOS EN EL CUERPO

EQUILIBRIO HÍDRICO: Absorción y Eliminación





EFECTOS DE LA PÉRDIDA DE: LÍQUIDOS/AGUA Y ELETRÓLITOS

**** Pérdida de Líquidos ****

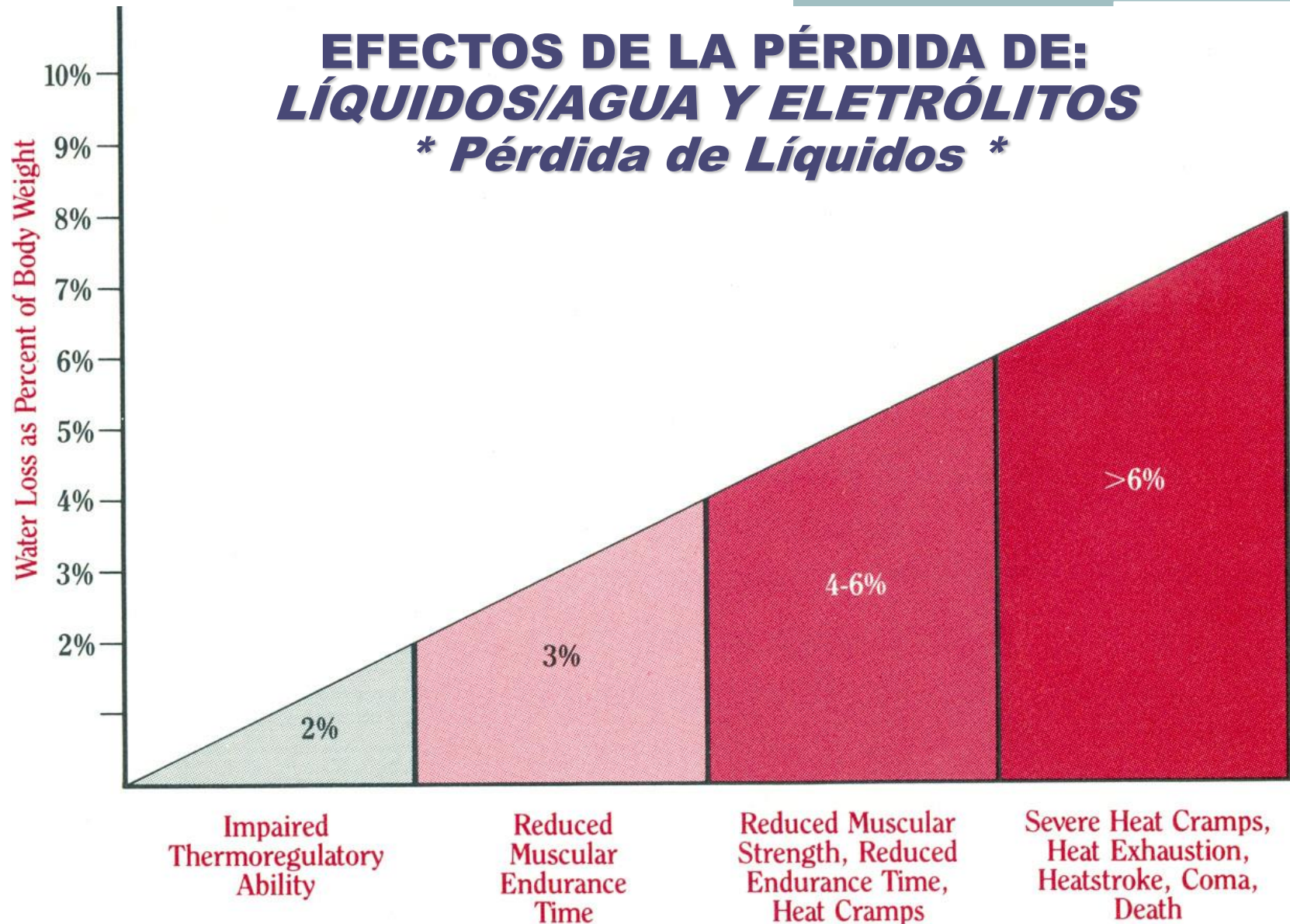


- ☐ **Pérdida de 1% de la Masa Corporal (MC, o Peso):**
 - **Disminución en el tiempo de reflejo**
 - **Reducción en la fortaleza muscular**
 - **Algunos trastornos en el tiempo de reflejo**
- ☐ **Pérdida de 3% de la Masa Corporal (MC, o Peso):**
 - **Aumento en la frecuencia cardiaca**
 - **Incremento en la temperatura rectal**
 - **Disminución en el estado de alerta mental**
 - **Reducción en la respuesta de los reflejos**
- ☐ **Pérdidas adicionales de líquidos:**
 - **Agotamiento por calor**
 - **Choque por calor**



EFECTOS DE LA PÉRDIDA DE: LÍQUIDOS/AGUA Y ELETRÓLITOS

** Pérdida de Líquidos **

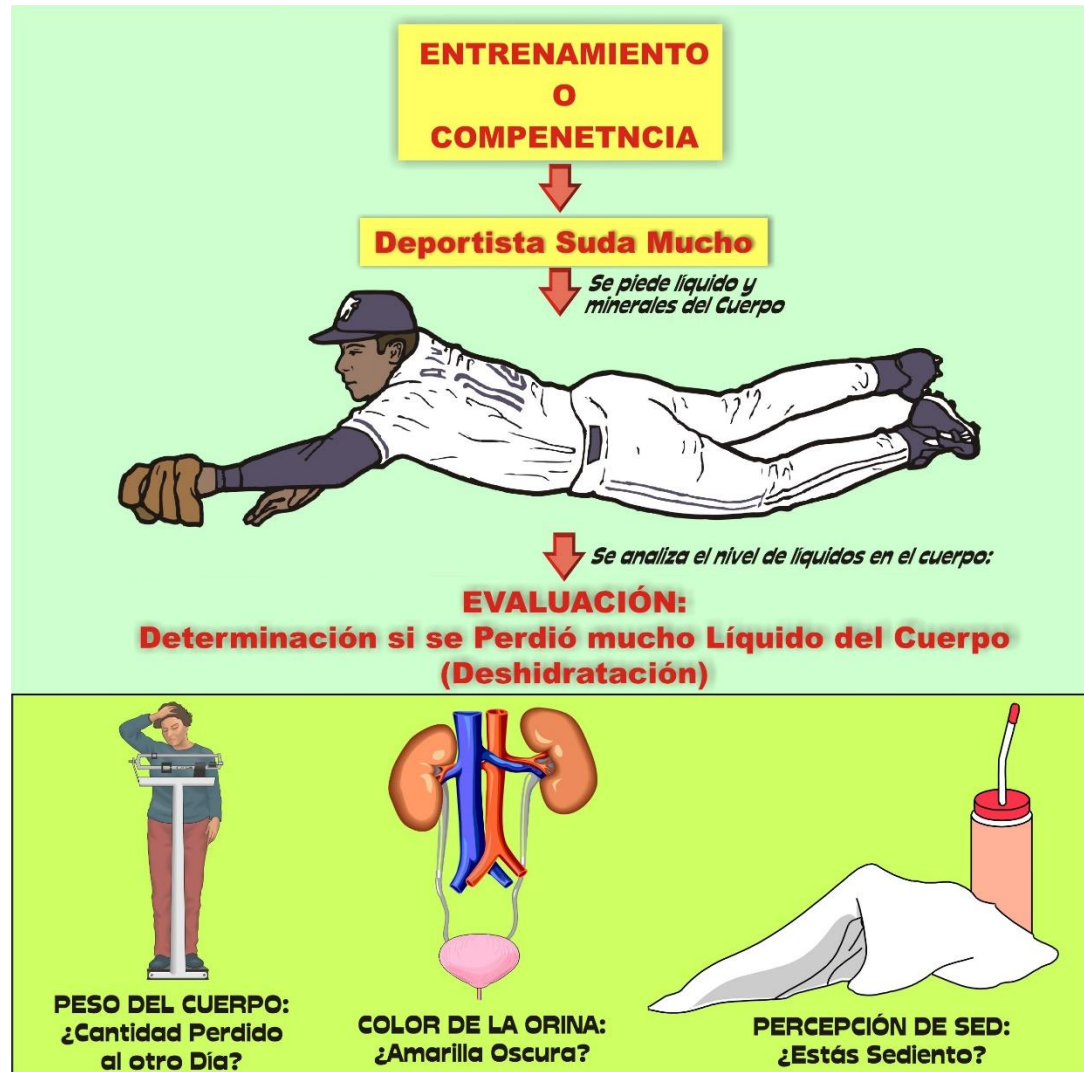




LÍQUIDOS Y ELECTRÓLITOS

REPOSICIÓN DEL AGUA Y ELECTRÓLITOS:

