MITOS Y LEYENDAS SOBRE EL EJERCICIO FÍSICO:
Tendencias del Mercado

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Artículo: *http://www.saludmed.com/articulos/Fisiologia_del_Ejercicio/Ejercicio-Fisico_Mitos_y_Leyendas.html*

CONTENIDO DE LA PRESENTACIÓN

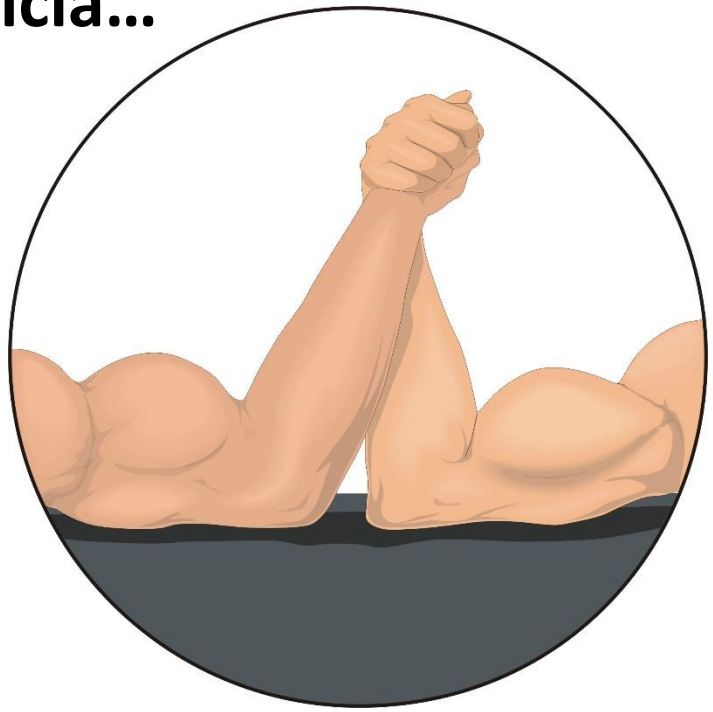
- Introducción
- Programas de ejercicio y actividad física
- Efectos del ejercicio agudo y crónico
- Control de peso
- Nutrición y actividad física
- Fraude comercial
- Terminología inapropiada
- Conclusión
- Referencias
- Recursos en la Internet/Web

INTRODUCCIÓN

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

CONCEPTO DE MITO

- “Historia ficticia…”



NOTA. De: "mito1," por Real Lengua Española [RAE], 2001, ***Diccionario de la lengua española***. 22ma. ed., Copyright 2001 por Real Academia Española. Recuperado de ***http://lema.rae.es/drae/?val=Mito***

FRAUDE DE LA SALUD

- **Internet/Web:**
  - **"alfabetización informacional":**
    - **Discriminar información fraudulenta**
    - **Criterios para un control de calidad:**
      - ⇨ **Código de conducta (HON code)**
      - ⇨ **Web Médica Acreditada (WMA)**
      - ⇨ **Webs Médica de Calidad (WMC)**
      - ⇨ **Información sobre fraudes de Medline Plus**
      - ⇨ **Página CDC sobre leyendas urbanas y falsos rumores**
      - ⇨ **Orientación de la FTC sobre ventas de productos milagrosos**

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).

INVESTIGACIONES

- **Fisiología del ejercicio:**
  - **Fundamentos científicos:**
    - **Información basada en evidencias:**
      - **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:***
          - **Revistas arbitradas (peer review journals)**

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.

INVESTIGACIONES

- **Métodos NO Científicos para contestar la pregunta:**
  - **Intuición**
  - **Tradición**
  - **Ensayo y error (*trial and error*)**
  - **Predisposición (*bias*)**
  - **Autoridad**
  - **Racionalización (razonamiento)**
  - **Método empírico**
  - **El mito**

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MITOS DEL EJERCICIO

- **Mitos del ejercicio y de la actividad física:**
  - **Posibles raíces:**
    - **Anuncios fraudulentos:**
      - ⇨ **Equipos y productos de ejercicio**
      - ⇨ **Bebidas deportivas**
  - **Solución:**
    - **Adquisición de conocimiento mediante:**
      - ⇨ **Hechos derivados de la evidencia científica**

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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**

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MITOS DEL EJERCICIO:

Identificar Sitios-Web

Basados en Evidencia Científica

- **Estrategias/Recomendaciones:**
  - **Cotejar la presencia de los siguientes criterios:**
    - **Dispone de un plan motivación adaptado necesidades:**
      - ⇨ **Equilibrio en la toma de decisiones**
      - ⇨ **Auto-eficacia**
      - ⇨ **Otros constructos psicológicos:**
        disponen de retrocomunicación a los clientes

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

PROGRAMAS DE EJERCICIO Y ACTIVIDAD FÍSICA

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

METODOLOGÍA DEL ENTRENAMIENTO FÍSICO

- **Mito:**
  - **Efectuar 15 minutos de ejercicios aeróbicos, 3 veces a la semana es suficiente para mejorar el componente cardiorrespiratorio**
- **Realidad:**
  - **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 - *Intensidad Moderada*:** 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.

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COMPONENTE	GUÍA O DOSIS
Modo : **(Tipo de Ejercicio)**	▶ ***Ejemplos*:** ● **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 *spinning*, ejecicios con máquinas elípticas, ejercicos aeróbicos de escalón, baile rápido

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COMPONENTE	GUÍA O DOSIS
Modo : **(Tipo de Ejercicio)**	▶ ***Ejemplos*:** ● **Grupo C:** ◈ **Descripción:** Actividades de Tolerancia Aeróbicas/Cardiorrespiratorias ● ***Requisito*: Destrezas motrices adecuadas** ● ***Requisito*: Aptitud física promedio** ◈ **Población indicada** - Adultos: Habilidades motoras apropiadas ◈ **Ejemplos:** Natación, esquí de campo traviesa, patinaje ● **Grupo D:** ◈ **Descripción:** Deportes recreativos ◈ **Población indicada** - Adultos: ● Participan en un programa de ejercicio regular ● Poseen un aptitud física promedio ◈ **Ejemplos:** Deportes de raqueta, baloncesto, balompie (fútbol), esquí de cuesta abajo, excursionismo a pie (caminata)

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COMPONENTE	GUÍA O DOSIS
Intensidad : (%, absoluto)	▶ ***Descripción:*** ● **Para la mayoría de los adultos - *Moderada a Vigorosa:*** ◈ **Moderada:** ● *Por ciento de la frecuencia cardiaca máxima de reserva (%FCmáx-resv)*: **40 - 59%** ● *Por ciento del consumo de oxígeno de reserva (%VO_2R)*: **40 - 59%** ● *Por ciento de la frecuencia cardiaca máxima (%FCmáx)*: **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 (%FCmáx-resv)*: **60 - 89%** ● *Por ciento del consumo de oxígeno de reserva (%VO_2R)*: **60 - 89%** ● *Por ciento de la frecuencia cardiaca máxima (%FCmáx)*: **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**

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COMPONENTE	GUÍA O DOSIS
Intensidad : (%, absoluto)	▶ ***Descripción***: ● **Para los aquellos adultos con una pobre aptitud física - *Liviana a Moderada:*** ◈ Liviana: ● *Por ciento de la frecuencia cardiaca máxima de reserva (%FCmáx-resv)*: 30 - 40% ● *Por ciento del consumo de oxígeno de reserva (%VO_2R)*: 30 - 40% ● *Por ciento de la frecuencia cardiaca máxima (%FCmáx)*: 57 - 64% ● *Por ciento del consumo de oxígeno máximo (%VO_2máx)*: 37 - 45% ● *Escala de la percepción del esfuerzo (RPE), o Borg Scale*: 9 - 11 ● *Equivalencia metabólica (MET)*: 2 - 2.9 ● **Individuos con patologías y envejecientes de edad avanzada - *Muy Liviana a Liviana:*** ◈ Muy Liviana: ● *Por ciento de la frecuencia cardiaca máxima de reserva (%FCmáx-resv)*: ≤ 30% ● *Por ciento del consumo de oxígeno de reserva (%VO_2R)*: ≤ 30% ● *Por ciento de la frecuencia cardiaca máxima (%FCmáx)*: ≤ 57% ● *Por ciento del consumo de oxígeno máximo (%VO_2máx)*: ≤ 37% ● *Escala de la percepción del esfuerzo (RPE), o Borg Scale*: ≤ 9 ● *Equivalencia metabólica (MET)*: ≤ 2

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COMPONENTE	GUÍA O DOSIS
Intensidad : (%, absoluto)	▶ ***Recomendaciones:*** ● **Entrenamiento en intérvalos:** ◆ **Propósitos - *Durante las sesiones de ejercicio, aumentar*:** ● Volumen total ● Intensidad promedio del ejercicio

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COMPONENTE	GUÍA O DOSIS
Duración : (minutos)	▶ ***Descripción***: ● **Para la mayoría de los adultos:** ◈ **Ejercicios aeróbicos continuos o discontinuos - *INTENSIDAD MODERADA*:** ● **Acumulación diaria:** 30 - 60 minutos por día ● **Acumulación semanal:** ≥ 150 minutos por semana ◈ **Ejercicios aeróbicos continuos o discontinuos - *INTENSIDAD VIGOROSA*:** ● **Acumulación diaria:** 20 - 60 minutos por día ● **Acumulación semanal:** ≥ 75 minutos por semana ◈ **Combinación - *INTENSIDAD MODERADA A VIGOROSA*:** ● **Acumulación diaria - *META*:** 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.

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

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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

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COMPONENTE	GUÍA O DOSIS
Volumen : **(Trabajo Total Semanal)**	▶ ***Descripción*:** ● **Para la mayoría de los adultos** ◈ **Producto de la Frecuencia, Intensidad y Duración:** ● **META:** ≥ 500 - 1,000 METs por minuto por semna (METs-min • sem^{-1}) ● **ACTIVIDAD FÍSICA de intensidad *Moderada*:** 1,000 kcal por semana (kcal • sem^{-1}) ● **EJERCICIO de intensidad *Moderada*:** ~150 minutos por semana (min • sem^{-1}) ● **Conteo de pedómetros:** ≥ 5,400-7,900 pasos por día (pasos • 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 - *Control de peso*:** ◈ **Recomendación:** MAYOR volumen que el regular

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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**

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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*
- Vigososa (≥ 6 METs): *≥ 75 min/semana*
- Combinación: *Moderada y Vigorosa*

DURACIÓN
(Tiempo: Acumulativo)
(Sesiones: 10 min/Intérvalo)

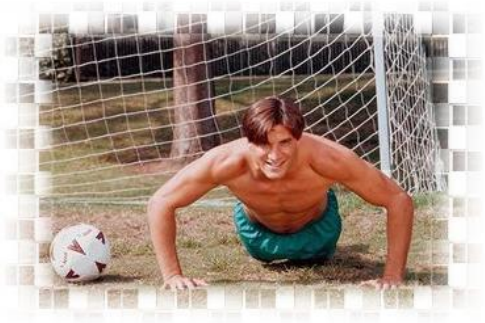
- ≥ 150 min/semana (Intensidad Moderada)
- ≥ 75 min/semana (Intensidad Vigorosa)
- Beneficios Mayores:
  - *≥ 300 min/semana (Intensidad Moderada)*
  - *≥ 150 min/semana (Intensidad Vigorosa)*

FRECUENCIA

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

MODO

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



HORA DEL DÍA PARA ENTRENAR

- **Mito:**
  - **La mejor hora para efectuar los ejercicios es en la mañana**
- **Realidad:**
  - **Los beneficios de ejercicio se obtiene a cualquier: hora del día que se entrena:**
    - **Fundamentadas en evidencias científicas:**
      - ⇨ **Ritmos circardianos:**
        - ◇ **La adaptaciones crónicas al ejercicio:**
          No varían significativamente

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http://www.jssm.org

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

METODOLOGÍA DEL ENTRENAMIENTO FÍSICO

- **Mito:**
  - **Es más importante desarrollar la tolerancia cardiorrespiratoria, o aeróbica, que la aptitud muscular**
- **Realidad:**
  - **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*

USDHHS (2008): Guías de Actividad Física para la Población de los Estados Unidos Continentales:

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 dirgidas 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*

AHA Scientific Statement

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

Mark A. Williams, PhD, Co-Chair; William L. Haskell, PhD, FAHA, Co-Chair; Philip A. Ades, MD; Ezra A. Amsterdam, MD; Vera Bittner, MD; Barry A. Franklin, PhD; Meg Gulanick, RN, PhD; Susan T. Laing, MD; Kerry J. Stewart, EdD

Abstract—Prescribed and supervised resistance training (RT) enhances muscular strength and endurance, functional capacity and independence, and quality of life while reducing disability in persons with and without cardiovascular disease. These benefits have made RT an accepted component of programs for health and fitness. The American Heart Association recommendations describing the rationale for participation in and considerations for prescribing RT were published in 2000. This update provides current information regarding the (1) health benefits of RT, (2) impact of RT on the cardiovascular system structure and function, (3) role of RT in modifying cardiovascular disease risk factors, (4) benefits in selected populations, (5) process of medical evaluation for participation in RT, and (6) prescriptive methods. The purpose of this update is to provide clinicians with recommendations to facilitate the use of this valuable modality. (***Circulation*. 2007;116:572-584.**)

Key Words: AHA Scientific Statements ■ exercise ■ cardiovascular diseases

TABLE 3. Guidelines and Statements Regarding Resistance and Flexibility Training

	Resistance Training		Flexibility Training	
Population	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 (≈3 s concentric, ≈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	

Reps indicates repetitions; ROM, range of motion; ACSM, American College of Sports Medicine; and AACVPR, American Association of Cardiovascular and Pulmonary Rehabilitation.

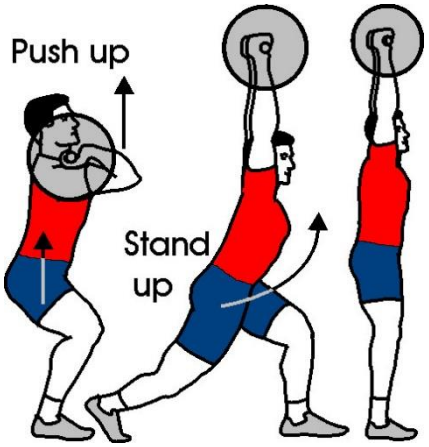
*Minimum 1 exercise per major muscle group, for example, chest press, shoulder press, triceps extension, biceps curl, pull-down (upper back), lower-back extension, abdominal crunch/curl-up, quadriceps extension or leg press, leg curls (hamstrings), and calf raise.

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. AAdes, 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***

TABLE 4. Recommendations for the Initial Prescription of RT

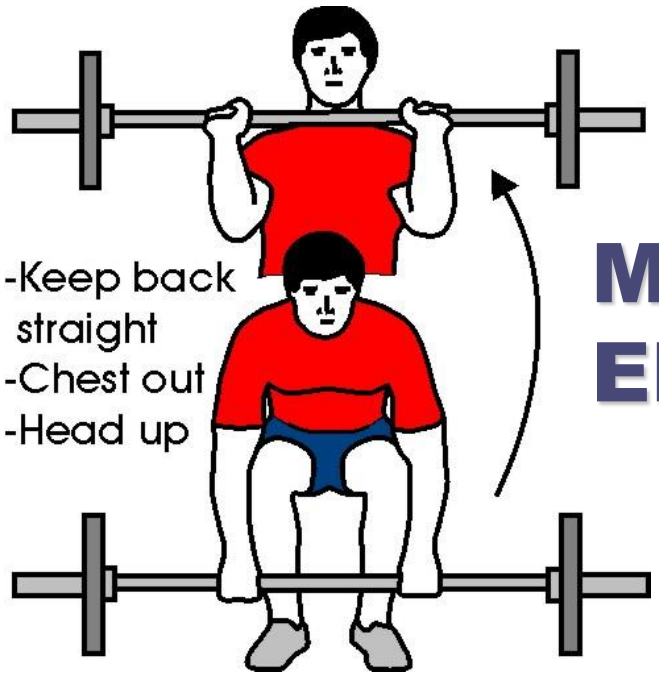
Resistance training should be performed
In a rhythmical manner at a moderate to slow controlled speed
Through a full range of motion, avoiding breathholding and straining (Valsalva maneuver) by exhaling during the contraction or exertion phase of the lift and inhaling during the relaxation phase
Alternating 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. AAdes, 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***



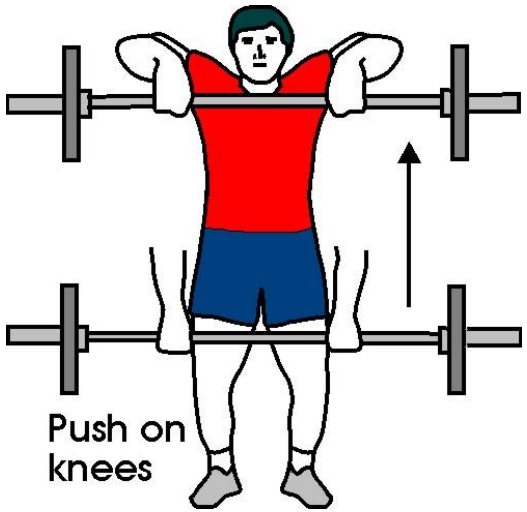
METODOLOGÍA DEL ENTRENAMIENTO FÍSICO

- **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 sendentarias 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

Resistance Training and Detraining Effects on Flexibility Performance in the Elderly Are Intensity-Dependent

Ioannis G. Fatouros,[1] Antonios Kambas,[1] Ioannis Katrabasas,[3] Diamanda Leontsini,[1] Athanasios Chatzinikolaou,[1] Athanasios Z. Jamurtas,[2] Ioannis Douroudos,[1] Nikolaos Aggelousis,[1] and Kiriakos Taxildaris[1]

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Abstract. Fatouros, I.G., A. Kambas, I. Katrabasas, D. Leontsini, 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,

Journal of Strength and Conditioning Research, 2005, 19(4), 842–846

Interaction Between Resistance Training and Flexibility Training in Healthy Young Adults

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[1]*Department of Physiology and Pharmacology and Department of Physical Education,* [2]*Universidade Federal Fluminense, Niterói, RJ, Brazil.*

Abstract. Nóbrega, A.C.L., K.C. Paula, and A.C.G. Carvalho. Interaction between resistance training and flexibility training in healthy young adults. *J. Strength Cond. Res. 19(4):842–846.* 2005.—To test the hypothesis that increases in muscle strength and flexibility are developed by specific training programs, 43 healthy young adults were tested before and after 4 different interventions conducted twice a week for 12 weeks: (a) resistance training only ($n = 13$); (b) flexibility training only ($n = 11$); (c) resistance and flexibility training ($n = 9$); and (d) no intervention ($n = 10$). There was no change in either strength or flexibility in the control group ($p > 0.05$). Resistance training improved muscle strength either alone (+14%; effect size = 0.53; $p < 0.001$) or in combination with flexibility training (+16%; effect size = 0.66; $p = 0.032$), but did not change flexibility ($p = 0.610$). Flexibility increased with specific training alone (+33%; $p < 0.001$) or in combination with resistance training (+18%; $p < 0.001$). In conclusion, in young, healthy subjects, resistance training alone did not increase flexibility, but resistance training did not interfere with the increase in joint range of motion during flexibility training. These results support the concept that specific training should be employed in order to increase either muscle strength or flexibility.

Key Words. physical training, range of motion, skeletal muscle, strength

necessary if resistance training itself could improve flexibility.

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.

Methods

Experimental Approach to the Problem

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 %**

Chronic Static Stretching Improves Exercise Performance

JOKE KOKKONEN[1], ARNOLD G. NELSON[2], CAROL ELDREDGE[1], and JASON B. WINCHESTER[2]

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ABSTRACT

KOKKONEN, J., A. G. NELSON, C. ELDREDGE, and J. B. WINCHESTER. Chronic Static Stretching Improves Exercise Performance. *Med. Sci. Sports Exerc.*, Vol. 39, No. 10, pp. 1825–1831, 2007. **Purpose:** This study investigated the influence of static stretching exercises on specific exercise performances. **Methods:** Thirty-eight volunteers participated in this study. The stretching group (STR) consisted of 8 males and 11 females whose activity was limited to a 10-wk, 40-min, 3-d·wk^{-1} static stretching routine designed to stretch all the major muscle groups in the lower extremity. The control group (CON) consisted of 8 males and 11 females who did not participate in any kind of regular exercise routine during the study. Each subject was measured before and after for flexibility, power (20-m sprint, standing long jump, vertical jump), strength (knee flexion and knee extension one-repetition maximum (1RM)), and strength endurance (number of repetitions at 60% of 1RM for both knee flexion and knee extension). **Results:** STR had significant average improvements ($P < 0.05$) for flexibility (18.1%), standing long jump (2.3%), vertical jump (6.7%), 20-m sprint (1.3%), knee flexion 1RM (15.3%), knee extension 1RM (32.4%), knee flexion endurance (30.4%) and knee extension endurance (28.5%). The control group showed no improvement. **Conclusion:** This study suggests that chronic static stretching exercises by themselves can improve specific exercise performances. It is possible that persons who are unable to participate in traditional strength training activities may be able to experience gains through stretching, which would allow them to transition into a more traditional exercise regimen.
Key Words: LONG JUMP, MUSCLE STRENGTH, MUSCLE ENDURANCE, SPRINTING, VERTICAL JUMP FLEXIBILITY

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The effects of stretching on the flexibility, muscle performance and functionality of institutionalized older women

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Abstract

Stretching has been widely used to increase the range of motion. We assessed the effects of a stretching program on muscle-tendon length, flexibility, torque, and activities of daily living of institutionalized older women. Inclusion/exclusion criteria were according to Mini-Mental State Examination (MMSE) (>13), Barthel Index (>13) and Lysholm Scoring Scale (>84). Seventeen 67 ± 9-year-old elderly women from a nursing home were divided into 2 groups at random: the control group (CG, N = 9) participated in enjoyable cultural activities; the stretching group (SG, N = 8) performed active stretching of hamstrings, 4 bouts of 1 min each. Both groups were supervised three times per week over a period of 8 weeks. Peak torque was assessed by an isokinetic method. Both groups were evaluated by a photogrammetric method to assess muscle-tendon length of uni- and biarticular hip flexors and hamstring flexibility. All measurements were analyzed before and after 8 weeks by two-way ANOVA with the level of significance set at 5%. Hamstring flexibility increased by 30% in the SG group compared to pre-training (76.5 ± 13.0° *vs* 59.5 ± 9.0°, P = 0.0002) and by 9.2% compared to the CG group (76.5 ± 13.0° *vs* 64.0 ± 12.0°, P = 0.0018). Muscle-tendon lengths of hip biarticular flexor muscles (124 ± 6.8° *vs* 118.3 ± 7.6°, 5.0 ± 7.0%, P = 0.031) and eccentric knee extensor peak torque were decreased in the CG group compared to pre-test values (-49.4 ± 16.8 *vs* -60.5 ± 18.9 Nm, -15.7 ± 20%, P = 0.048). The stretching program was sufficient to increase hamstring flexibility and a lack of stretching can cause reduction of muscle performance.