Prueba para Determinar el Estado de Deshidratación



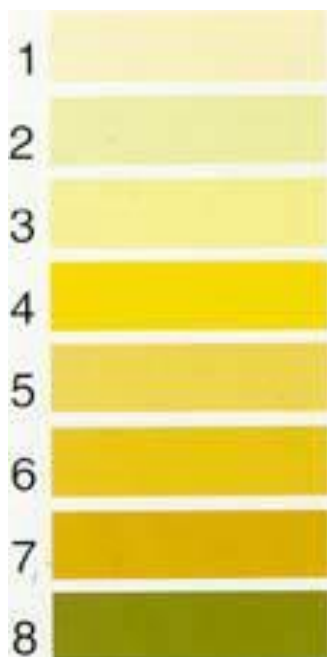


LÍQUIDOS Y ELECTRÓLITOS

REPOSICIÓN DEL AGUA Y ELECTRÓLITOS:

Prueba para Determinar el Estado de Deshidratación: Escala de Armstrong

Fecha	MC1 MC sin Ropa del día Anterior (kg)	MC2 MC sin Ropa de este día (kg)	MC1 - MC2 Diferencia entre las MC (kg)	¿Tienes Sed? (Sí/No)	COLOR DE LA ORINA según la Escala de Armstrong



1 - 3 = Bien Hidratado

4 - 6 = Leve a Moderadamente Deshidratado

7 ó más oscuro = Bien Deshidratado

NOTA. Reproducido de: *Performing in Extreme Environments*. (p.), por L. E. Armstrong, 2000, Champaign, IL: Human Kinetics. Copyright 2012 por AL. E. Armstrong.

LÍQUIDOS Y ELECTRÓLITOS

REPOSICIÓN DEL AGUA Y ELECTRÓLITOS:

Métodos para Evaluar el Estado de Hidratación: En el Campo

Table 9-2. Hydration Status: Body Mass and Urine Color Indices

Hydration	% Body Mass Change	Urine Color
Well hydrated	± 1	1 or 2
Minimal dehydration	-1 to -3	3 or 4
Significant dehydration	-3 to -5	5 or 6
Serious dehydration	Greater than -5	Greater than 6

NOTA. Reproducido de: *Exercise Physiology Integrating Theory and Application*. (p. 285), por W. J. Kraemer, S. J. Fleck, y M. R. Deschenes, 2012, Philadelphia: Lippincott Williams & Wilkins. Copyright 2012 por: Lippincott Williams & Wilkins, a Wolte Kluwer business.

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Antes Competencia



- ▶ **1-2 días antes:**
Beber mucho líquido
- ▶ **2-3 horas antes:**
1½ a 2½ vasos
- ▶ **15 minutos antes:**
1 a 2 vasos
- ▶ **Bebida deportiva:**
Solución de 4-8% CHO

Durante Competencia



- ▶ **Cada 15-20 minutos:**
 $\frac{3}{4}$ -1½ vaso de agua
- ▶ **Cada 15 minutos-**
Corredores de fondo:
 - **Bebida deportiva:**
6-12 onzas, según tolerado
- ▶ **Bebida deportiva:**
Solución de 4-8% CHO

Después Competencia

- ▶ **Primeros 30 minutos:**
2-4 vasos de líquido
- ▶ **Intervalos de 1-2 horas:**
1 litro de agua (16 onzas), o
- ▶ **Por cada 1 libra perdida:**
1 litro de agua (16 onzas)
- ▶ **Bebida deportiva:**
Solución de 4-8% CHO

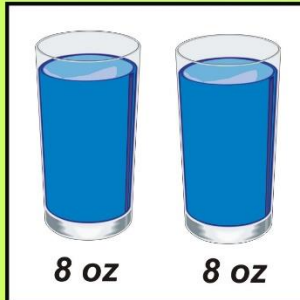


LÍQUIDOS Y ELECTRÓLITOS

REPOSICIÓN DEL AGUA Y ELECTRÓLITOS: Recomendaciones

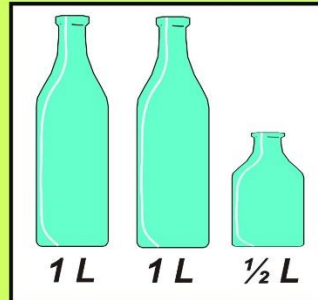
TOMANDO AGUA Y BEBIDAS DEPORTIVAS

2 horas antes del juego:



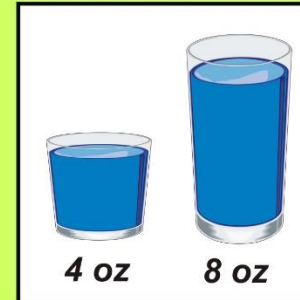
2 vasos de 8 onzas

Por cada hora de juego:



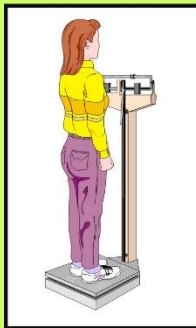
1 a 1½ de litros de agua

Cada 15 minutos durante el juego:

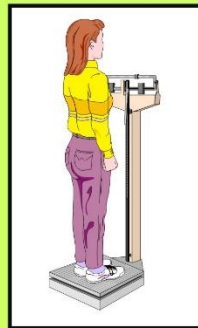


½ a 1 vaso de agua

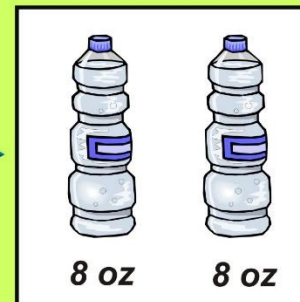
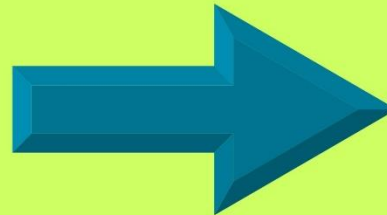
TOMANDO AGUA Y BEBIDAS DEPORTIVAS - Después del Ejercicio:



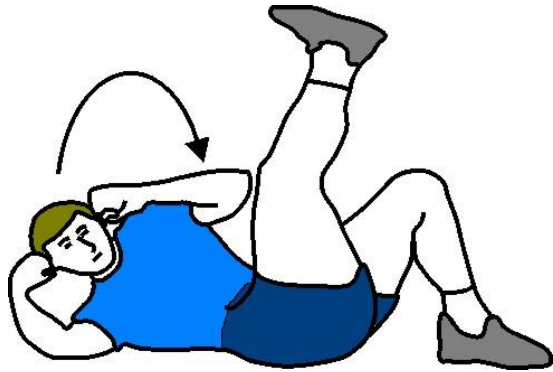
Pesarse



Por cada libra que pierdas



Tomar 16 onzas de agua



REDUCCIÓN DE GRASA LOCALIZADA

❑ Mito:

- Los abdominales son efectivos para reducir la grasa abdominal

❑ Realidad:

- El cuerpo no discrimina por región de las reservas:

- Fundamentadas en evidencias científicas:

⇒ Los abdominales solo queman 3-6 cal/min:

◇ 1 lb grasa = 3500 calorías

⇒ Programa de ejercicios para abdominales:

◇ Tonifica músculos en el área:

No específicamente elimina el tejido adiposo del mismo

Adipose tissue
12,000 g (108,000 kCal)