Key words: Homes for the aged; Muscle stretching exercises; Muscle strength; Flexibility; Activities of daily living

METODOLOGÍA DEL ENTRENAMIENTO FÍSICO

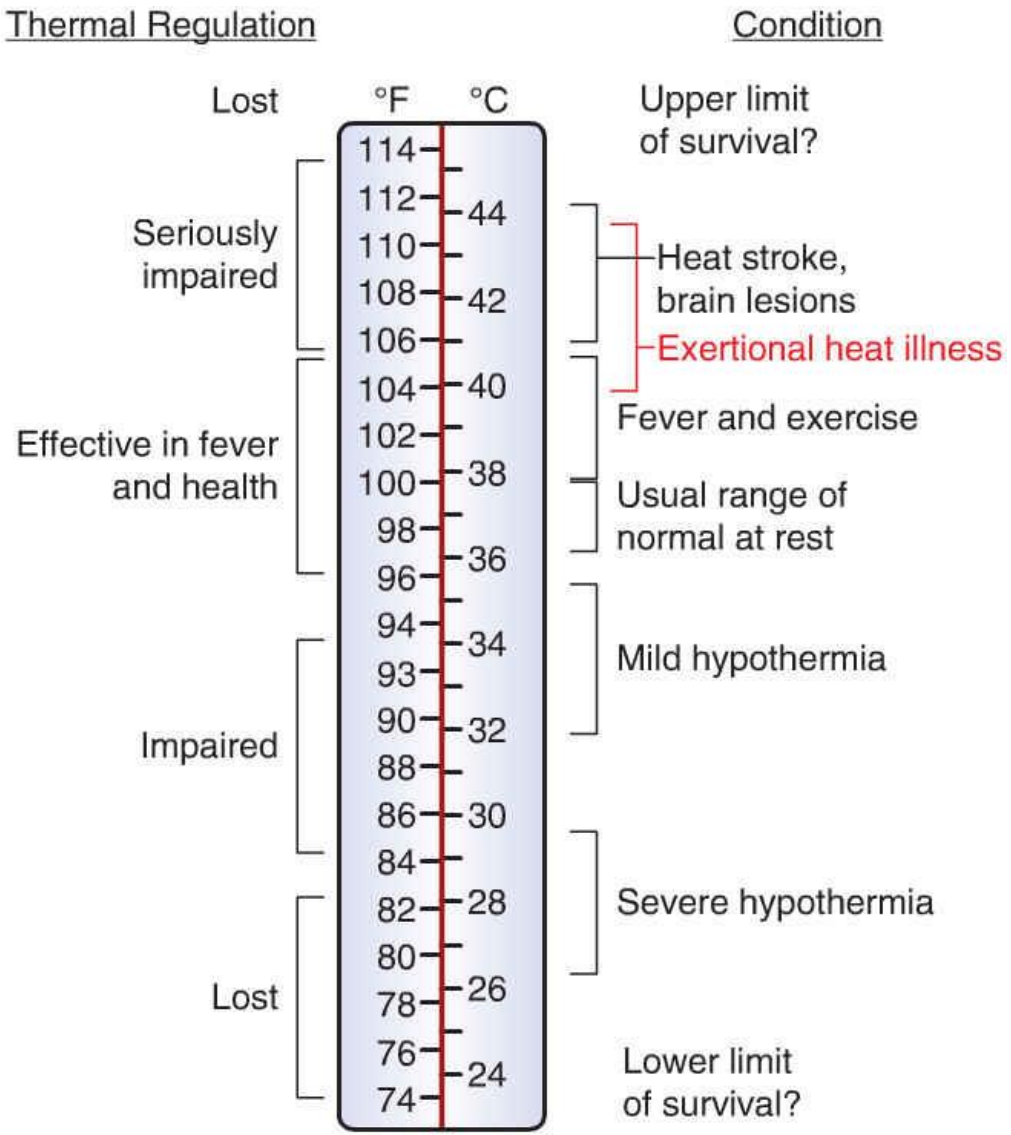
- **Mito:**
  - **Hacer ejercicios con fiebre alivia la enfermedad**
- **Realidad:**
  - **Los estados pirogénicos requieren reposo:**
    Puede acelerar la deshidratación y emergencias cardiacas
    - **Fundamentadas en evidencias científicas:**
      - ⇨ **Ejercicios agudos con fiebre:**
        - ◇ **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 cardiacas
    - **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. Hellerdtein (Eds.), 1984, New York: John Wiley & Sons. Copyright 1984 John Wiley & Sons, Inc.

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



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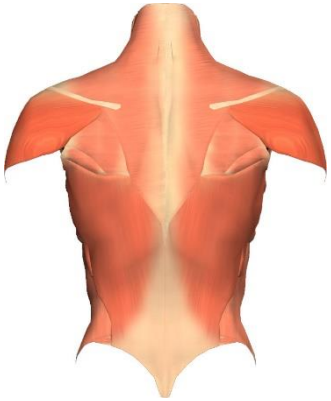


ENTRENAMIENTO MÚSCULOS ESTABILIZADORES DEL NUCLEO (CORE)

- **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 establidad del núcleo: *sin importar el tipo de ejercicio***

A PERIODIZED APPROACH FOR CORE TRAINING

by Jeffrey M. Willardson, Ph.D.

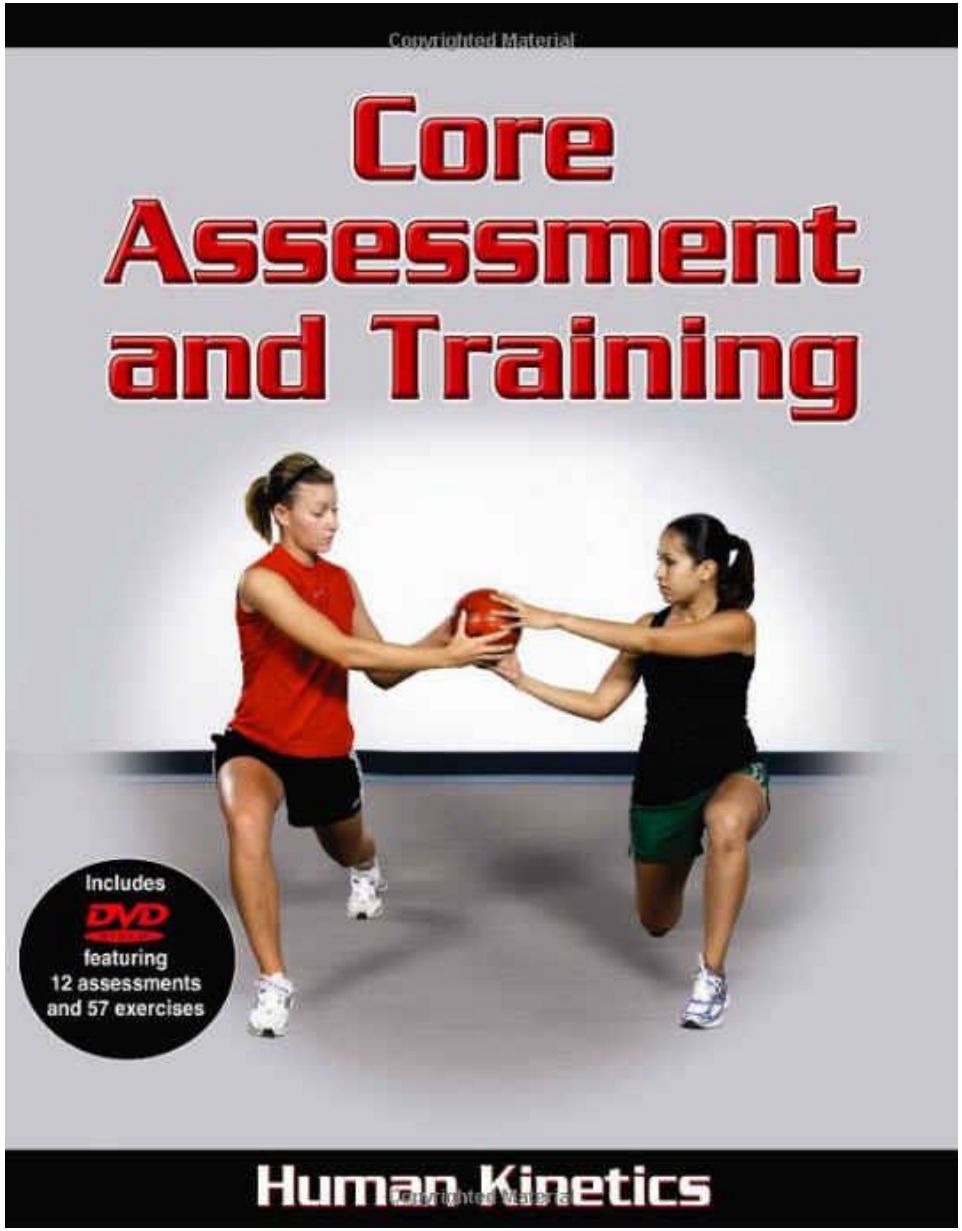
LEARNING OBJECTIVES

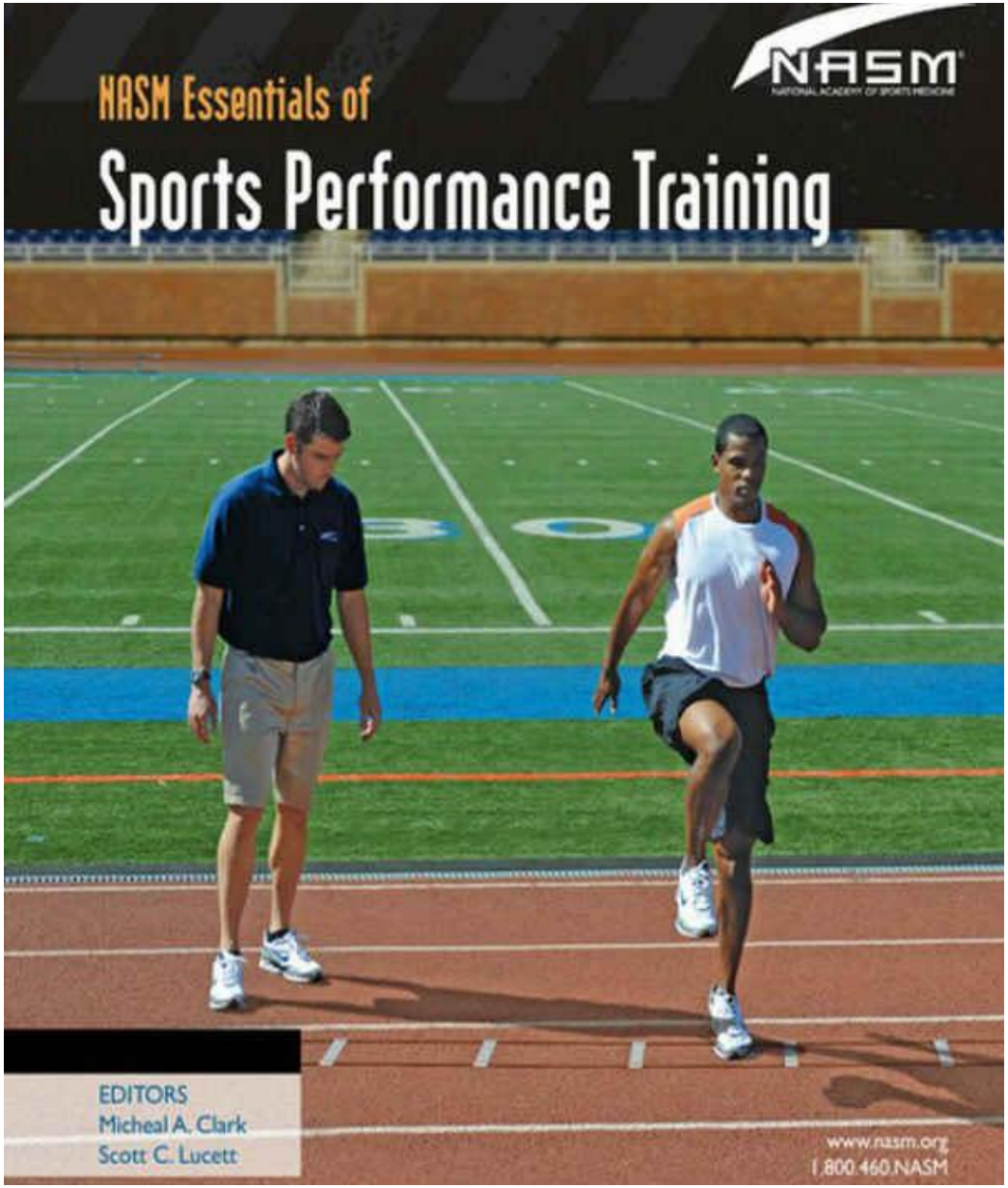
- Understand the importance of core stability exercises for healthy individuals.
- Understand how to perform resistance exercises for the development of muscular endurance, muscular strength, and muscular power in the core musculature.
- Understand the potential advantages and disadvantages of performing 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





CHAPTER 6

Core Training Concepts for Performance Enhancement

UPON COMPLETION OF THIS CHAPTER, YOU WILL BE ABLE TO:

- Understand the importance of the core musculature and its relationship to performance enhancement.
- Differentiate between the local stability, global stability, and movement systems of the core.
- 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.

MOTIVACIÓN PARA EL EJERCICIO Y LA ACTIVIDAD FÍSICA

- **Mito:**
  - **Es obligatorio matricularte en un gimnasio, o contratar un entrenador personal, para poder lograr un nivel elevado de aptitud física**
- **Realidad:**
  - **Se puede iniciar con:**
    - » ***Actividad físicas*** » ***Disminuir el tiempo sentado***
    - **Fundamentadas en evidencias científicas:**
      - ⇨ **Guías de actividad física del 2008 - EJEMPLO: *Caminar* :**
  - **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

Efecto agudo del estiramiento sobre el rendimiento físico: el uso de los estiramientos en el calentamiento

Acute effect of stretching on physical performance: the use of stretching exercises in warm-up

Francisco Ayala[1], Pilar Sainz de Baranda[2], Antonio Cejudo[3], Mark de Ste Croix[4]

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

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[1]*Sport Exercise & Life Sciences, The University of Northampton, Northampton, UNITED KINGDOM; and* [2]*School of Exercise, Biomedical & Health Sciences, Edith Cowan University, Joondalup, Western Australia, AUSTRALIA*

ABSTRACT

KAY, A. D., and A. J. BLAZEVICH. 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

Scand J Med Sci Sports 2010: 20: 169–181
doi: 10.1111/j.1600-0838.2009.01058.x

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Review

To stretch or not to stretch: the role of stretching in injury prevention and performance

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Accepted for publication 5 October 2009

Stretching is commonly practiced before sports participation; however, effects on subsequent performance and injury prevention are not well understood. There is an abundance of literature demonstrating that a single bout of stretching acutely impairs muscle strength, with a lesser effect on power. The extent to which these effects are apparent when stretching is combined with other aspects of a pre-participation warm-up, such as practice drills and low intensity dynamic exercises, is not known. With respect to the effect of pre-participation stretching on injury prevention a limited number of studies of varying quality have shown mixed results. A general consensus is that stretching in addition to warm-up does not affect the incidence of overuse injuries. There is evidence that pre-participation stretching reduces the incidence of muscle strains but there is clearly a need for further work. Future prospective randomized studies should use stretching interventions that are effective at decreasing passive resistance to stretch and assess effects on subsequent injury incidence in sports with a high prevalence of muscle strains.

ELPS

The full version of this article appears on bmj.com

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

Rob D Herbert, Michael Gabriel

Editorial by MacAuley and Best

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BMJ 2002;325:468–70

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

Ian Shrier, MD, PhD

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

Data Sources and Selection: MEDLINE and Sport Discus were searched using MeSH and textwords for English-language and French-language articles related to stretching and performance (or performance tests). Additional references were reviewed from the bibliographies and from citation searches on key articles. All articles related to stretching and performance (or performance tests) were reviewed.

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.

Conclusions: An acute bout of stretching does not improve force or jump height, and the results for running speed are contradictory. Regular stretching improves force, jump height, and speed, although there is no evidence that it improves running economy.

(*Clin J Sport Med* 2004;14:267–273)

Although clinicians are now generally aware of the issues related to stretching and injury, many authors also recommend stretching to improve performance.[7–9] If stretching decreases muscle stiffness (via changes in passive visco-elastic properties), less energy is required to move the limb, and force/speed of contraction may be increased. Alternatively, decreased stiffness may decrease storage of recoil energy, which would lead to greater energy requirements. If performance is enhanced, the issue of increased risk of injury may be moot for some persons.

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 on

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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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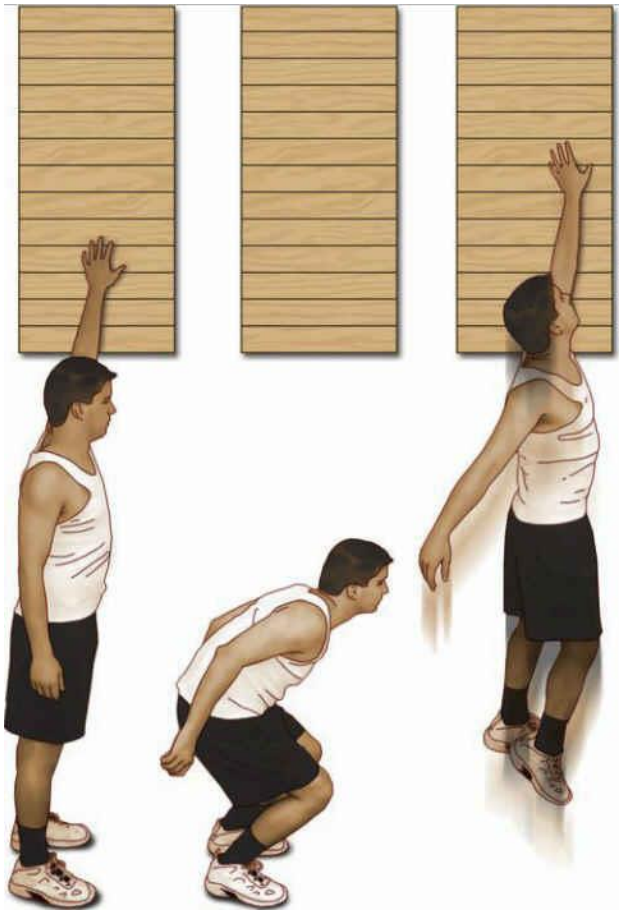
Greensboro, NC

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



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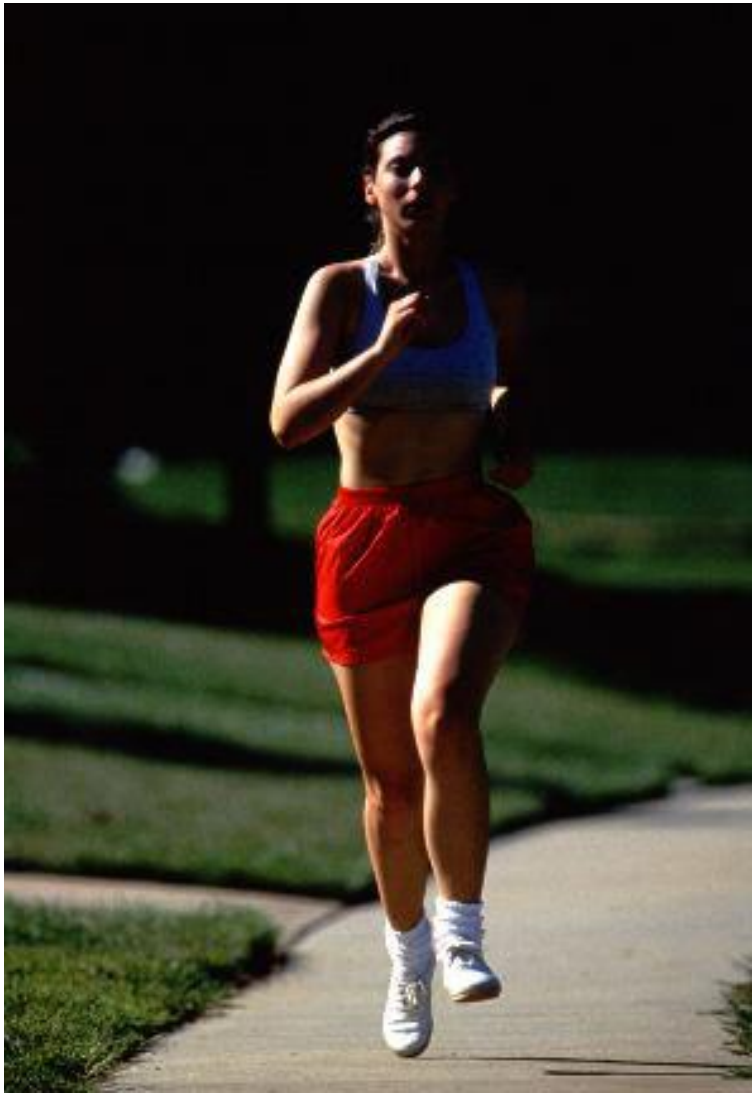
- **Impide la producción de la fuerza/potencia:**
  - **Para las contracciones: isométricas y concéntricas**
    - **Isométricas**
    - **Concéntricas**
- **Compromete la generación de una fuerza explosiva:**
  - **Ejecutoria de los saltos:**
    - **Medido por el:**
      - **Salto Vertical:**
        Prueba de potencia muscular