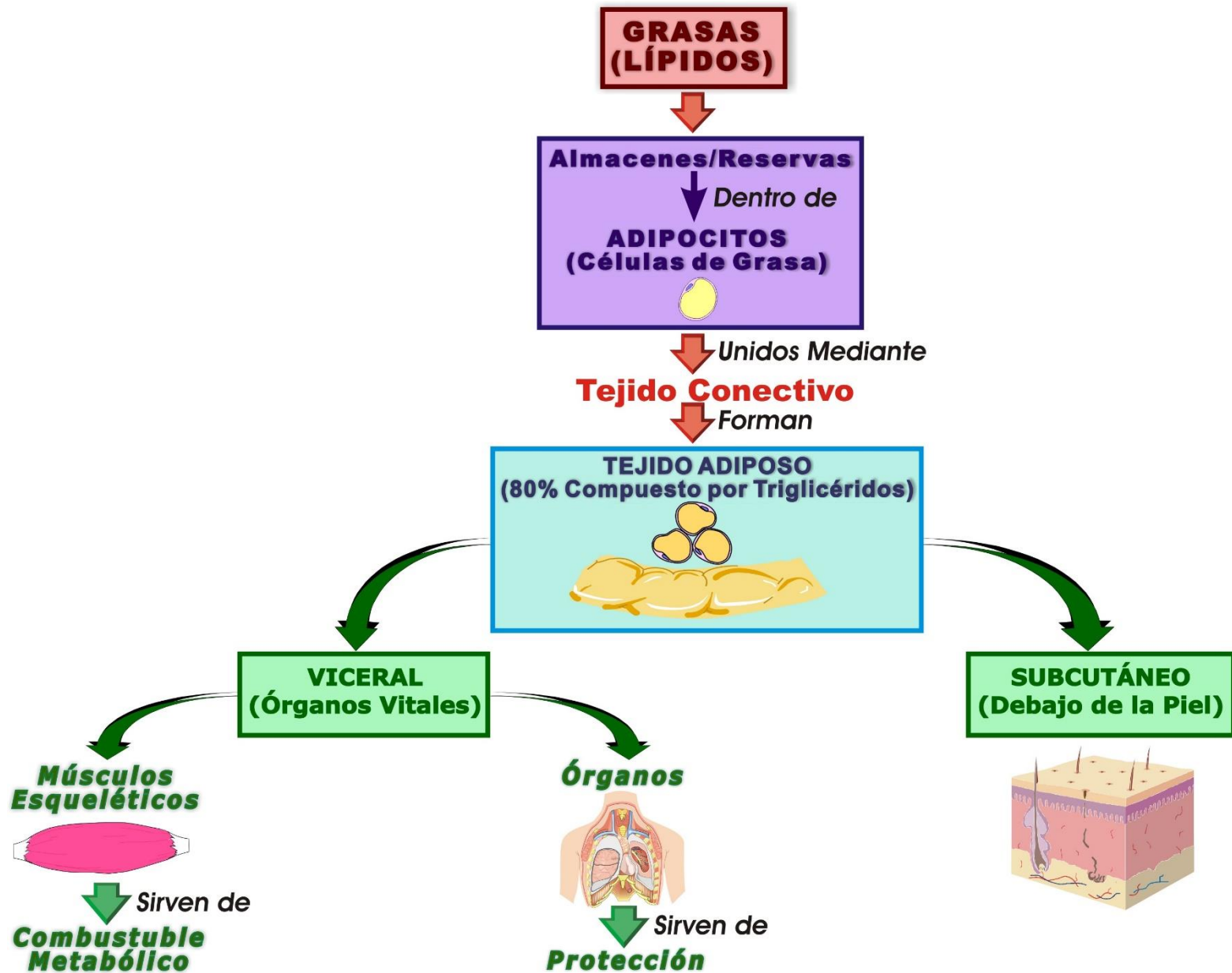
Plasma FFA
0.4 g (3.6 kCal)

Plasma triacylglycerols
4.0 g (36 kCal)

Intramuscular triacylglycerols
300 g (2700 kCal)

Total Fat
12,304 g (110,740 kCal)

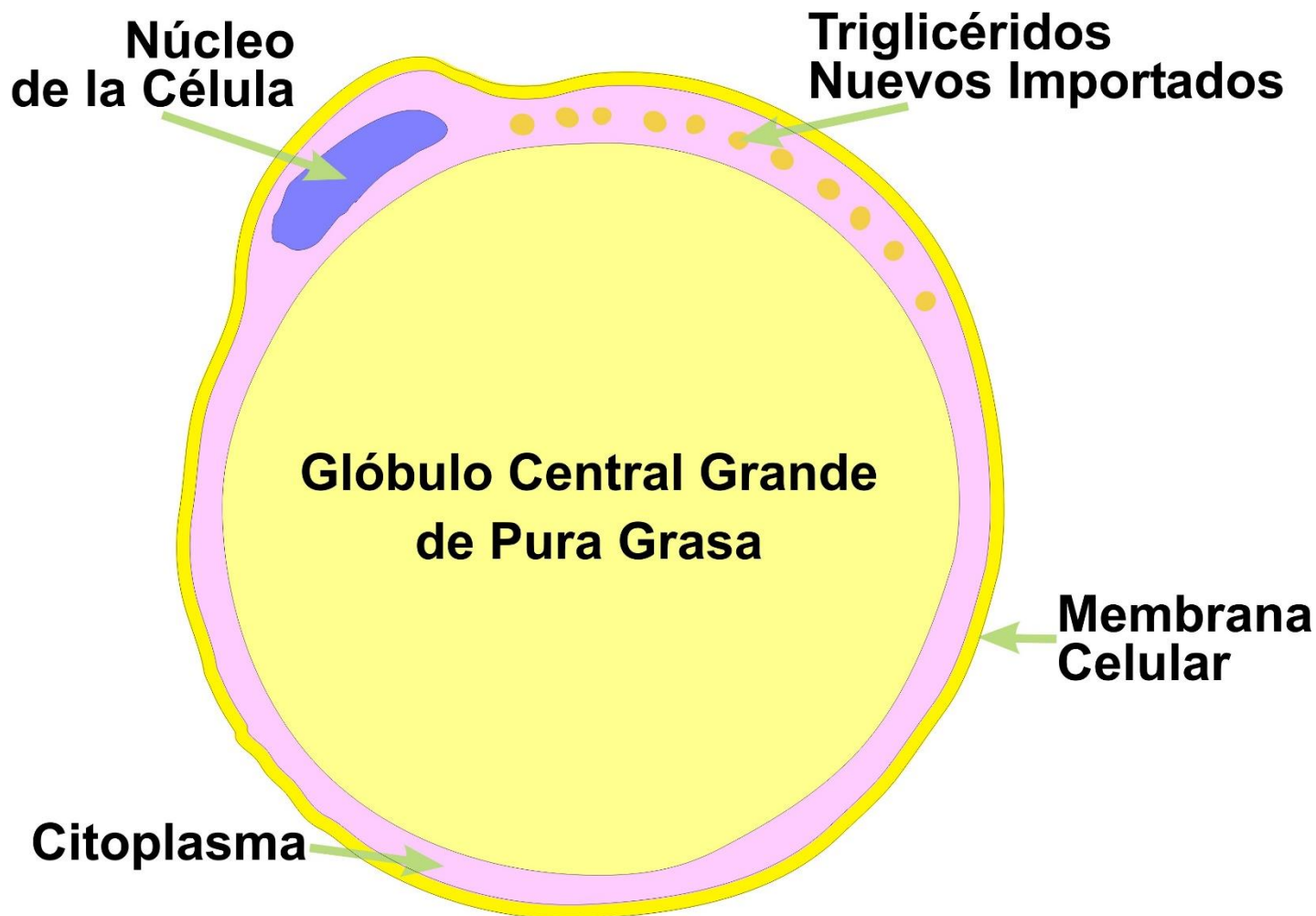
NOTA. Reproducido de: *Sports and Exercise Nutrition*. 7th. ed.; (p. 27), por W. D. McArdle, F. I. Katch, & V. I. Katch, 2010, Philadelphia: Lippincott Williams & Wilkins. Copyright 2010 por Lippincott Williams & Wilkins, a Wolters Kluwer business.