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

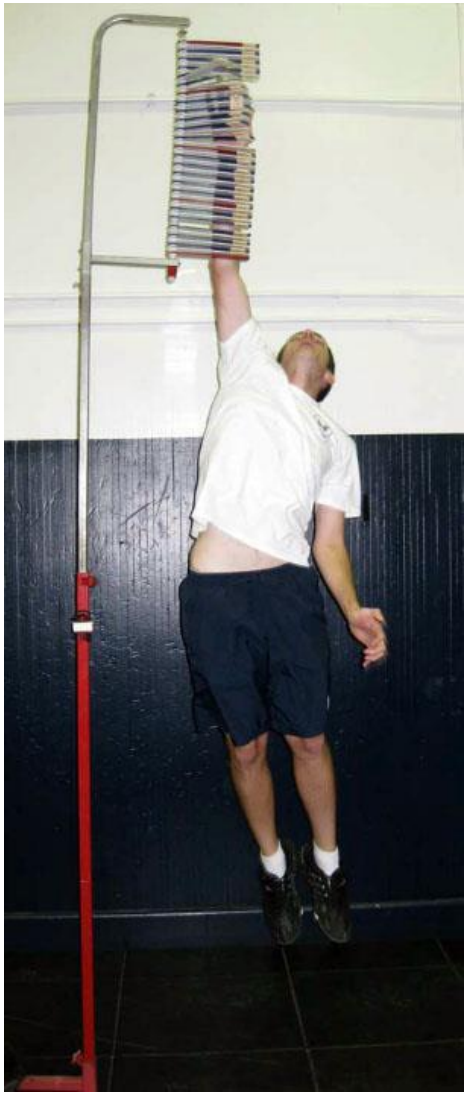


- **Disminuye el tiempo en:**
  - **Carreras de velocidad:**
    - **Medido por:**
      - **Evaluaciones anaeróbicas:**
        - ***Tres pruebas rápidas de:***
          20 metros cada una
- **Reduce la actividad:**
  - **Electromiográfica, en los:**
    - **Músculos esqueléticos:**
      Activos

EFECTOS 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***

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



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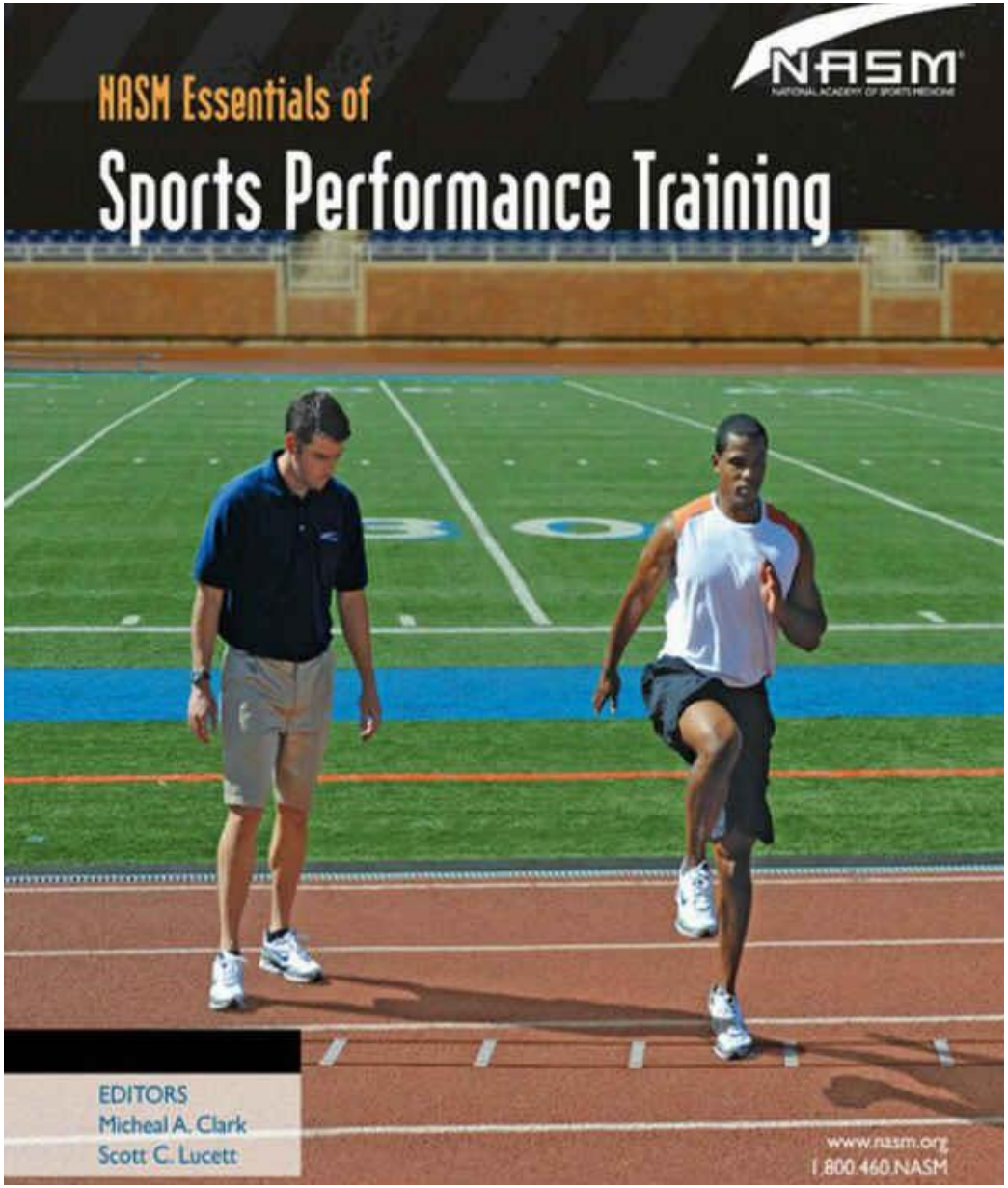
- **Facilita la fuerza explosiva:**
  - **Medido por:**
    Salto Vertical:
- **Mejora ejecutorias:**
  - **Destrezas deportivas:**
    - **Tennis de campo:**
      - **Servicio:**
        Velocidad en el servicio



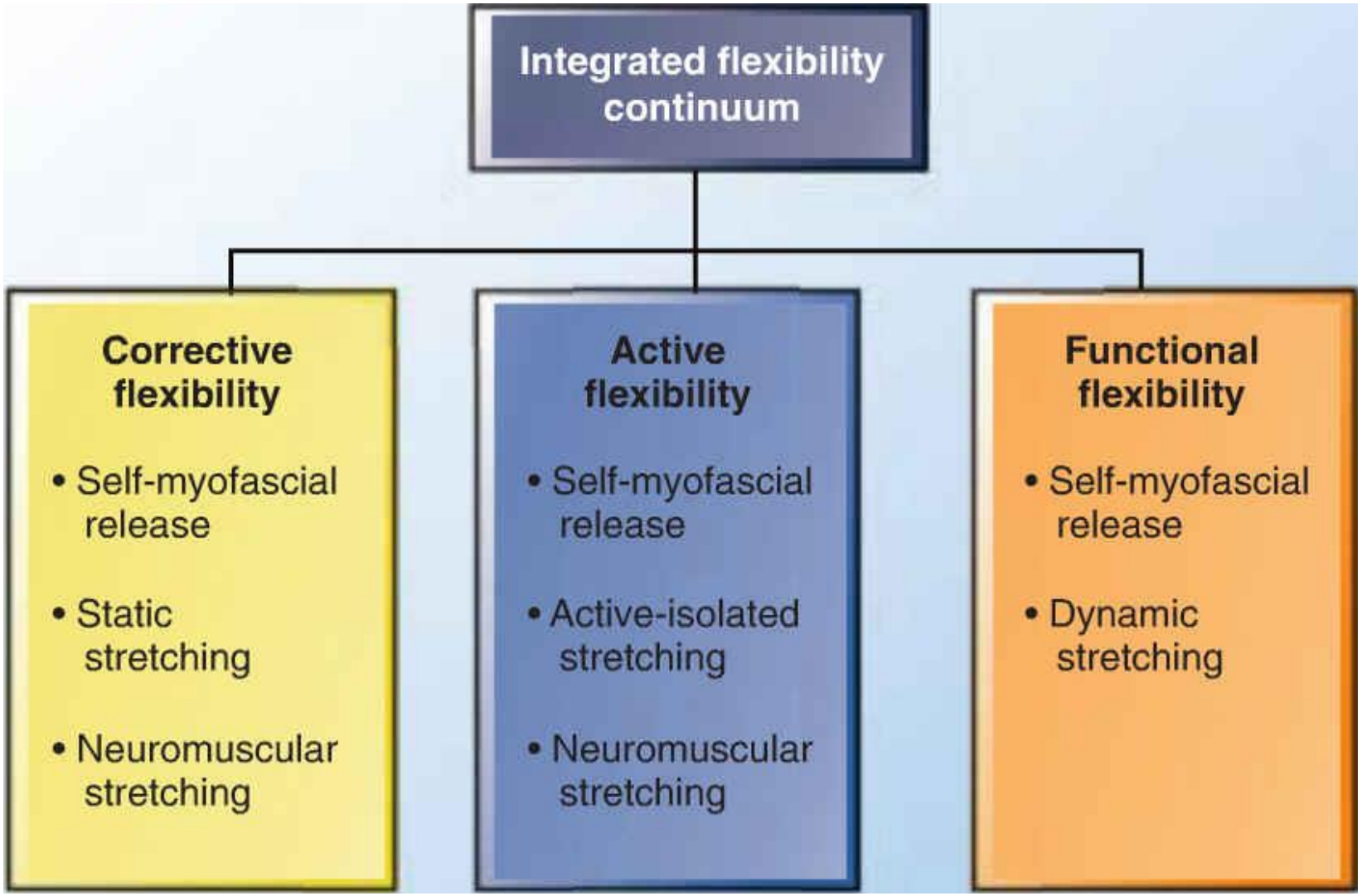
CHAPTER 4

Flexibility Training for Performance Enhancement

UPON COMPLETION OF THIS CHAPTER, YOU WILL BE ABLE TO:

- Explain the effects of muscle imbalances on the human movement system.
- Provide a scientific rationale for the use of an integrated flexibility training program.
- Differentiate between the types of flexibility techniques.
- Perform and instruct appropriate flexibility techniques for given situations.

FLEXIBILIDAD FUNCIONAL O INTEGRADA:
CONTINUO: Tipos de Estiramientos



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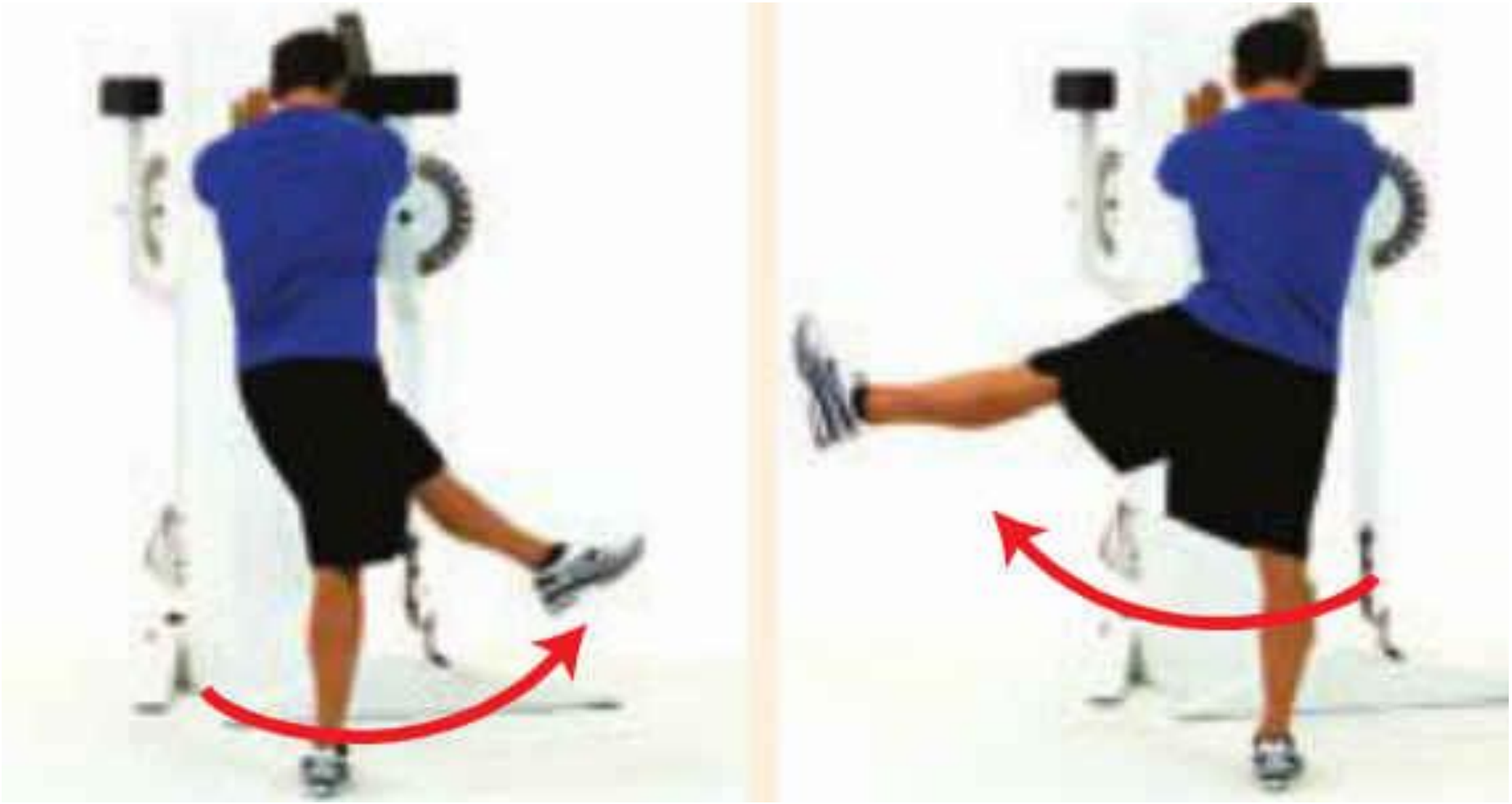

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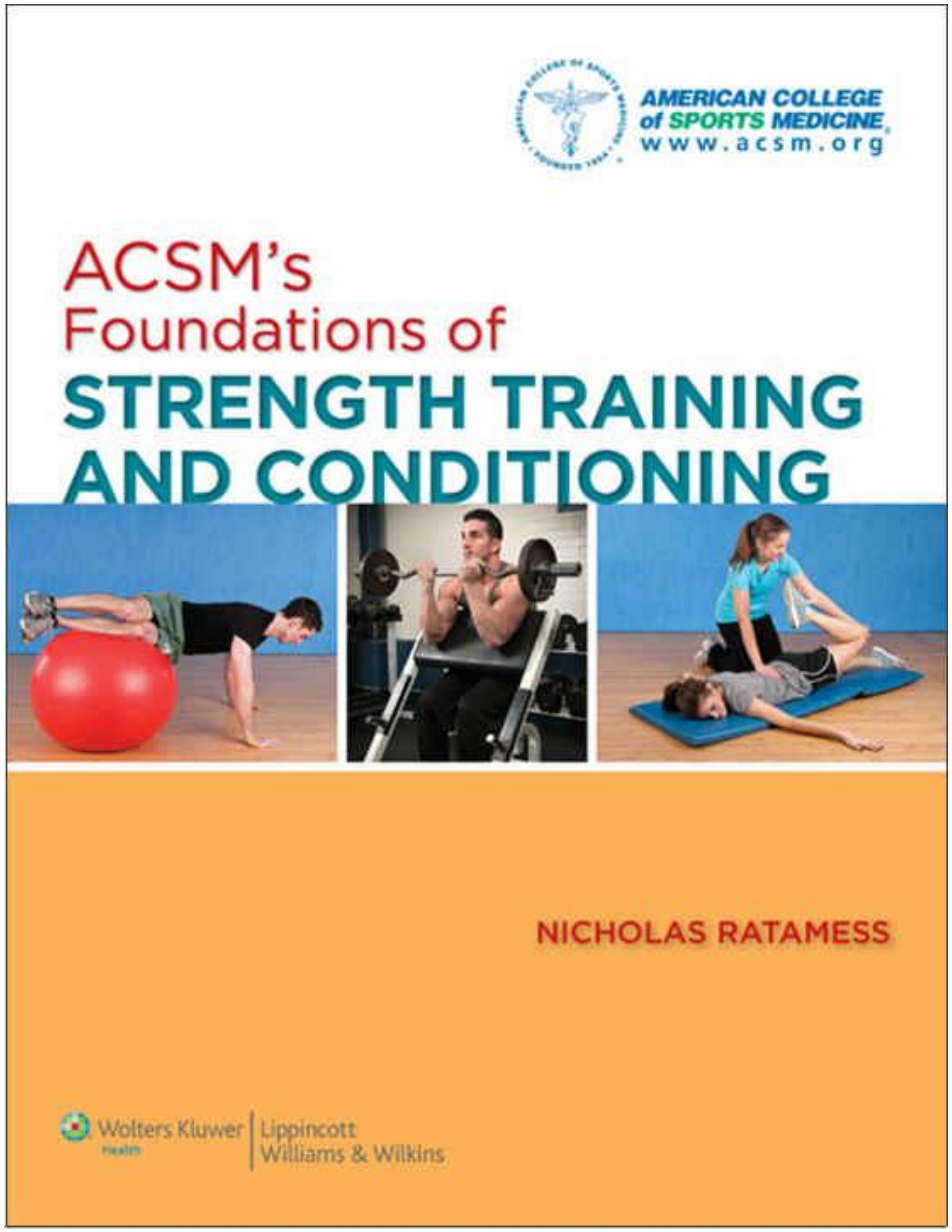


CHAPTER 10

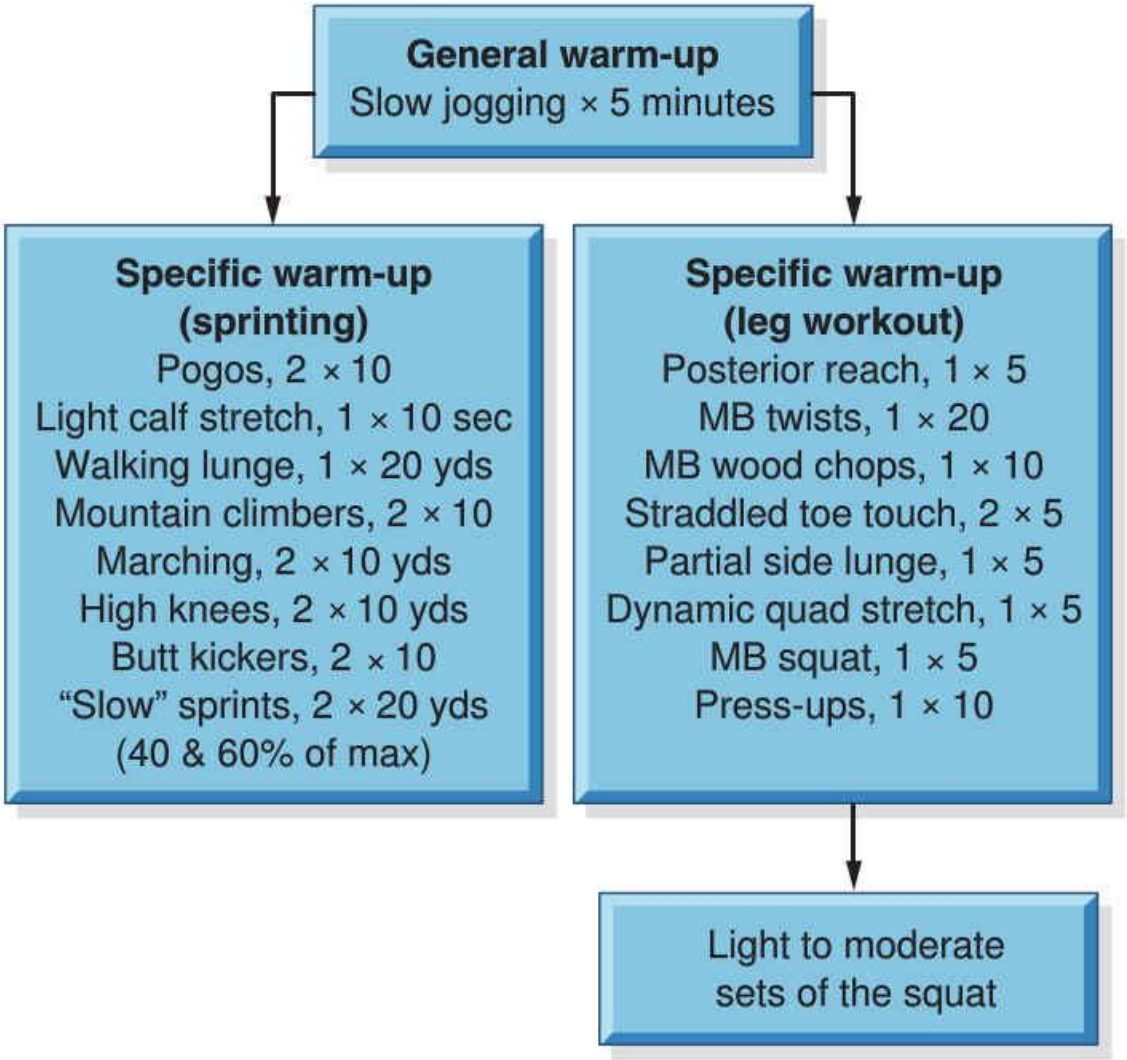
Warm-Up and Flexibility

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

CALENTAMIENTO Y FLEXIBILIDAD:
CALENTAMIENTO: Esquema y Componentes



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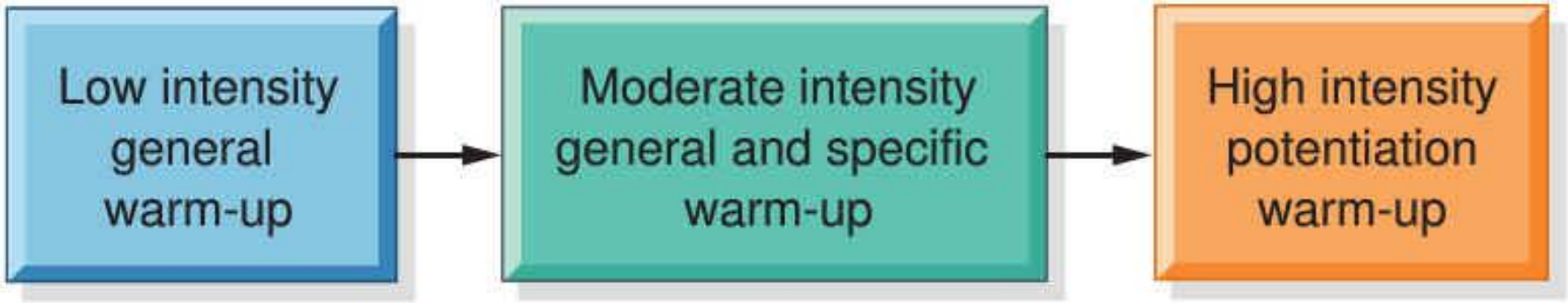
CALENTAMIENTO Y FLEXIBILIDAD:
CALENTAMIENTO: Continuo/Flujo
** Potenciación Pos-Activación **