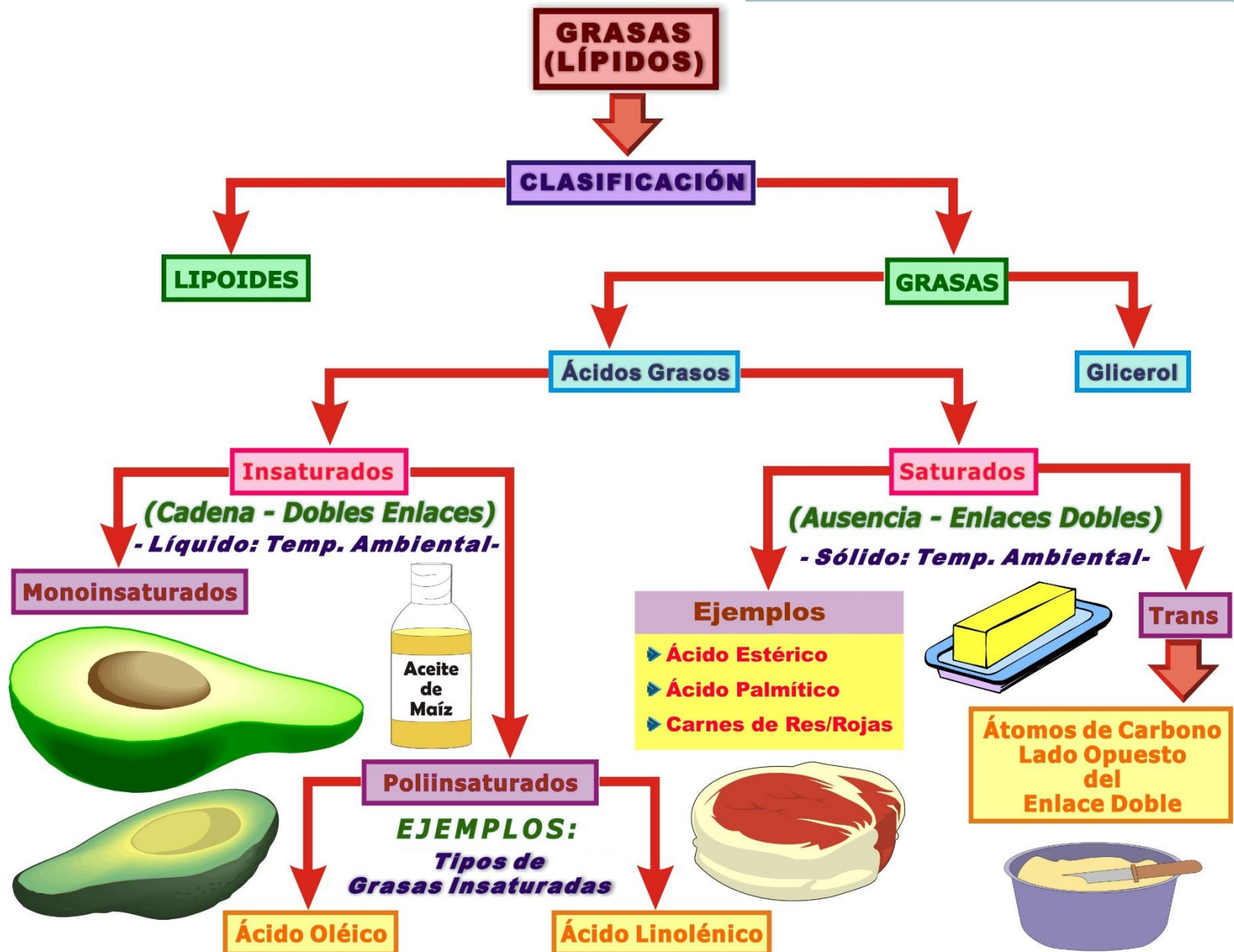


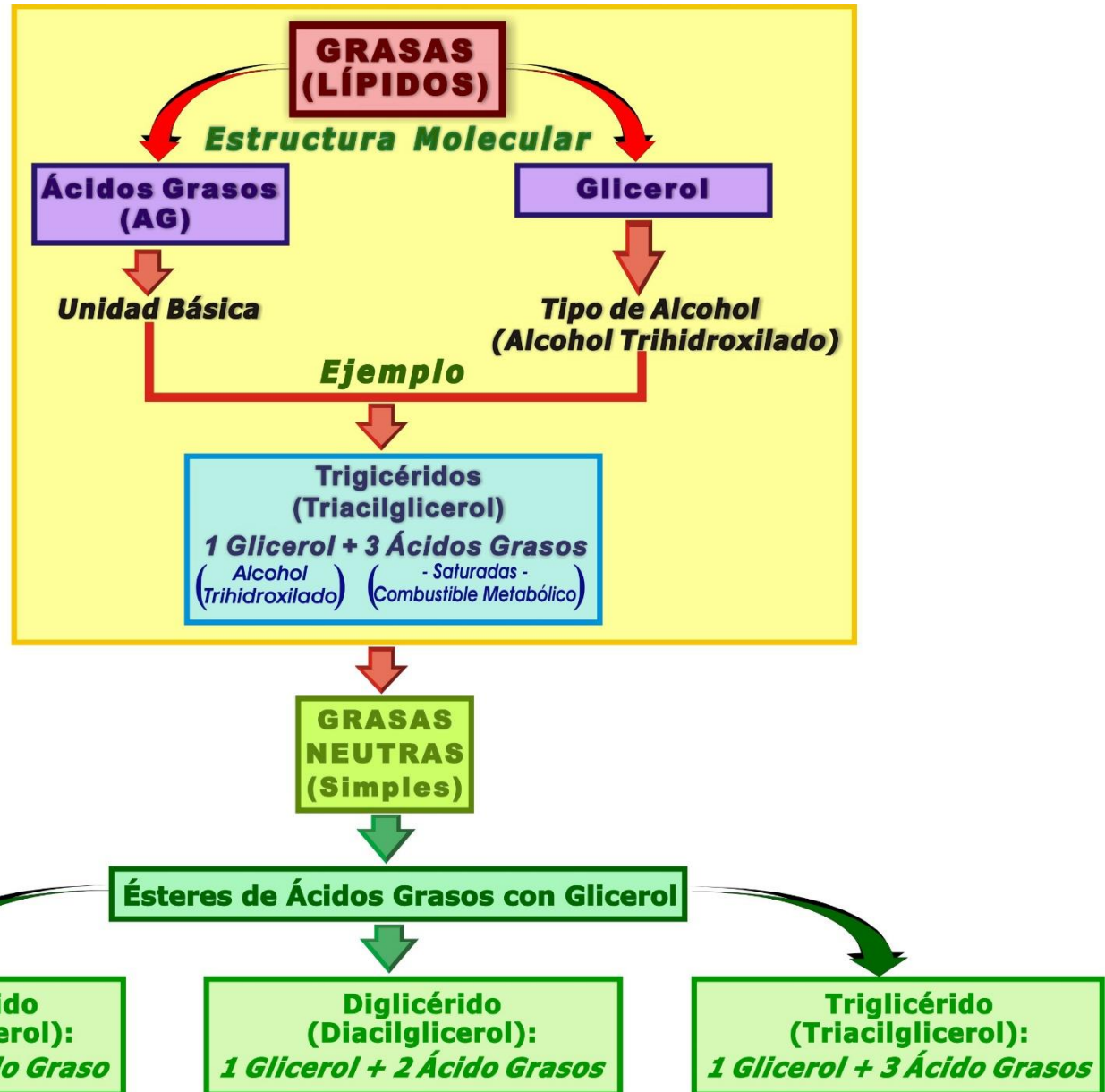


LÍPIDOS - RESERVAS EN EL CUERPO

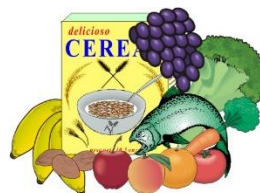
EL ADIPOSITO HUMANO: Célula de Grasa







La Ecuación



3000 kcal Ingeridas - 3000 kcal Gastadas = Sin Cambios de MC

Consumo
Calórico



Gasto
Calórico

EQUILIBRIO CALÓRICO

del



2000 kcal Ingeridas - 3000 kcal Gastadas = Reducción de MC

Consumo
Calórico