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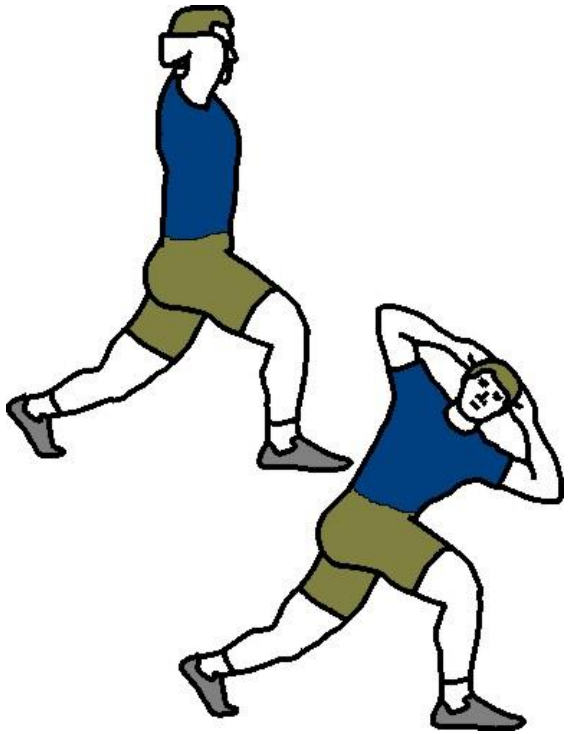
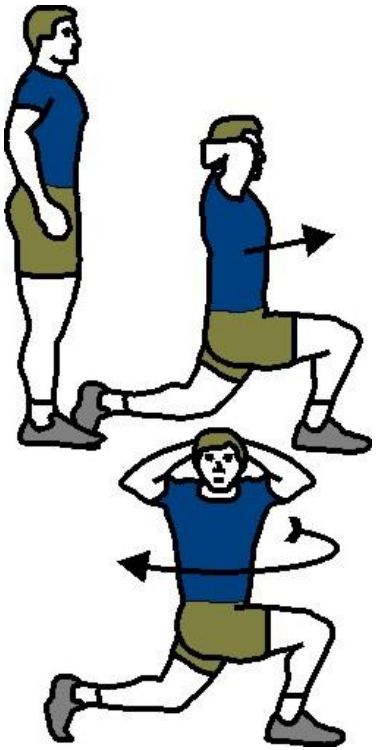


CALENTAMIENTO Y FLEXIBILIDAD

- **Estiramiento Dinámico:**
  - **Concepto:**
    - **Movimiento activo de las articulaciones:**
      - ⇨ **En un arco de movimiento completo:**
        - ◇ **Sin sostener la posición final de estiramiento**

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



CALENTAMIENTO Y FLEXIBILIDAD

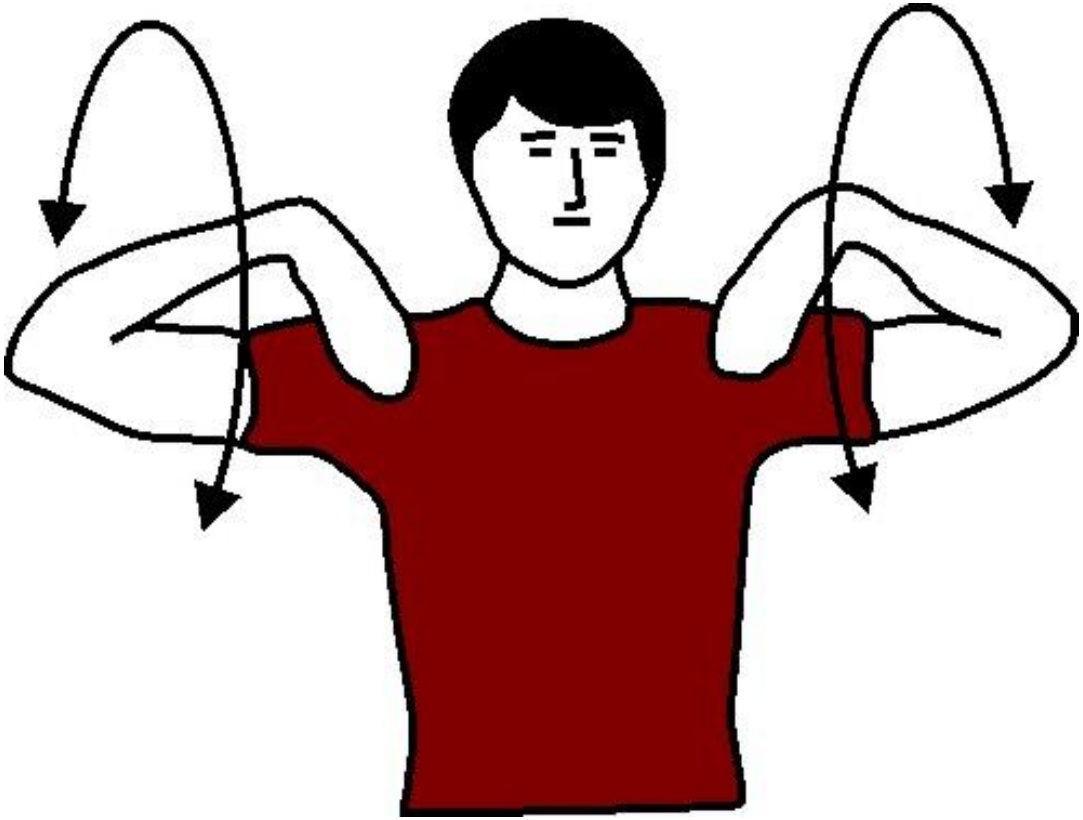
- **Estiramiento Dinámico:**
  - **Caraterísticas:**
    - **Es funcional en naturaleza**
    - **Comúnmente, replica movimientos deportivos específicos:**
      - ⇨ **Movimientos específicos:**
        No se enfoca en los grupos musculares

NOTA. Adaptado de: ***ACSM's Foundations of Strength Trsining 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:**



NOTA. Adaptado de: ***ACSM's Foundations of Strength Trsining 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 **

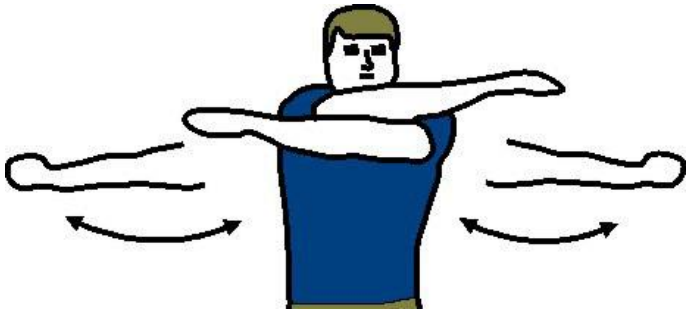
- **Círculos con el tronco, desde ahorcajadas:**

NOTA. Adaptado de: ***ACSM's Foundations of Strength Trsining 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 **

- **Caminata, levantando los rodillas:**

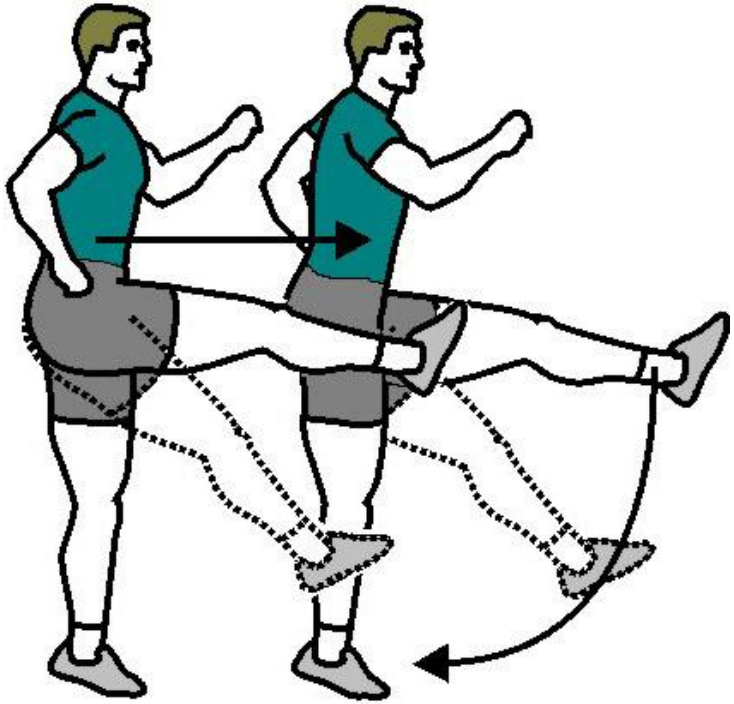
NOTA. Adaptado de: ***ACSM's Foundations of Strength Trsining and Conditioning***. (p. 170), por N. Ratamess, 2012, Philadelphia: Lippincott Williams & Wilkins. Copyright 2012 por American College of Sports Medicine.



CALENTAMIENTO Y FLEXIBILIDAD

- **Estiramiento Dinámico:**
  - **Elemento esencial para:**
    - **El calentamiento, previo a un**
      - ⇨ ***Ejercicio físico*, o**
      - ⇨ ***Competencia deportiva***

NOTA. Adaptado de: ***ACSM's Foundations of Strength Trsining 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:**
  - **Ventajas/beneficios:**
    - **Calentamiento simultaneo de:**
      - ⇨ **Varios grupos musculares:**

        Incrementa la eficiencia del calentamiento

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

CALENTAMIENTO Y ENFRIAMIENTO

- **Estiramiento Estático Agudo:**
  - **Indicaciones:**
    - **Fase de Calentamiento:**
      - ⇨ **Regiones con alta tensión muscular, o sobreactivas:**
        - ◇ **Duración para cada estiramiento estático:**
          - ◘ **Sostener: *20-30 segundos***
            - ► **Duraciones < *60 segundos*:**

              No afecta el rendimiento físico-deportivo

CALENTAMIENTO Y ENFRIAMIENTO

- **Estiramiento Estático Agudo:**
  - **Indicaciones:**
    - **Fase de Enfriamiento (Posterior al Ejercicio o Práctica):**
      - ⇨ **Justificación - Músculos en condicion: *Temperatura Elevada*:**
        - ◇ **Duración para cada estiramiento estático:**
          - ◘ **Ejemplo:**
            - ► **Luego de un ejercicio aeróbico:**

              Músculos se estiran con mayor facilidad

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***

REVIEW ARTICLE

Sports Med 2003; 33 (7): 483-498
0112-1642/03/0007-0483/$30.00/0

Warm Up II

Performance Changes Following Active Warm Up and How to Structure the Warm Up

David Bishop

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

Contents

EFECTOS DEL EJERCICIO AGUDO Y CRÓNICO

- 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

Committee Opinion

Number 267, January 2002

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.

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.

MEDICAL REPORT

by Shelby Scott, M.D., FACSM

Exercise During Pregnancy

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

SPECIAL COMMUNICATIONS
Roundtable Consensus Statement

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

ABSTRACT

Research over the past 20 years has focused on the safety of physical activity during pregnancy. Guidelines for health care providers and pregnant/postpartum women have been developed from the results of these studies. The overwhelming results of most studies have shown few negative effects on the pregnancy of a healthy gravida, but rather, be beneficial to the maternal-fetal unit. Recently, researchers have begun to consider the role of maternal physical activity in a more traditional chronic disease prevention model, for both mother and offspring. To address the key issues related to the role of physical activity during pregnancy and postpartum on chronic disease risk, the American College of Sports Medicine convened a Scientific Roundtable at Michigan State University in East Lansing, MI. Topics included preeclampsia, gestational diabetes, breastfeeding and weight loss, musculoskeletal disorders, mental health, and offspring health and development. **Key Words:** DIABETES, EXERCISE, HYPERTENSION, OBESITY, WOMEN

century, the number participating in school-sponsored sports exceeded 2.6 million (121). Many high school athletes wish to continue their physical activity programs during childbearing years, and seek information regarding the safety of remaining physically active during pregnancy and postpartum. Unfortunately, in the early years following Title IX, little information was available.

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 lo días***
- **Intensidad:**
  - **Moderada:**
    - **% VO_2R:** ***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***

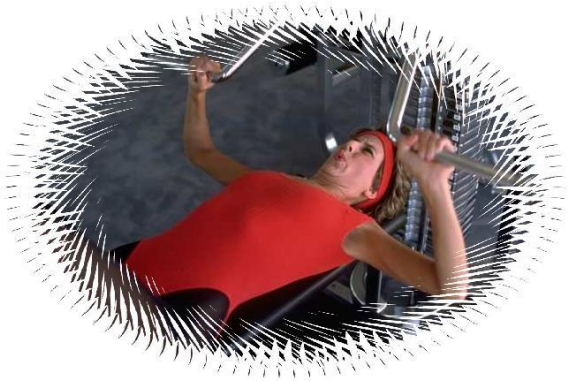
NOTA. Tomado de: ***Resource Manual for Guidelines for Exercise Testing and Prescription***. 9na. ed.; (p. 567), por American College of Sports Medicine, 2014, Philadelphia: Lippincott Williams & Wilkins. Copyright 2014 por: American College of Sports Medicine

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)

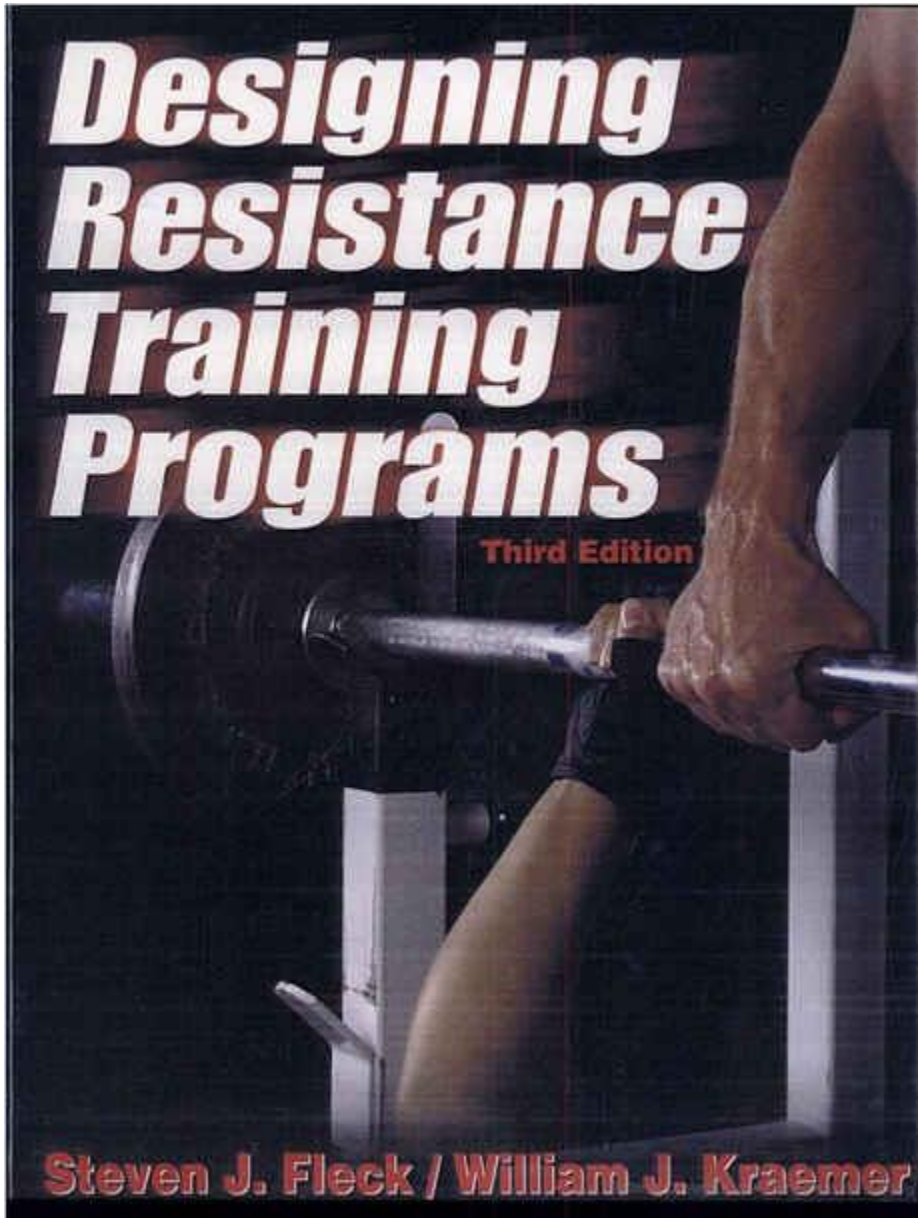
BMI (kg · m^{-2})	Age (yr)	Fitness Level	HR Range (bpm)
<25	<20	Any	140–155
	20–29	Low	129–144
		Active	135–150
		Fit	145–160
	30–39	Low	128–144
		Active	130–145
		Fit	140–156
≥25	20–29	Any	102–124
	30–39	Any	101–120

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

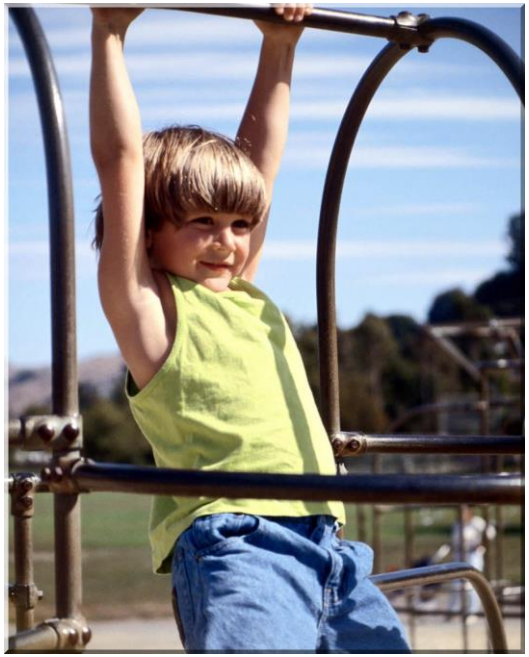
- **Mito:**
  - **El entrenamiento con pesas en mujeres, resulta en el desarrollo de músculos grandes, lo cual induce una pérdida de su imagen femenina**
- **Realidad – *Evidencias Científicas*:**
  - **La cantidad de testosterona no es suficiente para el desarrollo muscular marcado:**
    - **El promedio 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. Informcaión de: "Strength Training Effects in Prepubescents 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 PREPÚBERES

- **Entrenamiento con resistencias en niños**
  - **Desarrollo óseo - *Aumento en la Densidad Ósea*: *Estímulos para el remodelaje óseo***
    - **Estimula - *Aumento en*:**
      - ⇨ **Tensión muscular**
      - ⇨ **Frecuencia de la tensión**
      - ⇨ **Compresión**

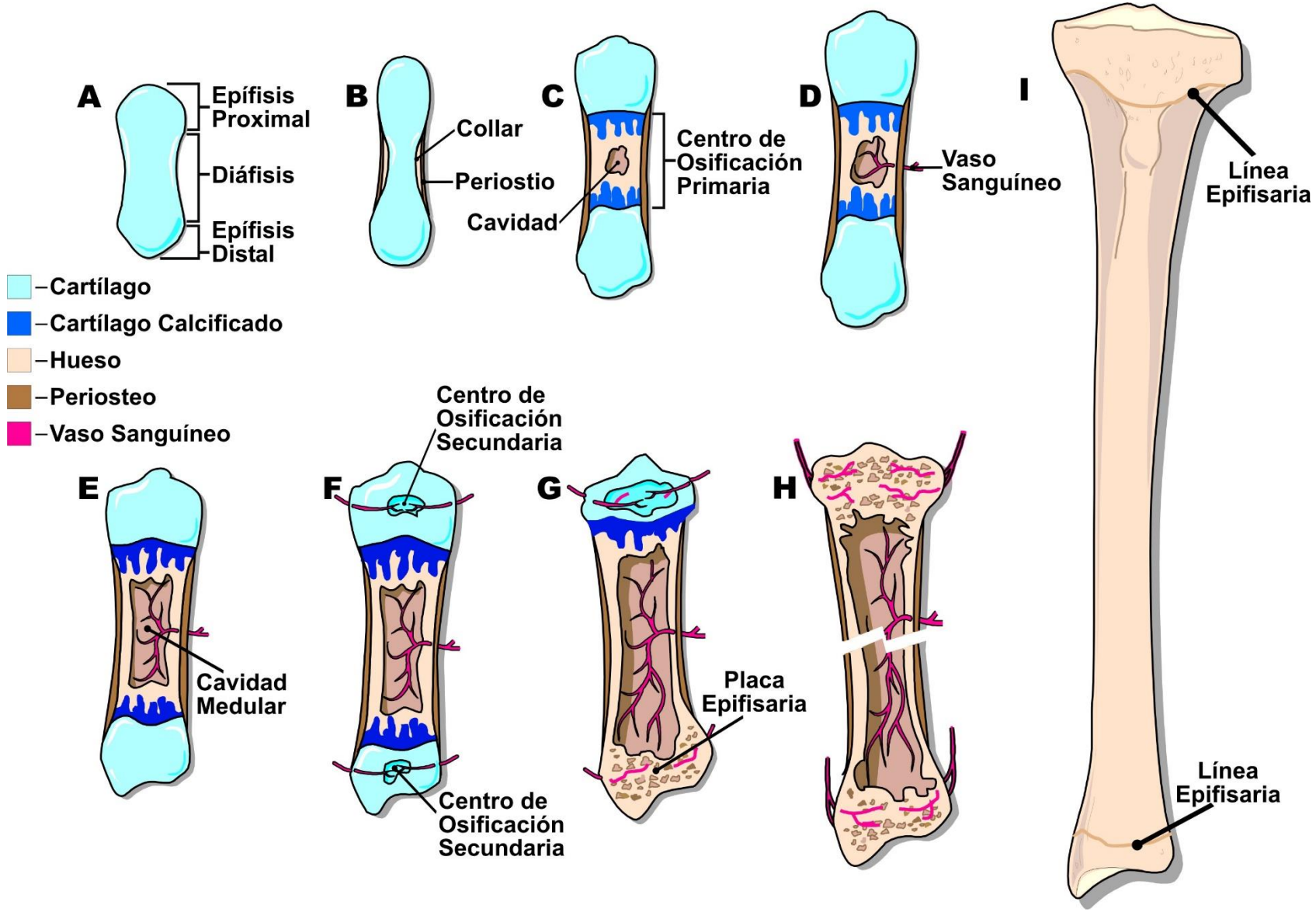
NOTA. Información de: "Adaptive Responses of Bone to Physical Activity", por: B. P Conroy, W. J. Kraemer, C. M, Maresh, & G. P. Dalsky, 1992, ***Medicine, Exercise, Nutrition, and Health, 1***(), 64-74.