Gasto
Calórico

EQUILIBRIO CALÓRICO NEGATIVO

Balance



4000 kcal Ingeridas - 2000 kcal Gastadas = Aumento de MC

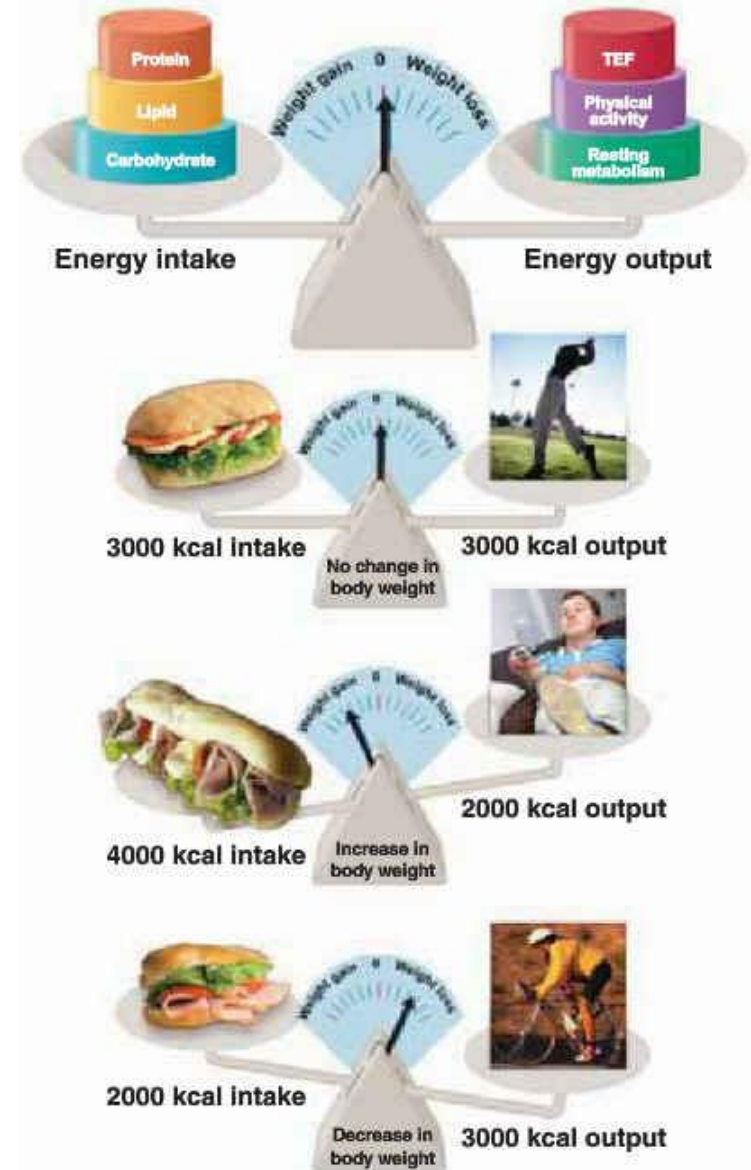
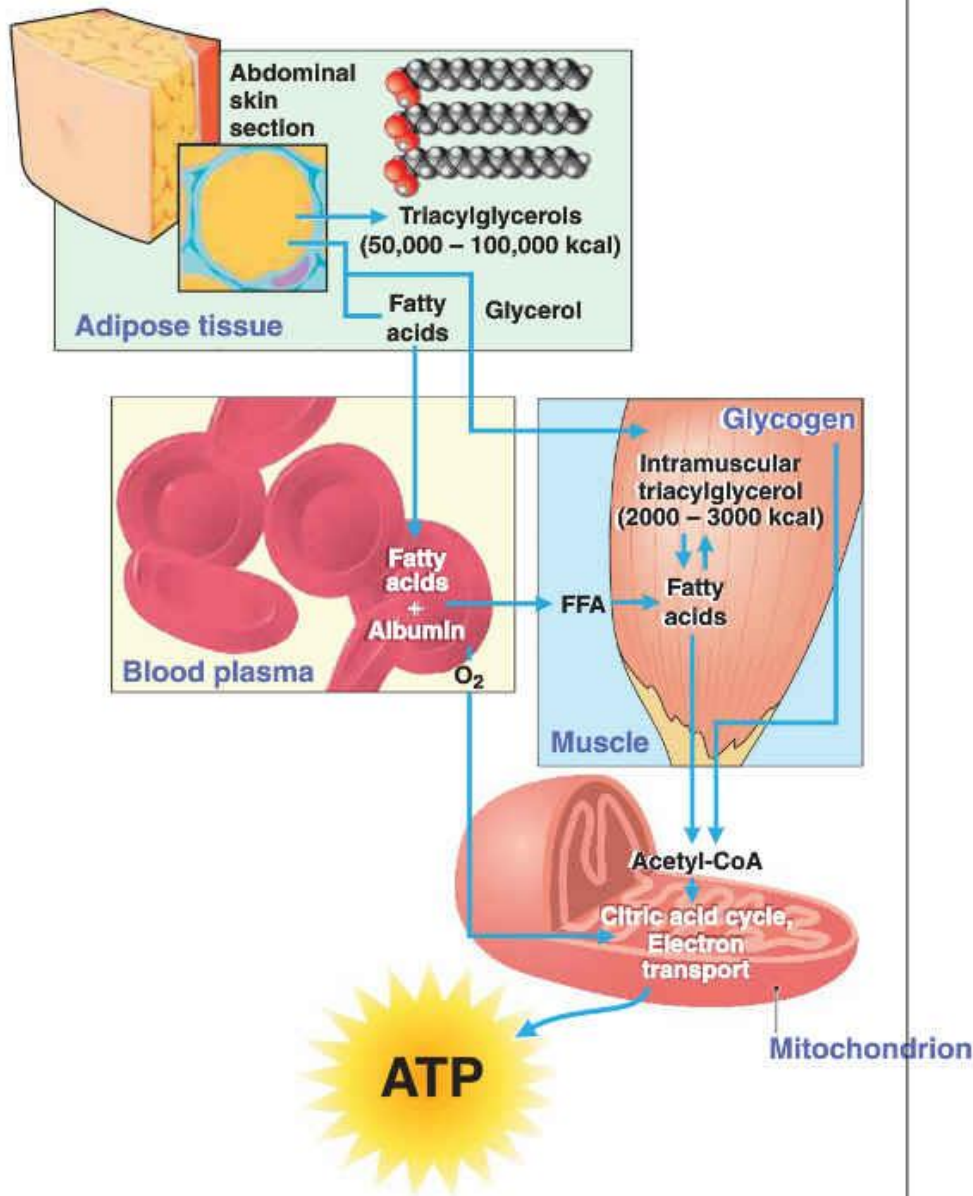
Consumo
Calórico



Gasto
Calórico

EQUILIBRIO CALÓRICO POSITIVO

Energético





➤ **El ejercicio quema muchas calorías**

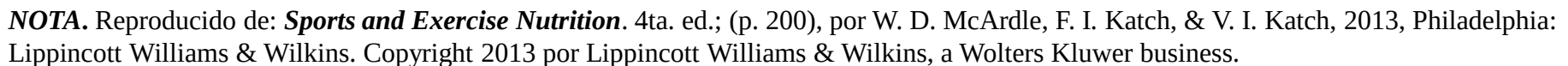
➤ **El cuerpo es económico en términos metabólicos:**