ENTRENAMIENTO CON RESISTENCIAS EN PREPÚBERES

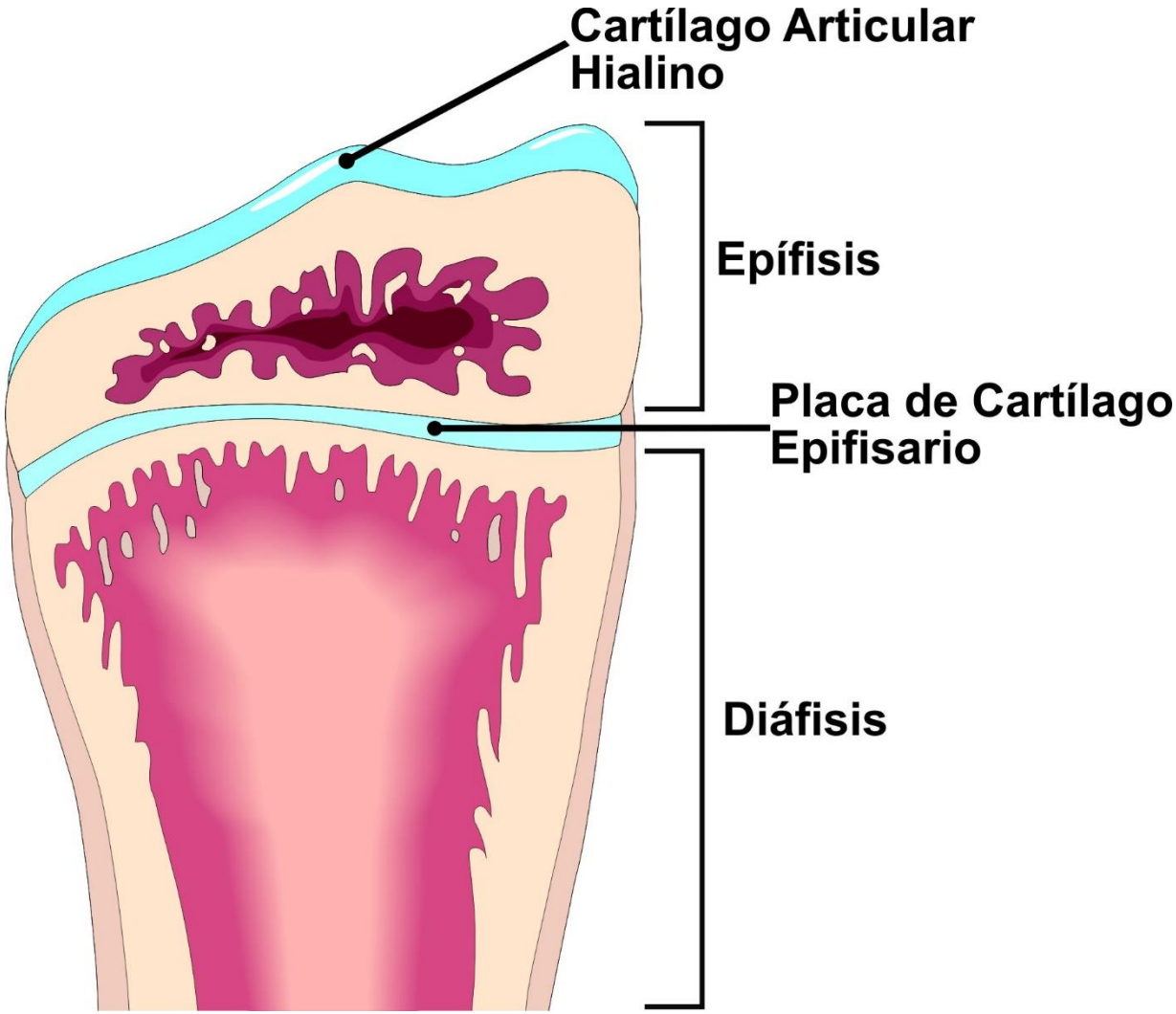
- **Entrenamiento con resistencias – *Pospúberes*:**
  Inicios de la adoslecencia
  - **Adaptaciones musculares:**
    - **Aumento en la fortaleza muscular, vía:**
      - **Hipertrofia muscular:**
        - **Principalmente – *Cambios hormonales:***
          - **Testosterona**
          - **Hormona 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 CRECIMIENO LINEAL EN LOS HUESOS LARGOS: *PLACA DE CARTÍLAGO EPIFISARIO*



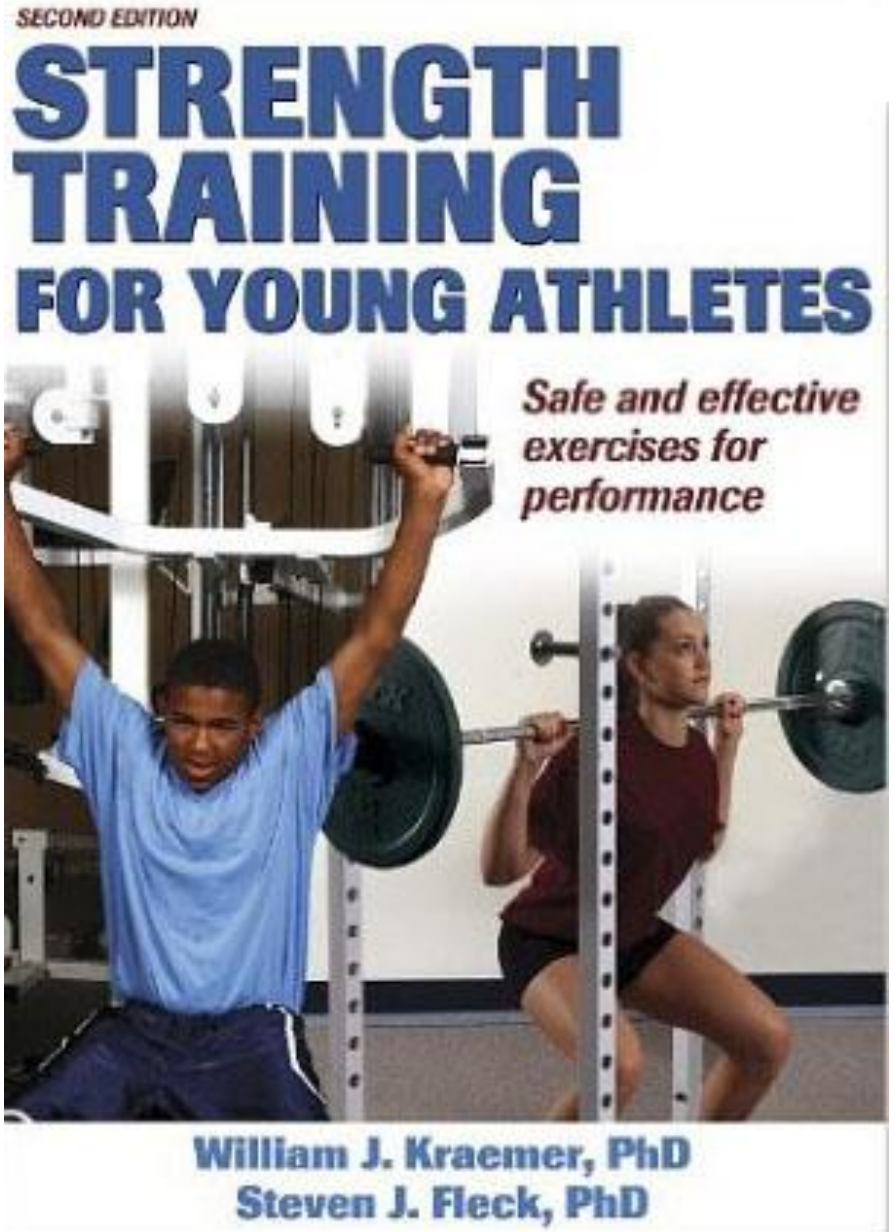
POBLACIÓN PEDIÁTRICA: *PRESCRIPCIÓN DE EJERCICIO*
** Entrenamiento con Resistencias **

TABLE 4-2 GUIDELINES FOR RESISTANCE TRAINING

Age (years)	Recommendations
7 or younger	Introduce child to basic exercises with little or no weight; develop the concept of a training session; teach exercise techniques; progress from body weight calisthenics, partner exercise, and lightly resisted exercises; keep volume low.
8–10	Gradually increase the number of exercises; practice exercise technique in all lifts; start gradual progressive loading of exercises; keep exercise simple; gradually increase training volume; carefully monitor toleration to the exercise stress.
11–13	Teach all basic exercise techniques; continue progressive loading of each exercise; emphasize exercise techniques; introduce more advanced exercise with little or no resistance
14–15	Progress to more-advanced youth programs in resistance exercise; add sport-specific components; emphasize exercise techniques; increase volume.
16 or older	Move child to entry-level adult programs after all background knowledge has been mastered and a basic level of training experience has been gained.

Note: If a child of any age begins a program without previous experience, start the child at previous levels and move to more advanced levels as exercise toleration, skill, amount of training time, and understanding permit.
Source: From Kraemer WJ, Fleck SJ. Strength Training for Young Athletes. Champaign, IL: Human Kinetics, 1993.

NOTA. Reproducido de: ***Exercise for Special Populations***. (p. 100), por P. Williamson, 2011, Philadelphia: Lippincott Williams & Wilkins.



POBLACIÓN PEDIÁTRICA: *PRESCRIPCIÓN DE EJERCICIO*

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

Age	Minimum Daily Activity
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.

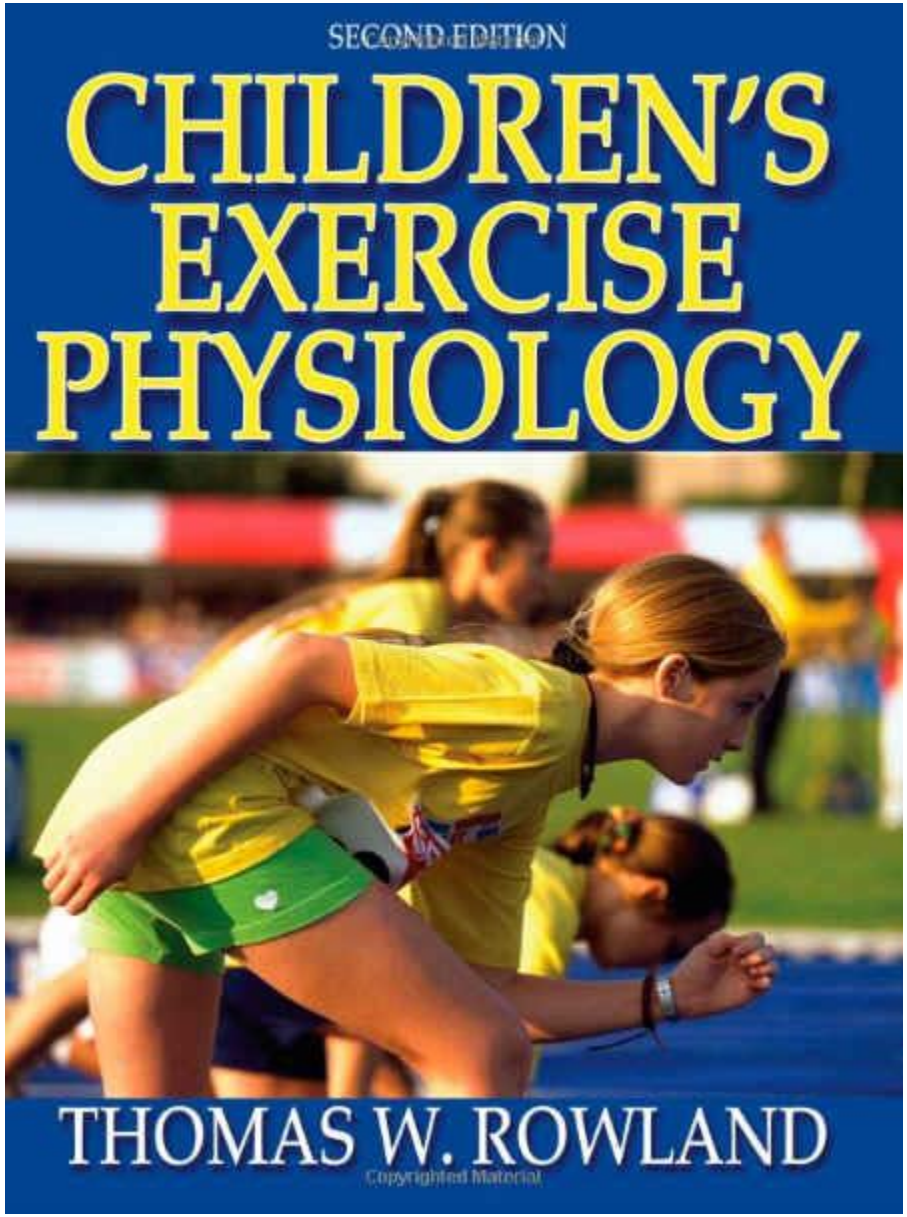
DISEÑO Y PLANIFICACIÓN DE PROGRAMAS DE EJERCICIOS:

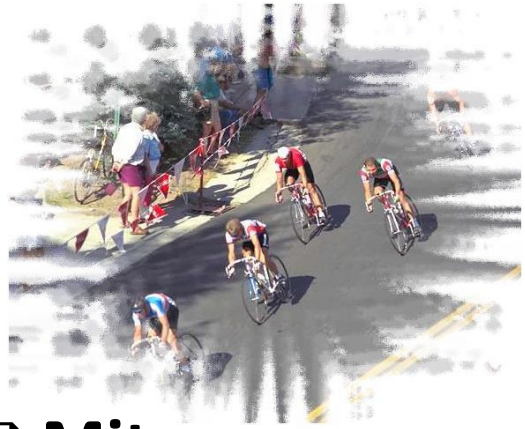
NIÑOS Y ADOLESCENTES

** Recomendaciones de Actividad Física **

- **Frecuencia:**
  - ***3 - 4 veces/semana:***
  - ***Preferiblemente todos lo días***
- **Intensidad:** ***Moderada o Vigorosa***
- **Duración:** ***60 minutos (acumulativo)***
- **Tipo/Modo:**
  - **Actividades que son divertidas**
  - **Movimientos físicos que promuevan el desarrollo del niño**

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**

International Journal of Scientific and Research Publications, Volume 2, Issue 8, August 2012 1
ISSN 2250-3153

Sleep Quality Improvement and Exercise: A Review

ZubiaVeqar, M EjazHussain

Centre for physiotherapy and rehabilitation sciences, JamiaMilliaIslamia, New Delhi, India

Abstract- Changing times and advancements in technology have taken a toll on human health. Poor sleep quality is rampant in every age group thus an apharmacological cure is slowly becoming a necessity of the times. Exercises/physical activities are a strong contender in the race. But still a lot work has to be done to finally conclude about its efficacy as the treatment. This article aims at reviewing the relation between sleep quality and exercise. This article reviews the experimental and epidemiological work done on the topic along with the reviews published on the same. The emphasis here is on the studies done and the possible mechanisms underlying the relationship. The article also talks about the lacunae in research and future directions for research.

Index Terms- Acute exercises, chronic exercise, exercise, physical activity, sleep, sleep quality

will be discussed in detail. There are various types of exercises and with all of them having different effects.

The purpose of this article is to write a comprehensive review on the effects of exercise on sleep. The article is planned as following:

1. Sleep-a basic understanding
2. Exercise- relevance and type
3. Sleep and exercise
4. Acute exercise studies
5. Chronic exercise studies
6. Possible mechanisms for the effects of exercise on sleep quality
7. Summary and conclusion
8. Future research
9. References

EL EJERCICIO Y EL SUEÑO

- **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

EL EJERCICIO Y EL SUEÑO

- **Hallazgos Científicos:**
  - **Efectos del ejercicio agudo:**
    - **El ejercicio antes de acostarse en la noche:**
      Respuesta detrimental sobre la calidad del sueño

J Physiother. 2012;58(3):157-63. doi: 10.1016/S1836-9553(12)70106-6.

Exercise training improves sleep quality in middle-aged and older adults with sleep problems: a systematic review.

Yang PY, Ho KH, Chen HC, Chien MY.

College of Medicine, National Taiwan University, Taipei, Taiwan.

Abstract

QUESTION: Does an exercise training program improve the quality of sleep in middle-aged and older adults with sleep problems?

DESIGN: Systematic review with meta-analysis of randomised trials.

PARTICIPANTS: Adults aged over 40 years with sleep problems.

INTERVENTION: A formal exercise training program consisting of either aerobic or resistance exercise.

OUTCOME MEASURES: Self-reported sleep quality or polysomnography.

RESULTS: Six trials were eligible for inclusion and provided data on 305 participants (241 female). Each of the studies examined an exercise training program that consisted of either moderate intensity aerobic exercise or high intensity resistance exercise. The duration of most of the training programs was between 10 and 16 weeks. All of the studies used the self-reported Pittsburgh Sleep Quality Index to assess sleep quality. Compared to the control group, the participants who were randomised to an exercise program had a better global Pittsburgh Sleep Quality Index score, with a standardised mean difference (SMD) of 0.47 (95% CI 0.08 to 0.86). The exercise group also had significantly reduced sleep latency (SMD 0.58, 95% CI 0.08 to 1.08), and medication use (SMD 0.44, 95% CI 0.14 to 0.74). However, the groups did not differ significantly in sleep duration, sleep efficiency, sleep disturbance, or daytime functioning.

CONCLUSION: Participation in an exercise training program has moderately positive effects on sleep quality in middle-aged and older adults. Physical exercise could be an alternative or complementary approach to existing therapies for sleep problems.

PMID: 22884182 [PubMed - indexed for MEDLINE]

EL EJERCICIO Y EL SUEÑO

- **Hallazgos Científicos:**
  - **Efectos del ejercicio crónico:**
    - **Programa de entrenamiento físico::**
      - **Dispone de un efecto moderadamente positivo:**
        - **Sobre la calidad del sueño:**
          - **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_2máx:***
        - ◇ **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**

CONTROL DE PESO - DÉFICIT CALÓRICO
BALANCE ENERGÉTICO NEGATIVO

2000 kcal Ingeridas - 3000 kcal Gastadas = Reducción de MC

Consumo Calórico

Gasto Calórico

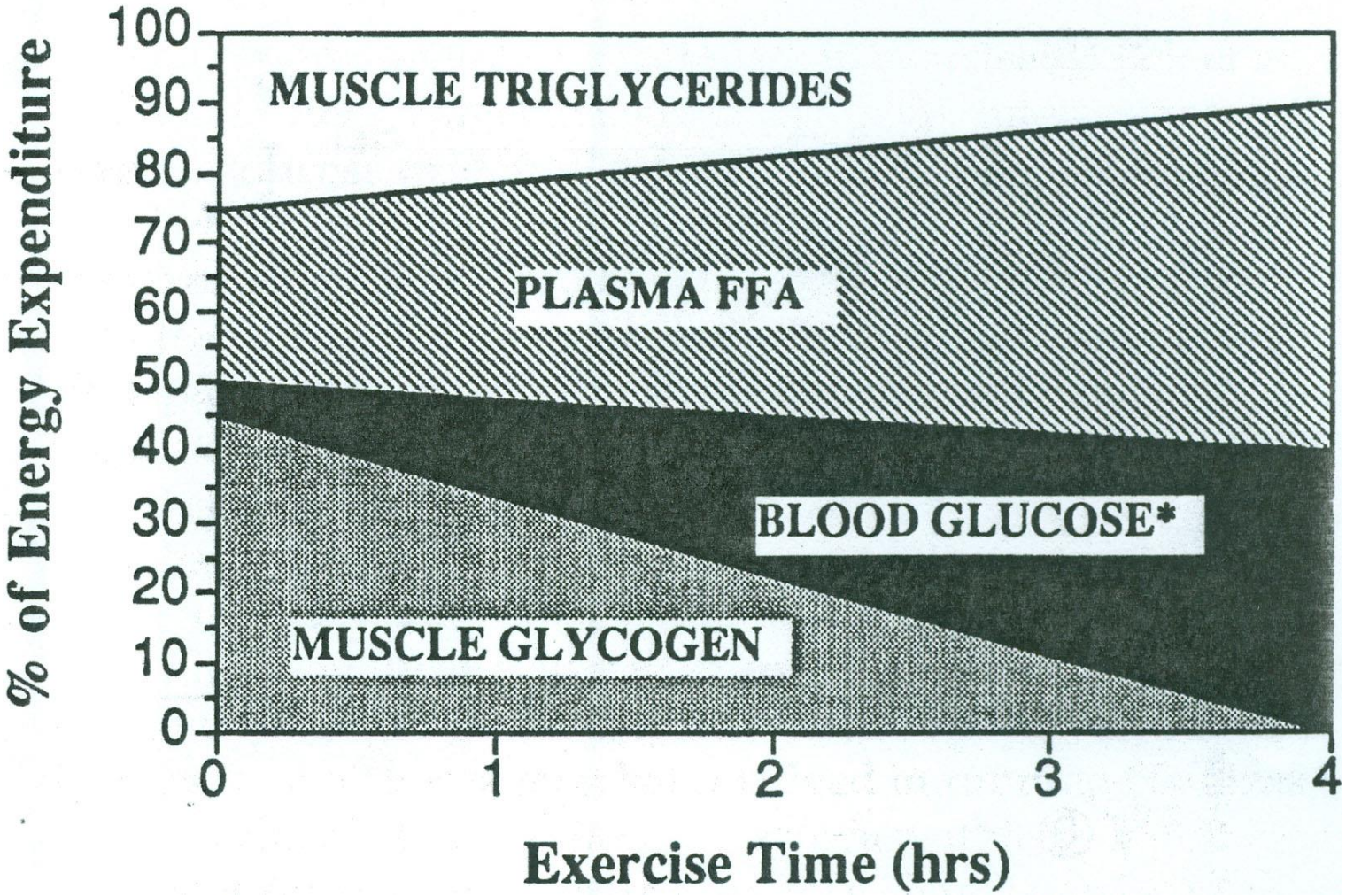
SUSTRATO ENERGÉTICO METABOLIZADO

PREFERENCIA SEGÚN LA: Intensidad del Ejercicio

INTENSIDAD	COMBUSTIBLE METABÓLICO UTILIZADO
< 30% VO_2máx	Principalmente las Reservas Musculares de Grasa
40 - 60% VO_2máx	Se Utilizan Equitativamente las Grasas y los CHO
75% VO_2máx	Principalmente los CHO
80% VO_2máx	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_2máx



NOTA. Reproducido de: "Fuels for Sports Performace," 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.

Muscle glycogen utilization during prolonged strenuous exercise when fed carbohydrate

EDWARD F. COYLE, ANDREW R. COGGAN,
MARI K. HEMMERT, AND JOHN L. IVY
Human Performance Laboratory, Department of Physical and Health Education, University of Texas, Austin, Texas 78712

COYLE, EDWARD F., ANDREW R. COGGAN, MARI K. HEMMERT, AND JOHN L. IVY. *Muscle glycogen utilization during prolonged strenuous exercise when fed carbohydrate.* J. Appl. Physiol. 61(1): 165–172, 1986.—The purpose of this study was to determine whether the postponement of fatigue in subjects fed carbohydrate during prolonged strenuous exercise is associated with a slowing of muscle glycogen depletion. Seven endurance-trained cyclists exercised at 71 ± 1% of maximal O_2 consumption ($\dot{V}O_{2\,max}$), to fatigue, while ingesting a flavored water solution (i.e., placebo) during one trial and while ingesting a glucose polymer solution (i.e., 2.0 g/kg at 20 min and 0.4 g/kg every 20 min thereafter) during another trial. Fatigue during the placebo trial occurred after 3.02 ± 0.19 h of exercise and was preceded by a decline ($P < 0.01$) in plasma glucose to 2.5 ± 0.5 mM and by a decline in the respiratory exchange ratio (i.e., R; from 0.85 to 0.80; $P < 0.05$). Glycogen within the vastus lateralis muscle declined at an average rate of 51.5 ± 5.4 mmol glucosyl units (GU)·kg^{-1}·h^{-1} during the first 2 h of exercise and at a slower rate ($P < 0.01$) of 23.0 ± 14.3 mmol GU·kg^{-1}·h^{-1} during the third and final hour. When fed carbohydrate, which maintained plasma glucose concentration (4.2–5.2 mM), the subjects exercised for an additional hour before fatiguing (4.02 ± 0.33 h; $P < 0.01$) and maintained their initial R (i.e., 0.86) and rate of carbohydrate oxidation throughout exercise. The pattern of muscle glycogen utilization, however, was not different during the first 3 h of exercise with the placebo or the carbohydrate feedings. The additional hour of exercise performed when fed carbohydrate was accomplished with little reliance on muscle glycogen (i.e., 5 mmol GU·kg^{-1}·h^{-1}; NS) and without compromising carbohydrate oxidation. We conclude that when they are fed carbohydrate, highly trained endurance athletes are capable of oxidizing carbohydrate at relatively high rates from sources other than muscle glycogen during the latter stages of prolonged strenuous exercise and that this postpones fatigue.

endurance; physical performance; fatigue; glucose oxidation; athletes; diet

The purpose of this study was to directly measure muscle glycogen utilization during strenuous exercise with and without carbohydrate feedings to determine whether muscle glycogen sparing can explain the postponement of fatigue. Our first approach in the present study was simply to quantify glycogen utilization during 105 min of cycling when subjects were fed carbohydrates and when they fasted. After observing no difference in glycogen utilization during these nonfatiguing bouts of exercise, we proceeded to quantify glycogen utilization and carbohydrate oxidation during the latter stages of prolonged exercise performed to fatigue when subjects fasted and were fed carbohydrates.

METHODS

Initial Study of Glycogen Utilization During 105 min of Exercise With and Without Carbohydrate Feedings

Our first study measured glycogen utilization following 105 min of exercise at 71.4 ± 0.8% of maximal O_2 uptake ($\dot{V}O_{2\,max}$) with and without carbohydrate feedings. These exercise trials employed a different group of five subjects, from the subsequent study described below, which exercised seven subjects to the point of fatigue. The specific methodology of this initial study is only briefly described at this point because it followed the same general procedures as employed during the first 105 min of exercise in the bouts performed to fatigue, which are described in detail below. The mean (±SE) age, weight, and $\dot{V}O_{2\,max}$ were 26 ± 2 yr, 71.9 ± 1.7 kg, and 4.67 ± 0.14 l/min, respectively, for this first group of five endurance-trained cyclists. The ordering of the carbohydrate and placebo trials was randomized in this first study and performed

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

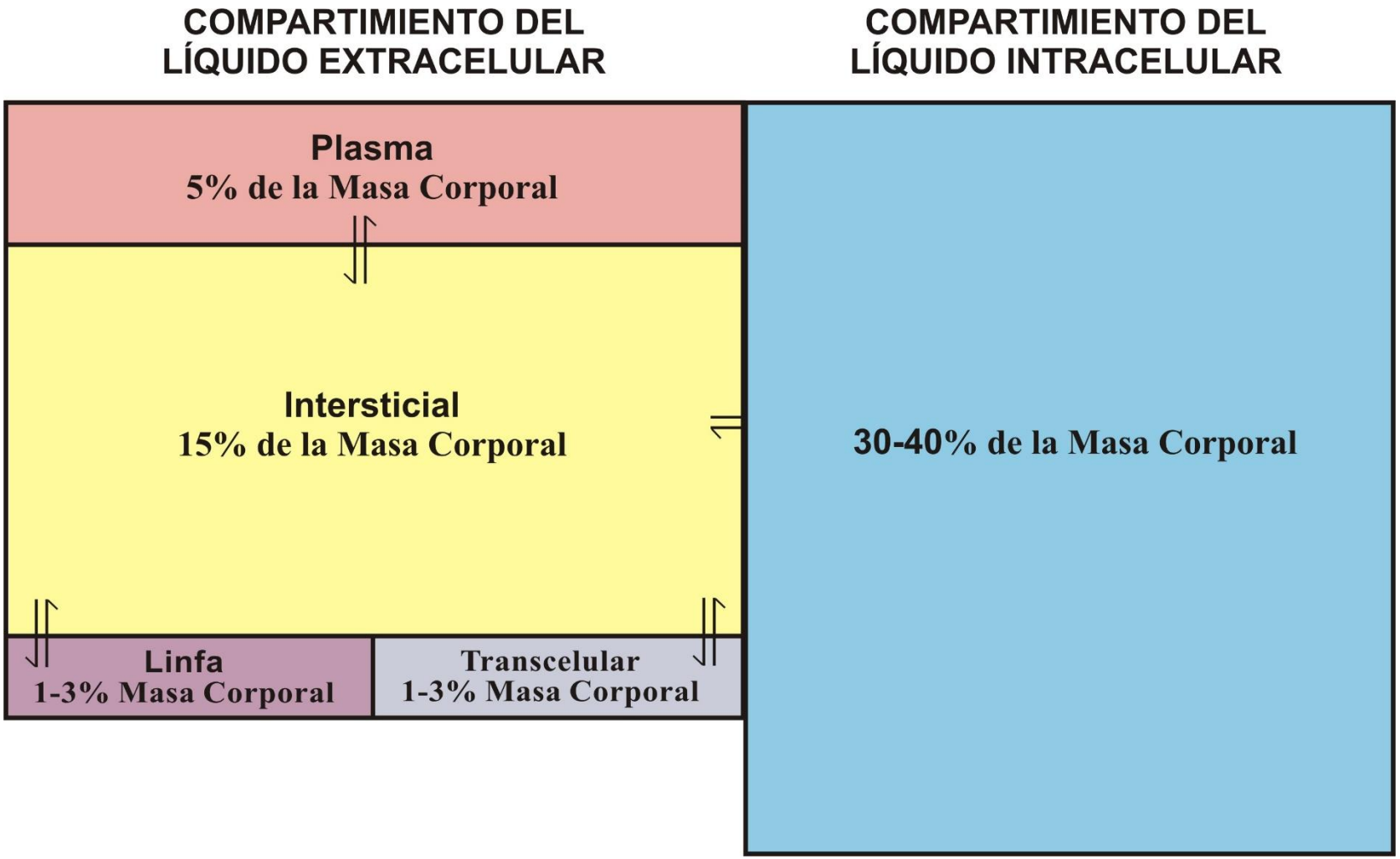
the adipose tissue during different exercise intensities is unknown.

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.

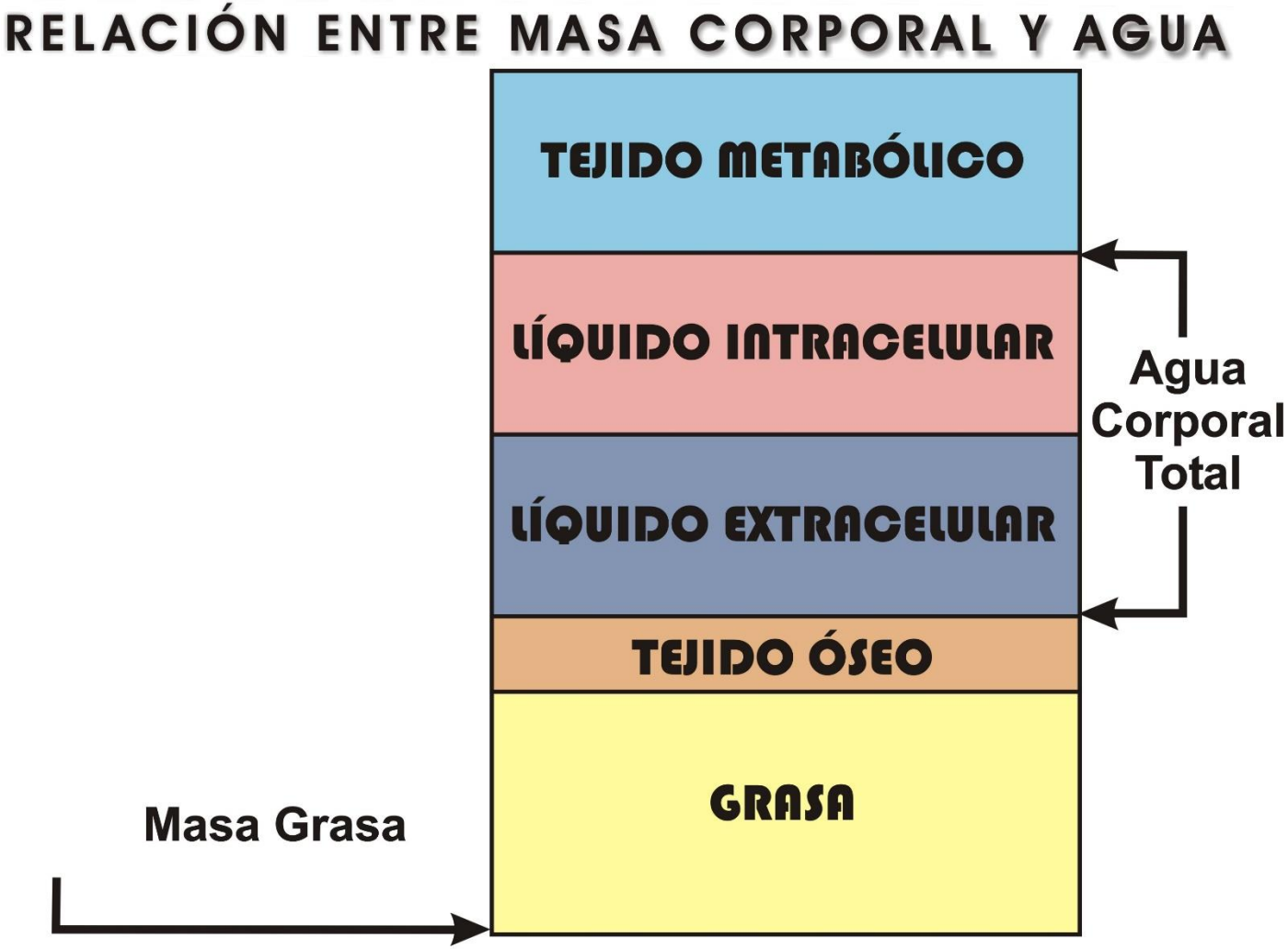
The aim of the present study was to determine the quantitative effects of exercise intensity and duration on endogenous FFA mobilization and utilization. We hypothesized that lipolysis within adipocytes is stimulated maximally during very-low-intensity exercise, since peripheral lipolysis is very sensitive 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



COMPARTIMIENTOS DE LÍQUIDOS EN EL CUERPO
RELACIÓN: Masa Corporal y Agua

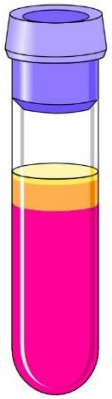


Modelo de Cinco Compartimientos

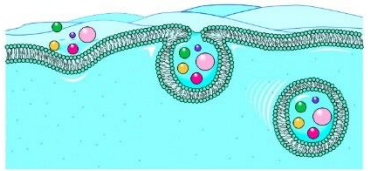
COMPARTIMIENTOS/LÍQUIDOS DEL CUERPO
(60% de la Masa Corporal es Agua)

LÍQUIDO EXTRACELULAR
(Fuera de las Células)

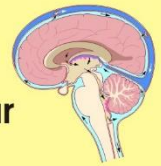
- Plasma (Porción Líquida Sangre)



- Líquido INSTERSTICIAL/TISULAR (Entre Células/Tejidos)

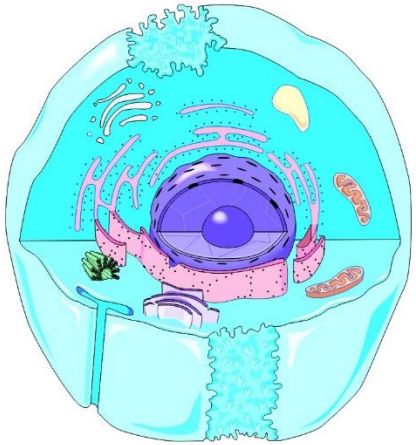


- Líquido TRANSCELULAR
  - Líquido Cereboespinal (encefaloraquídeo)
  - Líquido Secreciones Sistema Gastro-Intestinal
  - Líquido Sinovial
  - Líquido Pleural
  - Líquido Intra-Ocular
  - Líquido Peritoneal



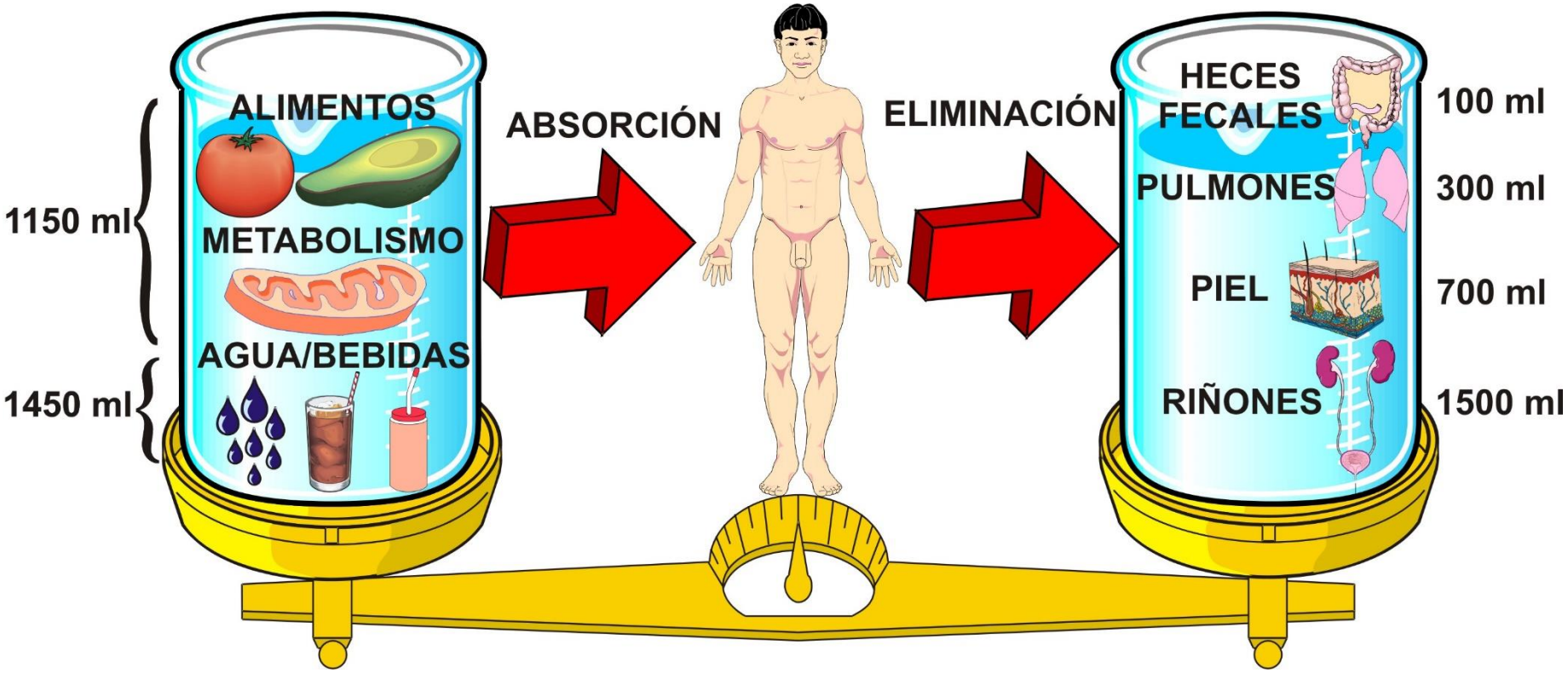
LÍQUIDO INTRACELULAR
(Dentro de las Células)

- Citoplasma *(Célula Normal)*
- Sarcoplasma *(Célula Muscular)*



LÍQUIDOS EN EL CUERPO

EQUILIBRIO HÍDRICO: Absorción y Eliminación

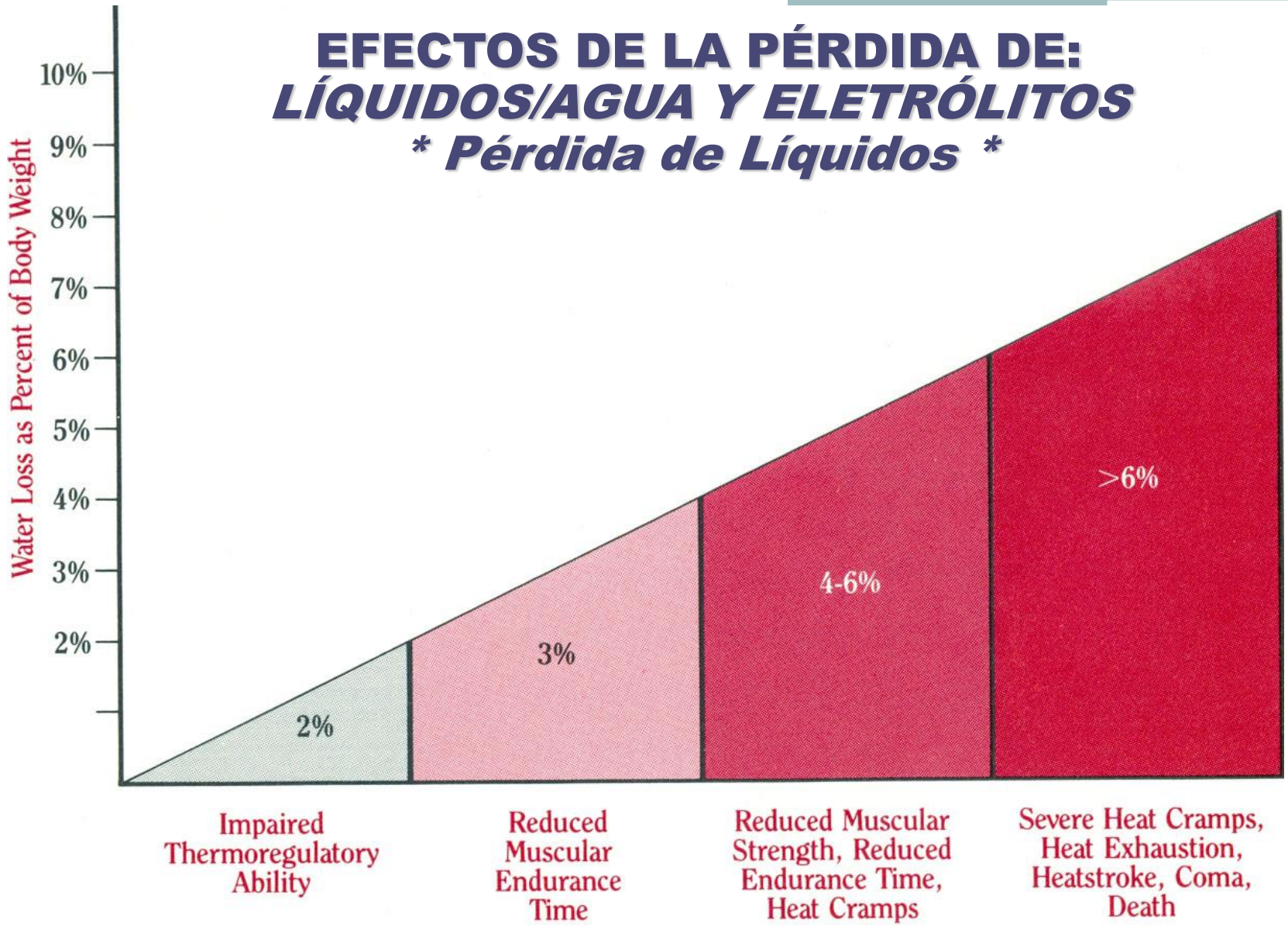


EFECTOS DE LA PÉRDIDA DE:
LÍQUIDOS/AGUA Y ELETRÓLITOS
** Pérdida de Líquidos **

- **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 **



NOTA. Reproducido de:Macaraeg, P. V., Santos, C. A. (1984). The effect of a glucose polymer electrolyte solution on exercise duration. ***National Athletic Trainers Journal***, p. 263

LÍQUIDOS Y ELECTRÓLITOS

REPOSICIÓN DEL AGUA Y ELECTRÓLITOS:

Prueba para Determinar el Estado de Deshidratación

ENTRENAMIENTO O COMPENETNCIA

Deportista Suda Mucho

Se piede liquido y minerales del Cuerpo

Se analiza el nivel de líquidos en el cuerpo:

EVALUACIÓN:
Determinación si se Perdió mucho Líquido del Cuerpo (Deshidratación)

PESO DEL CUERPO: ¿Cantidad Perdido al otro Día?

COLOR DE LA ORINA: ¿Amarilla Oscura?