- ⇒ **30 minutos de ejercicios moderados:**
Solo consumen de 200-400 calorías

- ⇒ **Alternativa para el control de peso a largo plazo:**

- ◇ **Disminuir el consumo energético de los alimentos:**
Sólidos y líquidos

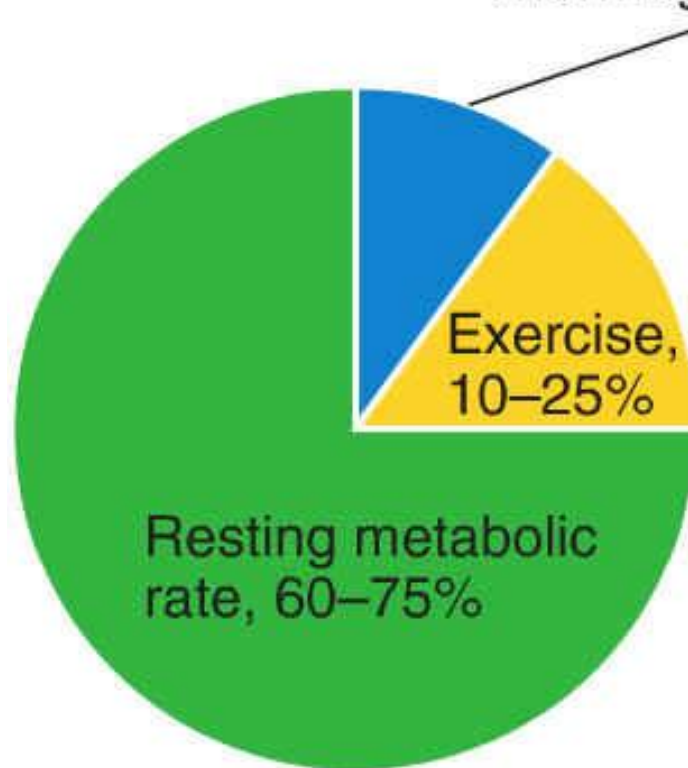
Diario



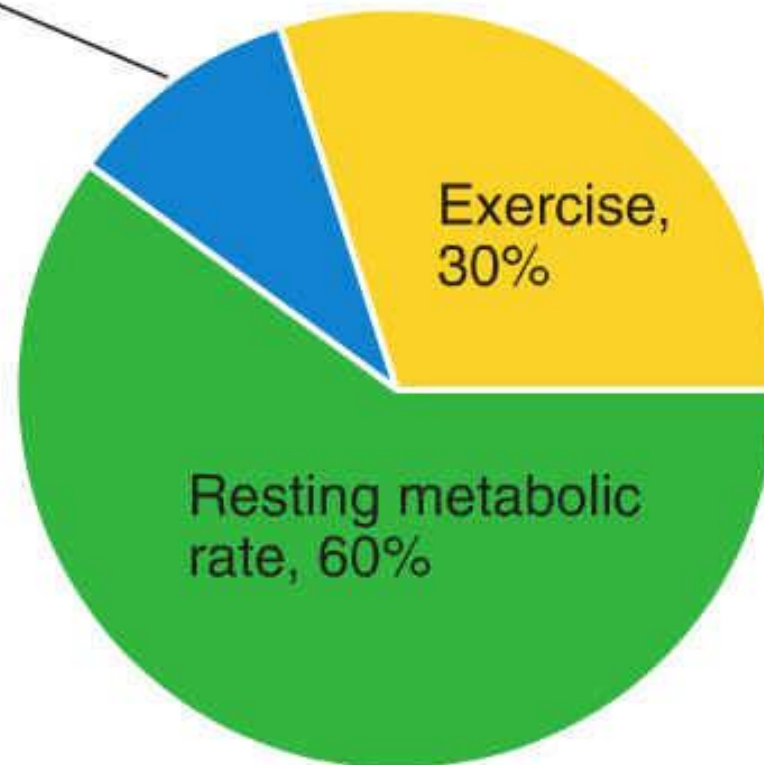
CONTROL DE PESO

GASTO ENERGÉTICO: Sedentario vs. Activo

Thermogenesis, 10%



Sedentary Individual



Active Individual

NOTA. Reproducido de: *Exercise Physiology for Health, Fitness, and Performance*. (p. 220), por S. A. Plowman, & D. L. Smith, 2011, Philadelphia: Lippincott Williams & Wilkins. Copyright 2011 por Lippincott Williams & Wilkins, a Wolters Kluwer business.



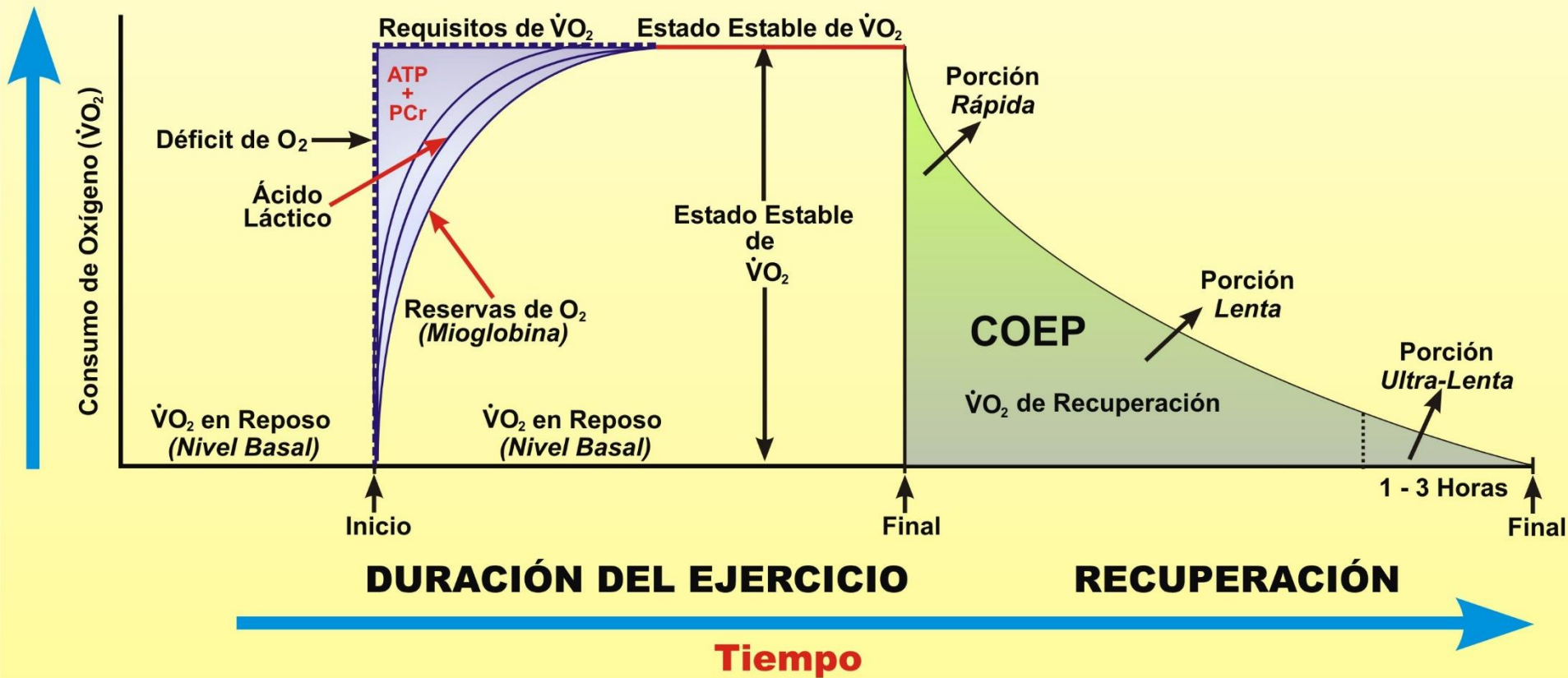
➤ **Después del ejercicio, el metabolismo se acelera todo el día, quemando un gran número de calorías adicionales**

➤ **El cuerpo gasta poca energía posterior al ejercicio:**

- ⇒ **La opción real es disminuir el contenido de lípidos:**
Controlar la ingesta de alimentos altos en calorías