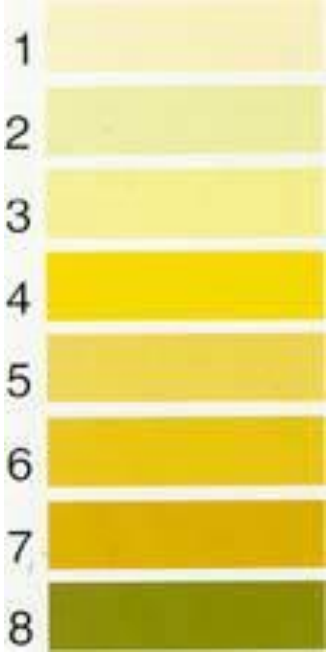
PERCEPCIÓN DE SED: ¿Estás Sediento?

LÍQUIDOS Y ELECTRÓLÍTOS

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 Amstrong



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, Champaingn, IL: Human Kinetics. Copyright 2012 por AL. E. Amstrong.

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.

LÍQUIDOS Y ELECTRÓLITOS

REPOSICIÓN DEL AGUA Y ELECTRÓLITOS: Recomendaciones

AGUA O BEBIDAS DEPORTIVAS

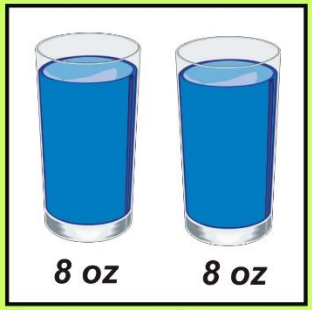
Antes Competencia	Durante Competencia	Después Competencia
1-2 días antes: *Beber mucho líquido*	**Cada 15-20 minutos:** ¾-1½ vaso de agua	**Primeros 30 minutos:** *2-4 vasos de líquido*
2-3 horas antes: *1½ a 2½ vasos*	**Cada 15 minutos-** *Corredores de fondo:*	**Intervalos de 1-2 horas:** *1 litro de agua (16 onzas), o*
15 minutos antes: *1 a 2 vasos*	**Bebida deportiva:** *6-12 onzas, según tolerado*	**Por cada 1 libra perdida:** *1 litro de agua (16 onzas)*
Bebida deportiva: *Solución de 4-8% CHO*	**Bebida deportiva:** *Solución de 4-8% CHO*	**Bebida deportiva:** *Solución de 4-8% CHO*

LÍQUIDOS Y ELECTRÓLITOS

REPOSICIÓN DEL AGUA Y ELECTRÓLITOS: Recomendaciones

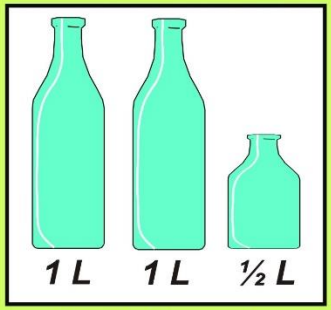
TOMANDO AGUA Y BEBIDAS DEPORTIVAS

2 horas antes del juego:



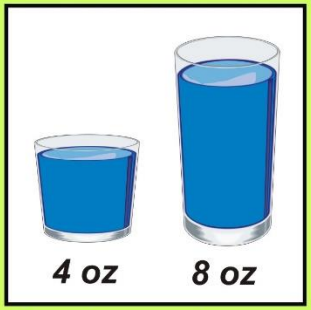
2 vasos de 8 onzas

Por cada hora de juego:



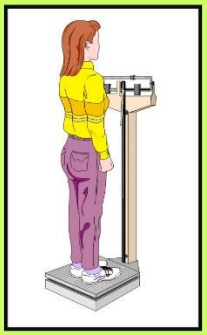
1 a 1½ de litros de agua

Cada 15 minutos durante el juego:

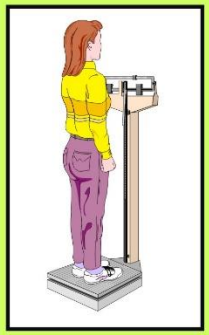


½ a 1 vaso de agua

TOMANDO AGUA Y BEBIDAS DEPORTIVAS - Después del Ejercicio:

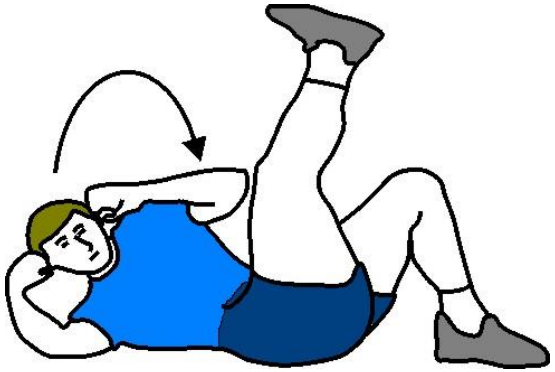


Pesarse



Por cada libra que pierdas

Tomar 16 onzas de agua

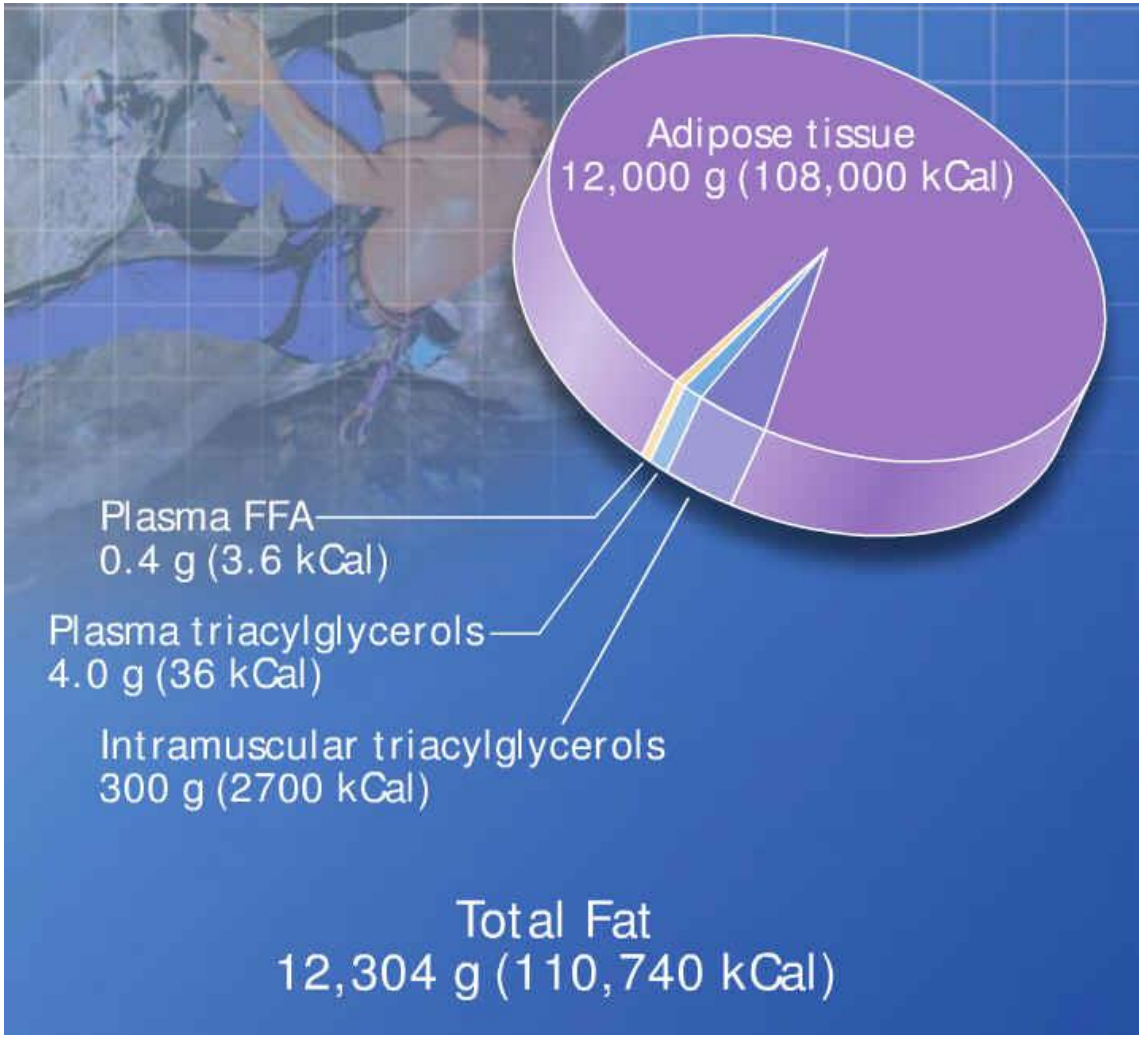


REDUCCIÓN DE GRASA LOCALIZADA

- **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

LÍPIDOS - CONTENIDO ENERGÉTICO EN EL CUERPO
DISTRIBUCIÓN DE LOS ALMACENES DE GRASA



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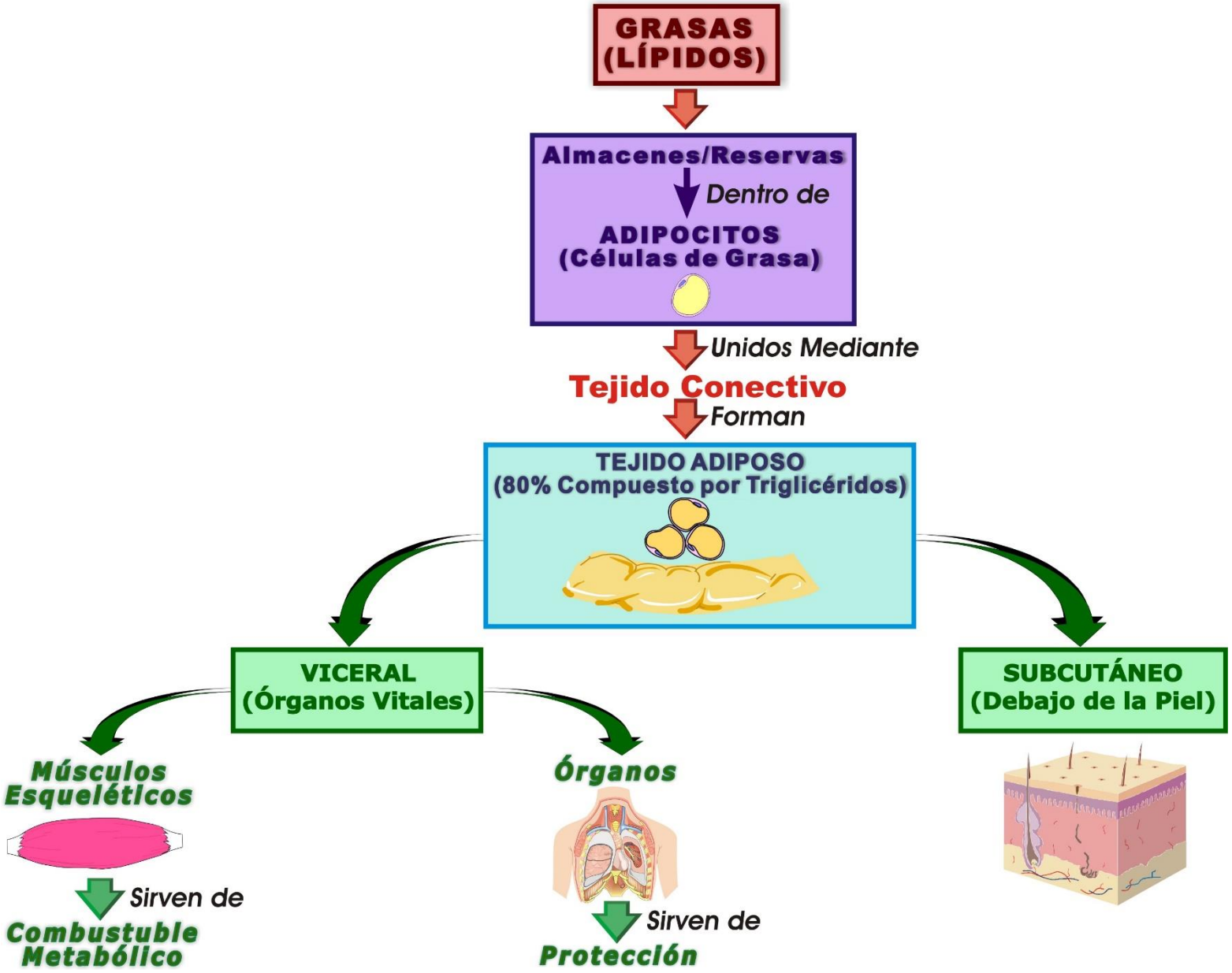
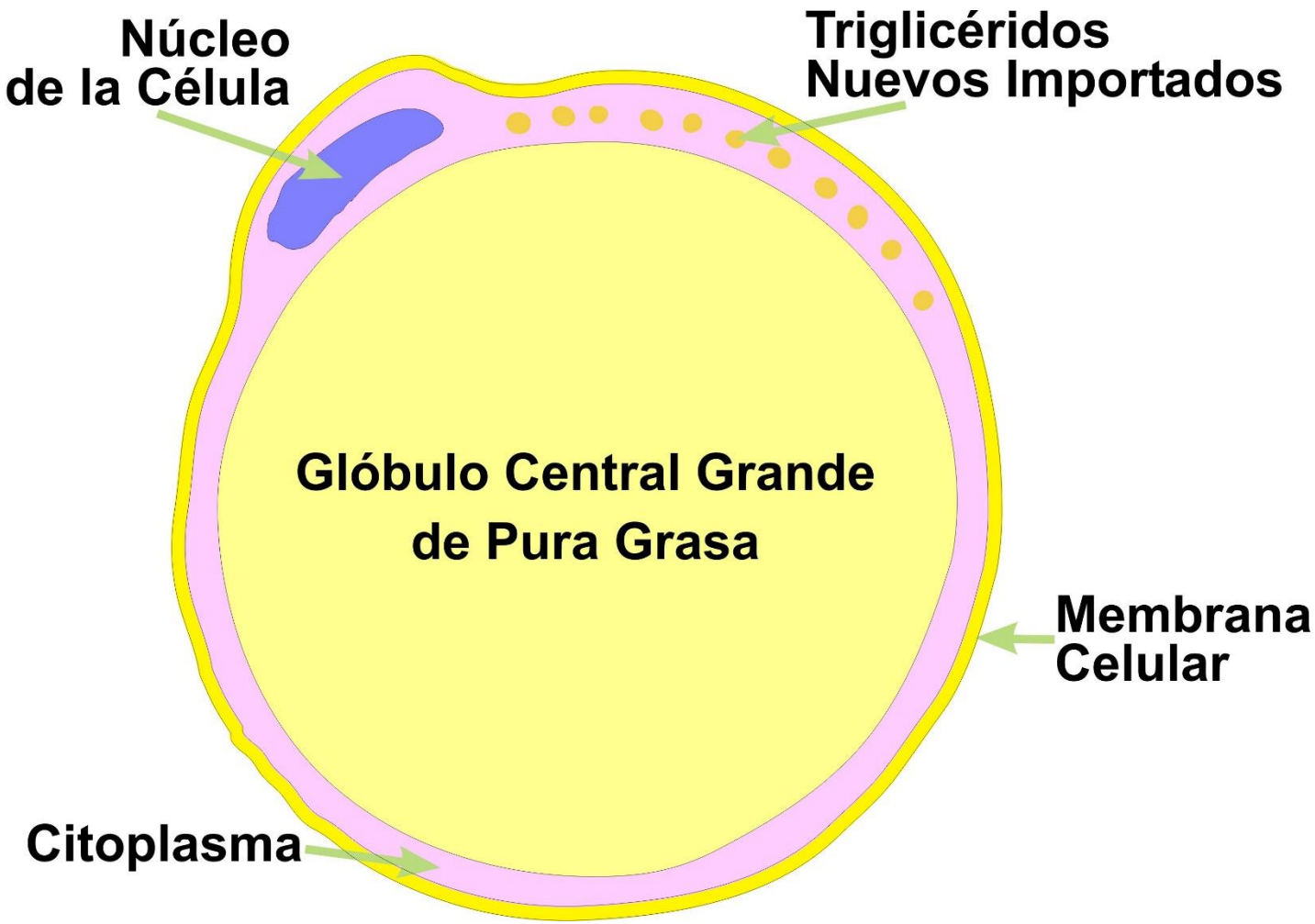


LÍPIDOS - RESERVAS EN EL CUERPO
EL ADIPOSITO HUMANO: Célula de Grasa



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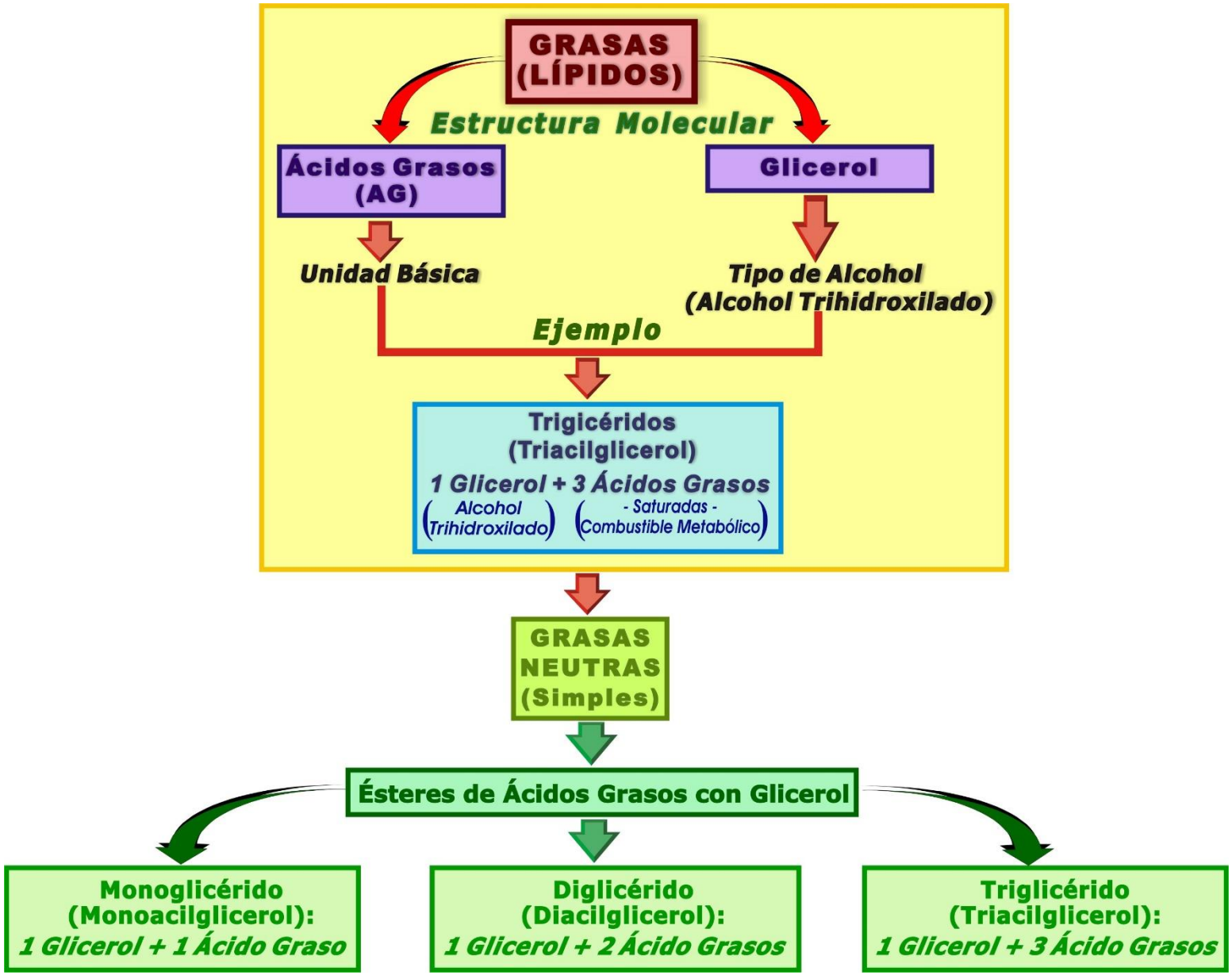
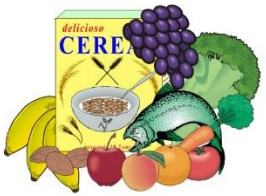
GRASAS (LÍPIDOS)

CLASIFICACIÓN

- LIPOIDES
- GRASAS
  - Ácidos Grasos
    - Insaturados
      (Cadena - Dobles Enlaces)
      - Líquido: Temp. Ambiental-
      - Monoinsaturados
        - Aceite de Maíz
      - Poliinsaturados
        - EJEMPLOS: Tipos de Grasas Insaturadas
        - Ácido Oléico
        - Ácido Linolénico
    - Saturados
      (Ausencia - Enlaces Dobles)
      - Sólido: Temp. Ambiental-
      - Ejemplos
        - Ácido Estérico
        - Ácido Palmítico
        - Carnes de Res/Rojas
      - Trans
        - Átomos de Carbono Lado Opuesto del Enlace Doble
  - Glicerol