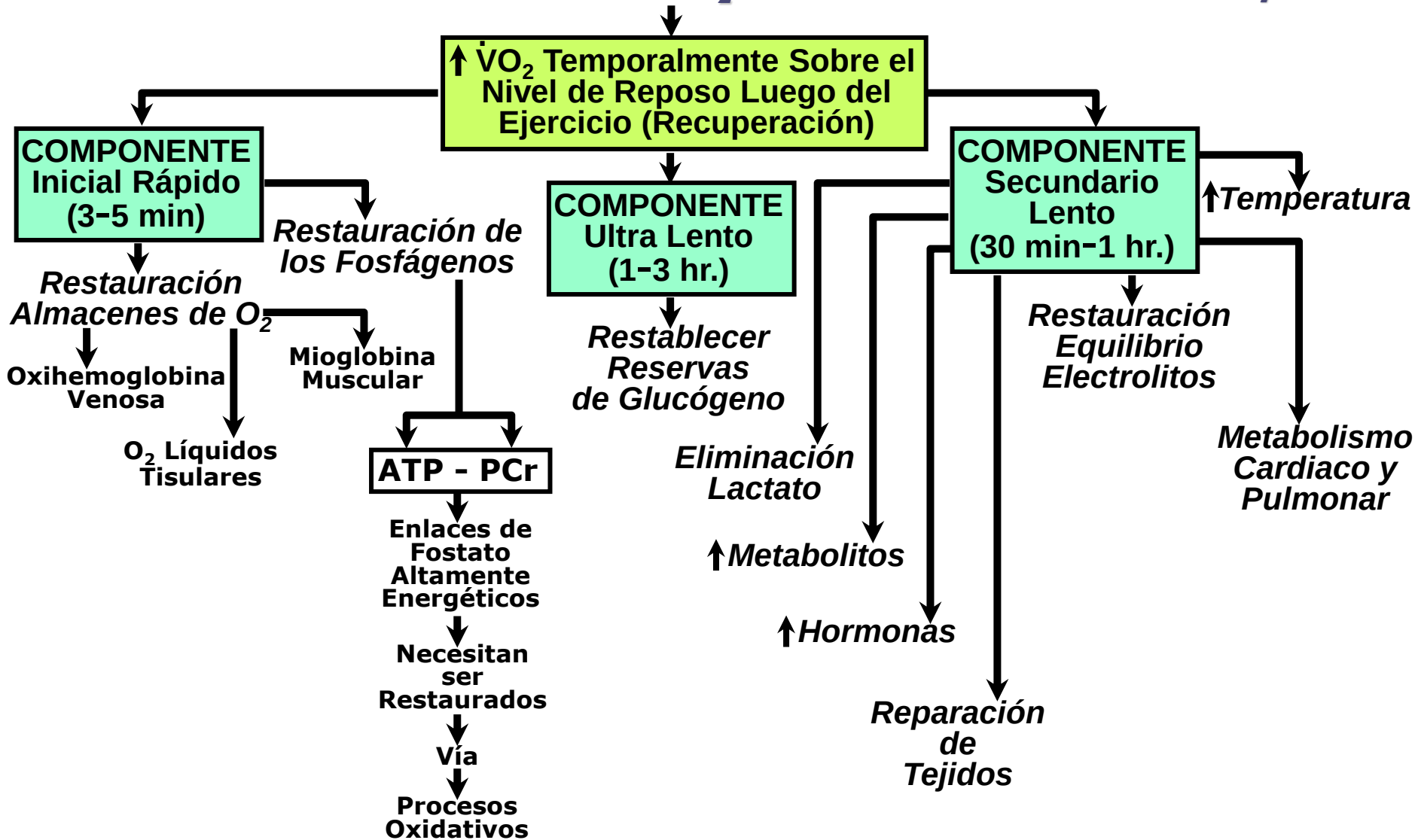


DÉFICIT DE OXÍGENO, ESTADO ESPABLE Y COEP: CONSUMO DE OXÍGENO EN EXCESO POSTERIOR AL EJERCICIO



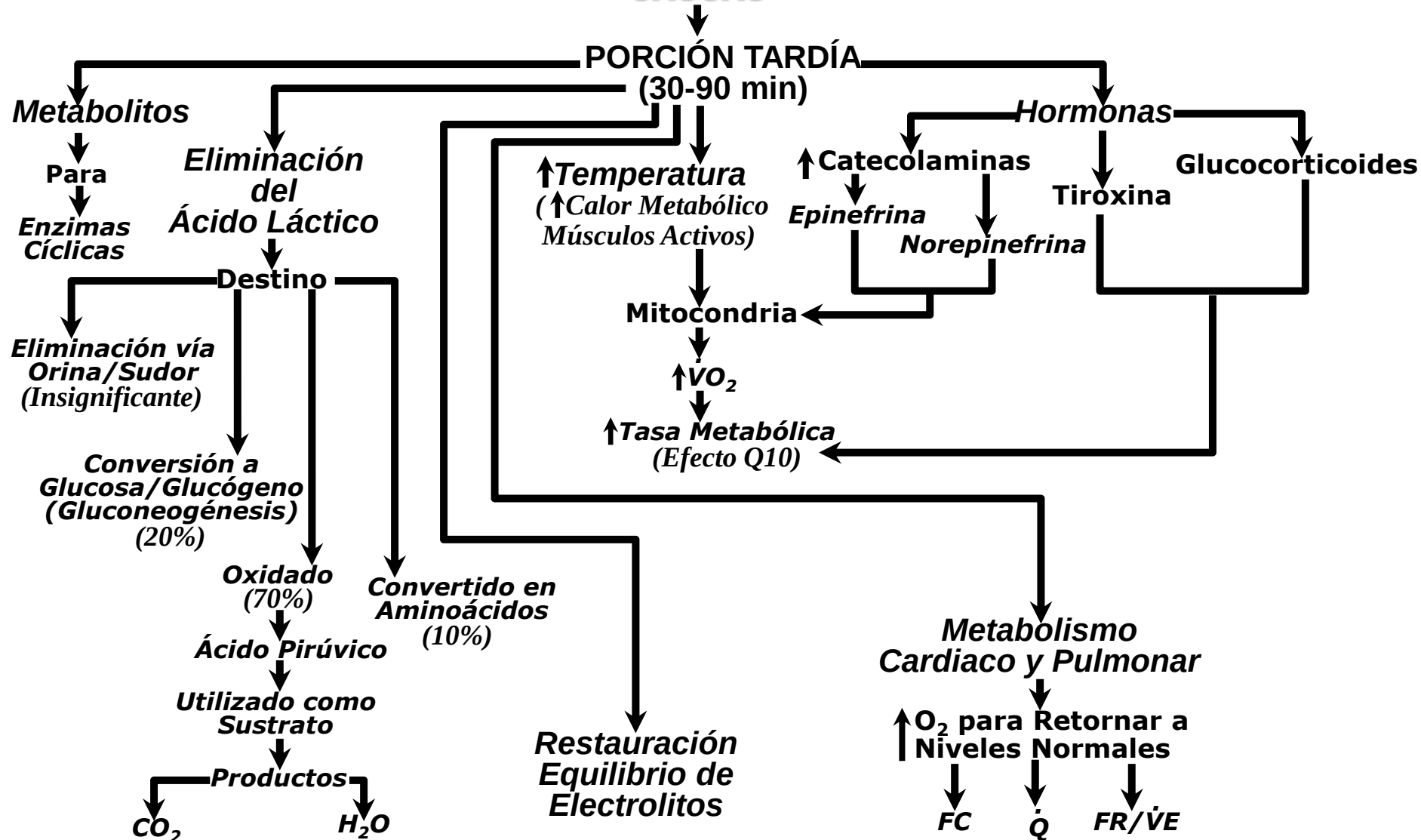


CONSUMO DE OXÍGENO EN EXCESO POSTERIOR AL EJERCICIO (COEP) *OXÍGENO DE RECUPERACIÓN: Exceso O_2 Normalmente Consumido en Reposo*



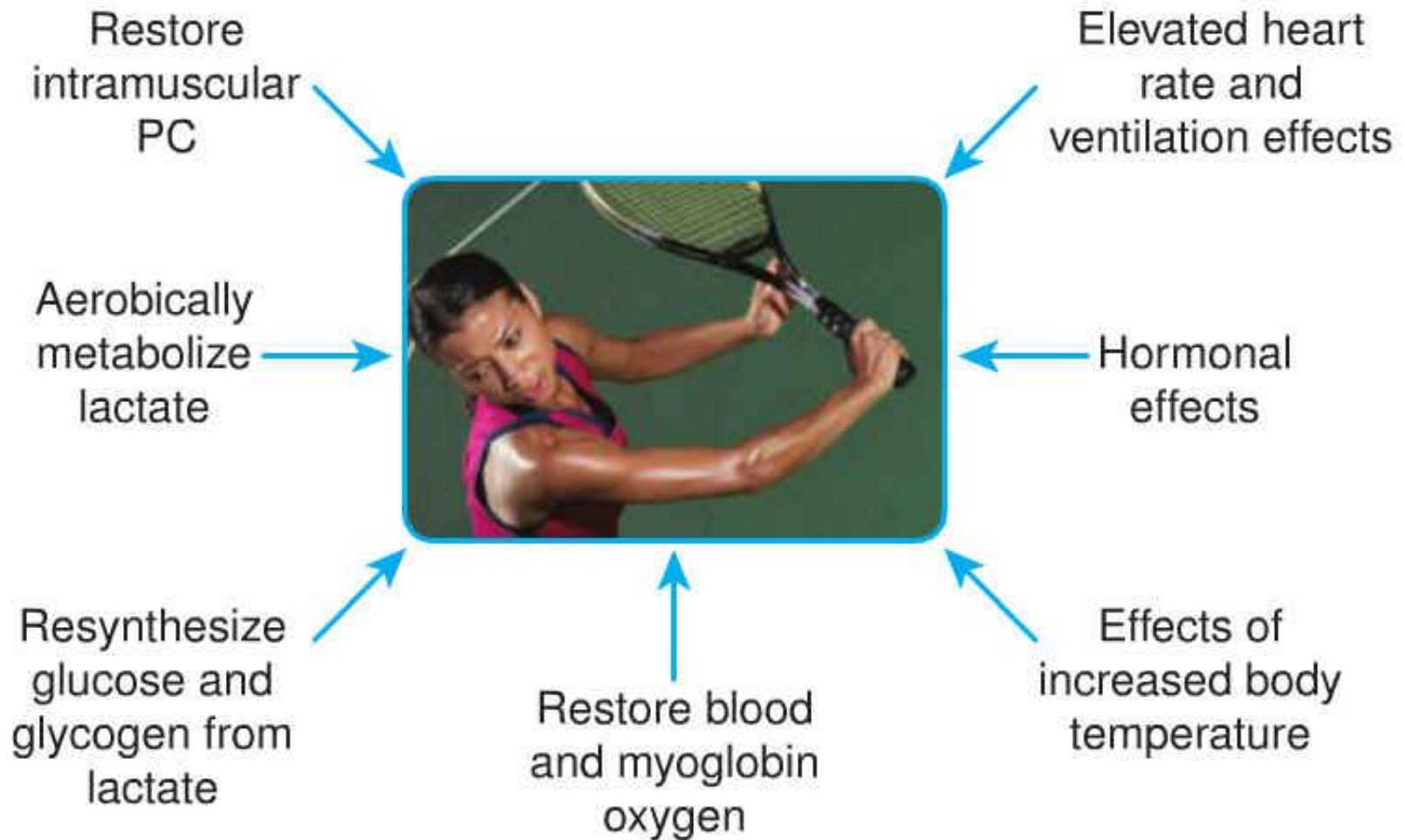


CONSUMO DE OXÍGENO EN EXCESO POSTERIOR AL EJERCICIO (COEP) OXÍGENO DE RECUPERACIÓN: Exceso O_2 Normalmente Consumido en Reposo * CAUSAS *





CONSUMO DE OXÍGENO EN EXCESO POSTERIOR AL EJERCICIO (COEP) *OXÍGENO DE RECUPERACIÓN: Exceso O_2 Normalmente Consumido en Reposo* *** CAUSAS ***



NOTA. Reproducido de: *Exercise Physiology: Integrating Theory and Application*. (p. 52), por W. J. Kraemer, S. J. Fleck, & M. R. Deschmes, 2012, Philadelphia: Lippincott Williams & Wilkins. Copyright 2012 por Lippincott Williams & Wilkins, a Wolters Kluwer business.



NUTRICIÓN Y ACTIVIDAD FÍSICA

- ☐ **CHO, grasas y proteínas**
- ☐ **Vitaminas y minerales**
- ☐ **Hidratación y líquidos**

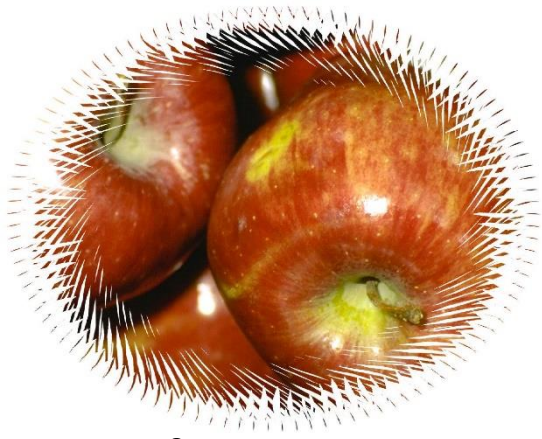
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Realidad: *Las vitaminas no contienen calorías*

Realidad: *El exceso de vitaminas puede afectar la salud*

Realidad: *Consumir variedad de alimentos asegura obtener todas las vit. que el organismo humano requiere*

Realidad: *La mayoría de los CPLD elite tienen una mayor ingesta calórica, lo cual asegura un suministro adecuado vit.*



VITAMINAS Y MINERALES

❑ Mito:

- El ejercicio agota las reservas de vitaminas y minerales, de manera que se requiere la suplementación de estos nutrientes

❑ Realidad:

- Con una dieta equilibrada:
el cuerpo satisface las necesidades de estos nutrientes
- Fundamentadas en evidencias científicas:
 - ⇒ Seleccionar una variedad de alimentos naturales:
Garantiza obtención vitaminas/minerales que necesitan
 - ⇒ Atletas con posibles deficiencias de vitaminas y minerales:
Estética, Vegetariano, Hacer un Peso, Comida Chatarra



VITAMINAS Y MINERALES: *Suplementación* ***DEFICIENCIAS: Deportes de Alto Riesgo***

ATLETAS EN PELIGRO DE UNA DEFICIENCIA VITAMÍNICA



AQUELLOS QUE LIMITAN SU CONTENIDO CALÓRICO



**ATLETAS PENDIENTES A UN AUMENTO
COSMÉTICO DE SU PESO CORPORAL**

-  **Gimnastas**
-  **Bailarinas**
-  **Patinadores
Sobre hielo
de figura**
-  **Clavadistas**



**ATLETAS QUE REQUIEREN
CONTROLAR EL PESO (HACER EL PESO)**

-  **Luchadores
olímpicos**
-  **Boxeadores**
-  **Jinetes de
caballos de
carrera**
-  **Jugadores de
“Football” de
peso liviano**
-  **Remo**
-  **Tripulación
de un navío**



Prácticas Dietéticas Pobres/Deficientes

DISCIPLINA DEPORTIVA	CRITERIO
Gimnasia, jinetes, ballet, baile, gimnasia rítmica, patinaje sobre hielo, aeróbicos	Bajo Peso Corporal: Reducido consumo energético crónico para poder alcanzar un bajo porcentaje de grasa
Deportes que se clasifican por su peso (Ej: judo, boxeo, lucha olímpica, remo, salto con esquí)	Peso de Competencia: Dietas para la pérdida radical de peso, con el fin de llegar a la categoría del peso de competencia deseable
Fisiculturistas	Bajo Peso Graso: Pérdida de peso drástico para alcanzar la cantidad más baja de grasa en el organismo
Atletas vegetarianos	Especialmente en eventos de tolerancia

NOTA: Adaptado de: *Nutritional Needs of Athletes*. (p. 8), por F. Brouns, 1993, New York: John Wiley & Sons. Copyright 1993 por John Wiley & Sons Ltd.



VITAMINAS Y MINERALES:

RECOMENDACIÓN: Atletas en General



- **Ingerir una variedad de alimentos, para asegurar una dieta balanceada, con las raciones adecuadas de cada grupo de alimento, según las demandas energéticas de su deporte**
- **No asumir que la supercarga de vitaminas sustituirá la necesidad de un entrenamiento vigoroso**

The image is a vertical collage of two photographs. The top photograph shows a baseball player in a green uniform with the number 1 on the back, swinging a bat on a reddish-brown dirt field. Two people in white shirts and helmets are crouching in the foreground, watching the play. The bottom photograph shows a rowing team of five people in white shirts on a river, with a grassy bank in the background.

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A close-up photograph of several bright red cherries. The cherries are covered in numerous small, clear water droplets, giving them a glossy, fresh appearance. They are set against a dark, almost black background, which makes the vibrant red color of the fruit stand out. Some green stems are visible, extending from the cherries. The lighting is soft, highlighting the texture of the fruit and the individual droplets.

- 



NOTA. Adaptado de: "ChooseMyPlate.gov: Getting Started with MyPlate," por United States Department of Agriculture [USDA], 2012. Copyright 2012 por United States Department of Agriculture [USDA]. Recuperado de <http://www.choosemyplate.gov/downloads/GettingStartedWithMyPlate.pdf>

PIRÁMIDA ALIMENTARIA: *PUERTO RICO*