La Ecuación del Balance Energético



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

Consumo Calórico

Gasto Calórico

EQUILIBRIO CALÓRICO

2000 kcal Ingeridas - 3000 kcal Gastadas = Reducción de MC

Consumo Calórico

Gasto Calórico

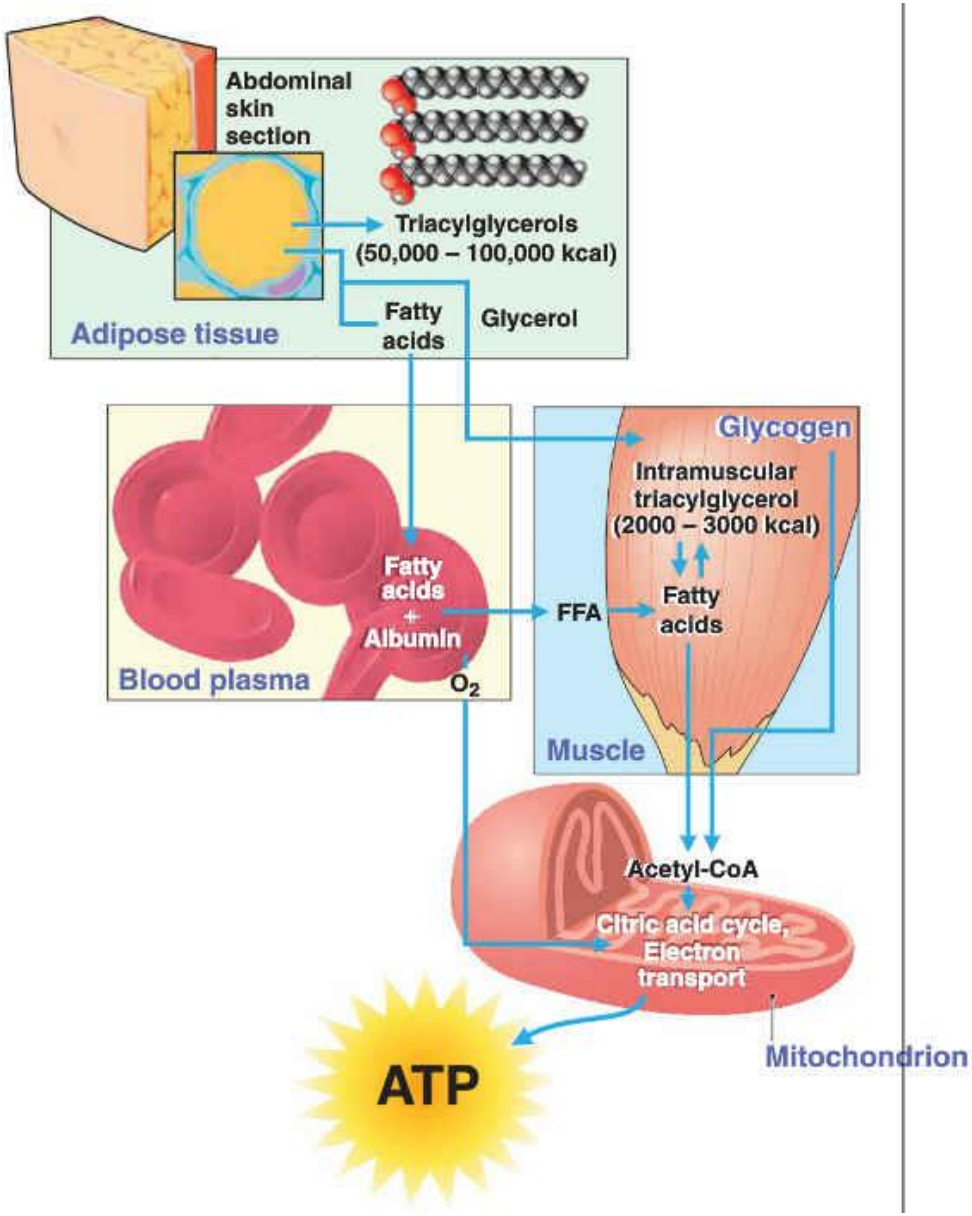
EQUILIBRIO CALÓRICO NEGATIVO

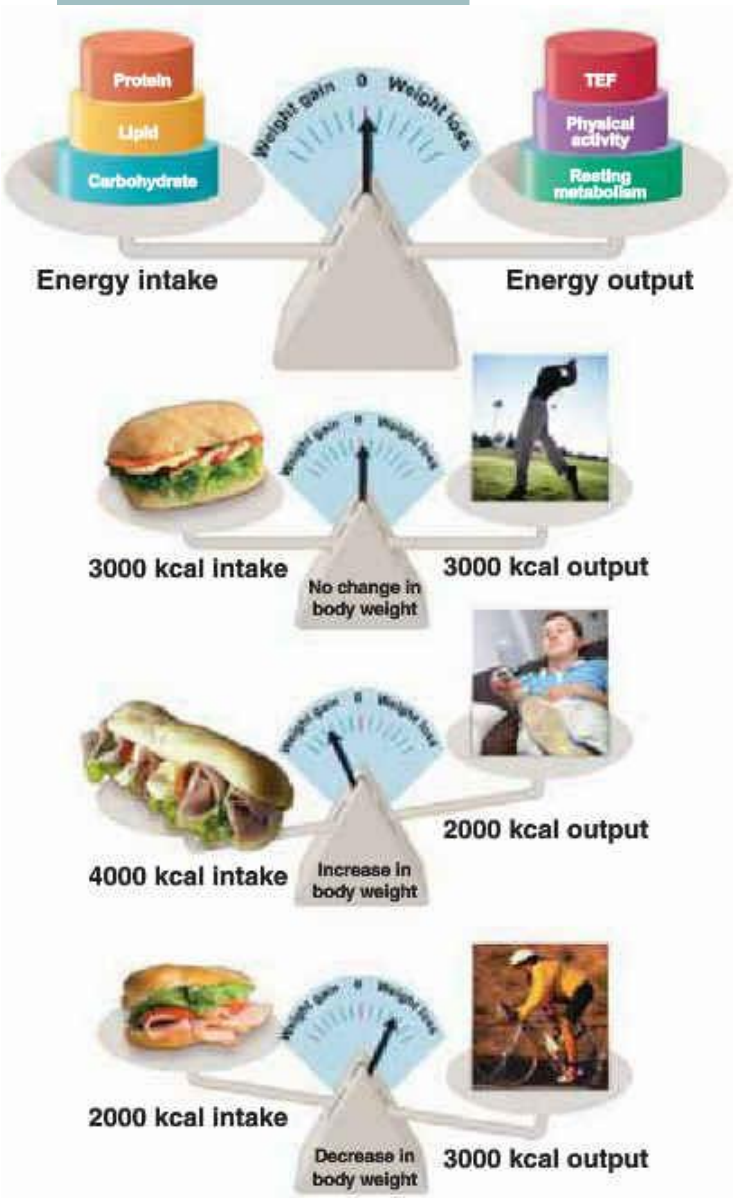
4000 kcal Ingeridas - 2000 kcal Gastadas = Aumento de MC

Consumo Calórico

Gasto Calórico

EQUILIBRIO CALÓRICO POSITIVO





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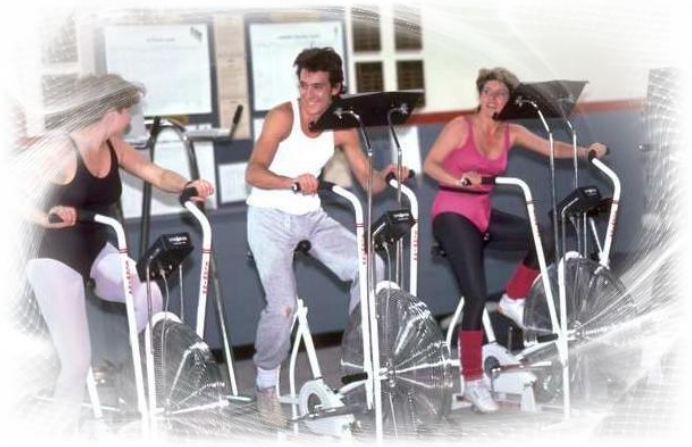
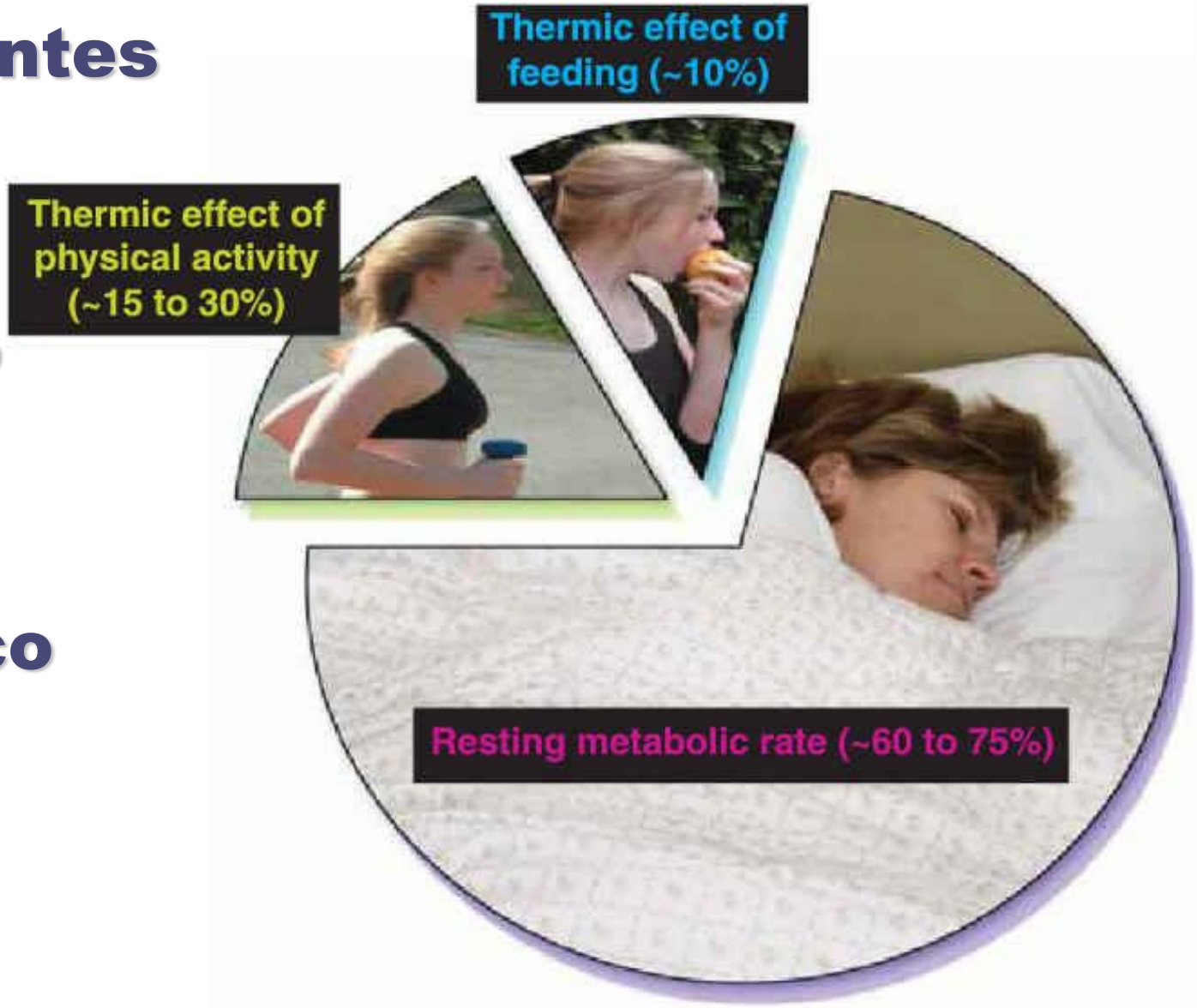


CALORÍAS QUE GENERA EL CUERPO DURANTE EL EJERCICIO Y ACTIVIDAD FÍSICA

- **Mito:**
  - **El ejercicio quema muchas calorías**
- **Realidad:**
  - **El cuerpo es económico en términos metabólicos:**
    - **Fundamentadas en evidencias científicas:**
      - ⇨ **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

Componentes del Gasto Energético Diario



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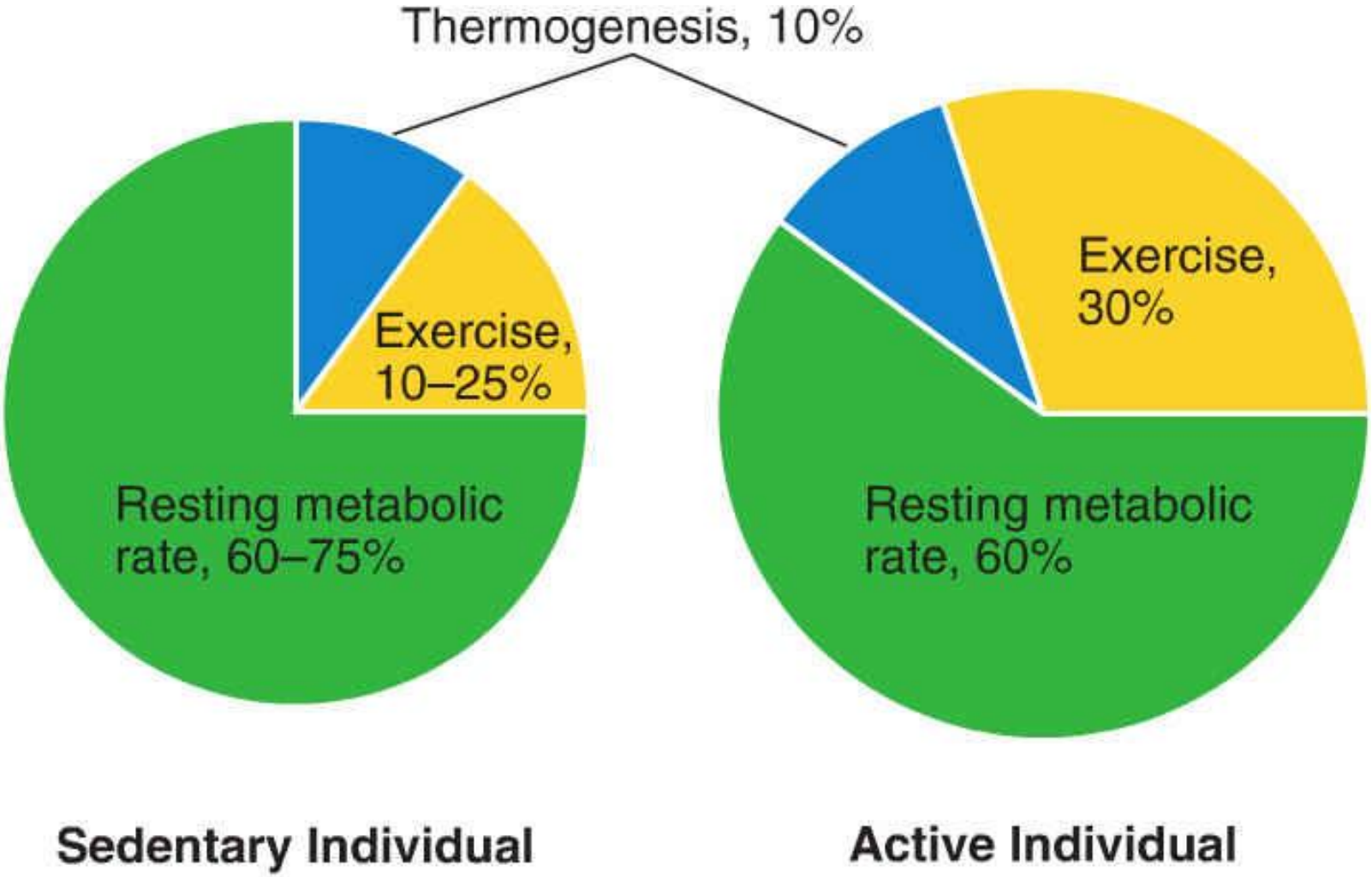
CONTROL DE PESO
GASTO ENERGÉTICO: Sedentario vs. Activo

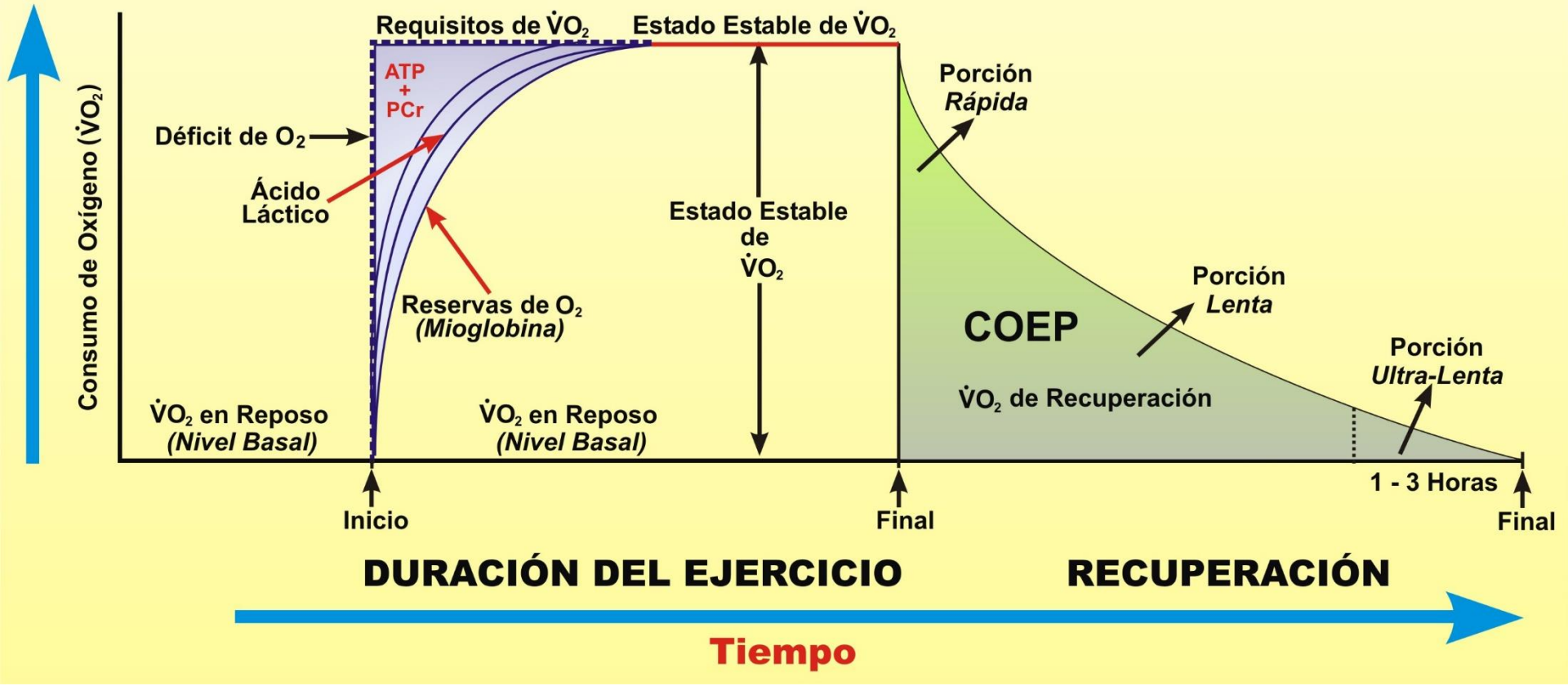


NOTA. Reproducido de: ***Exercise Physiology for Health, Fitness, and Performance***. (p. 220), por S. A. Plowman, & D. L. Smith, 2011, Philadelphia: Lippincott Williams & Wilkins. Copyright 2011 por Lippincott Williams & Wilkins, a Wolters Kluwer business.

PROCESOS DE RECUPERACIÓN

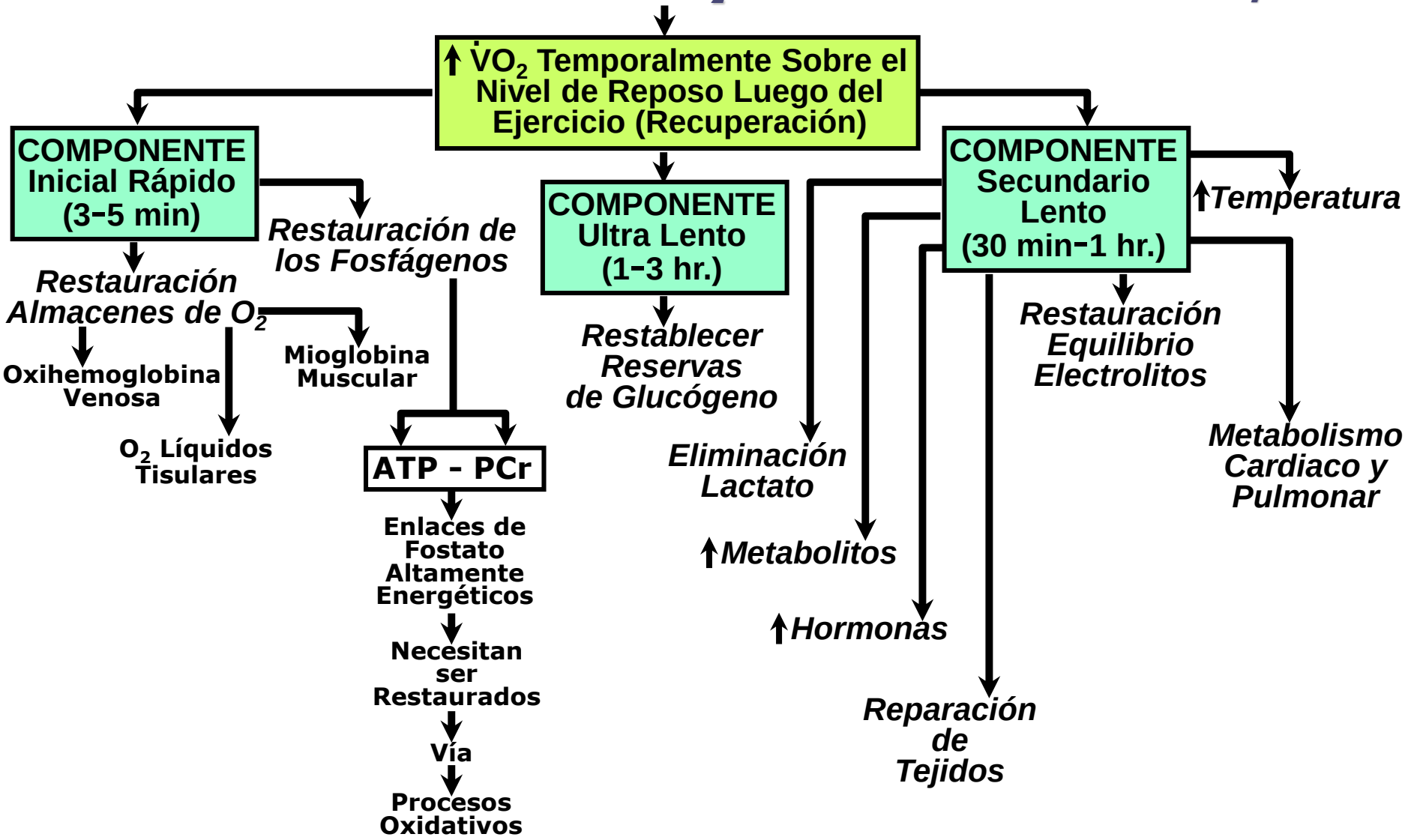
- **Mito:**
  - **Después del ejercicio, el metabolismo se acelera todo el día, quemando un gran número de calorías adicionales**
- **Realidad:**
  - **El cuerpo gasta poca energía posterior al ejercicio:**
    - **Fundamentadas en evidencias científicas:**
      - ⇨ **Luego de 30-45 minutos de un ejercicio vigoroso:** ***Solo se generan de 10-25 calorías adicionales***
      - ⇨ **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)

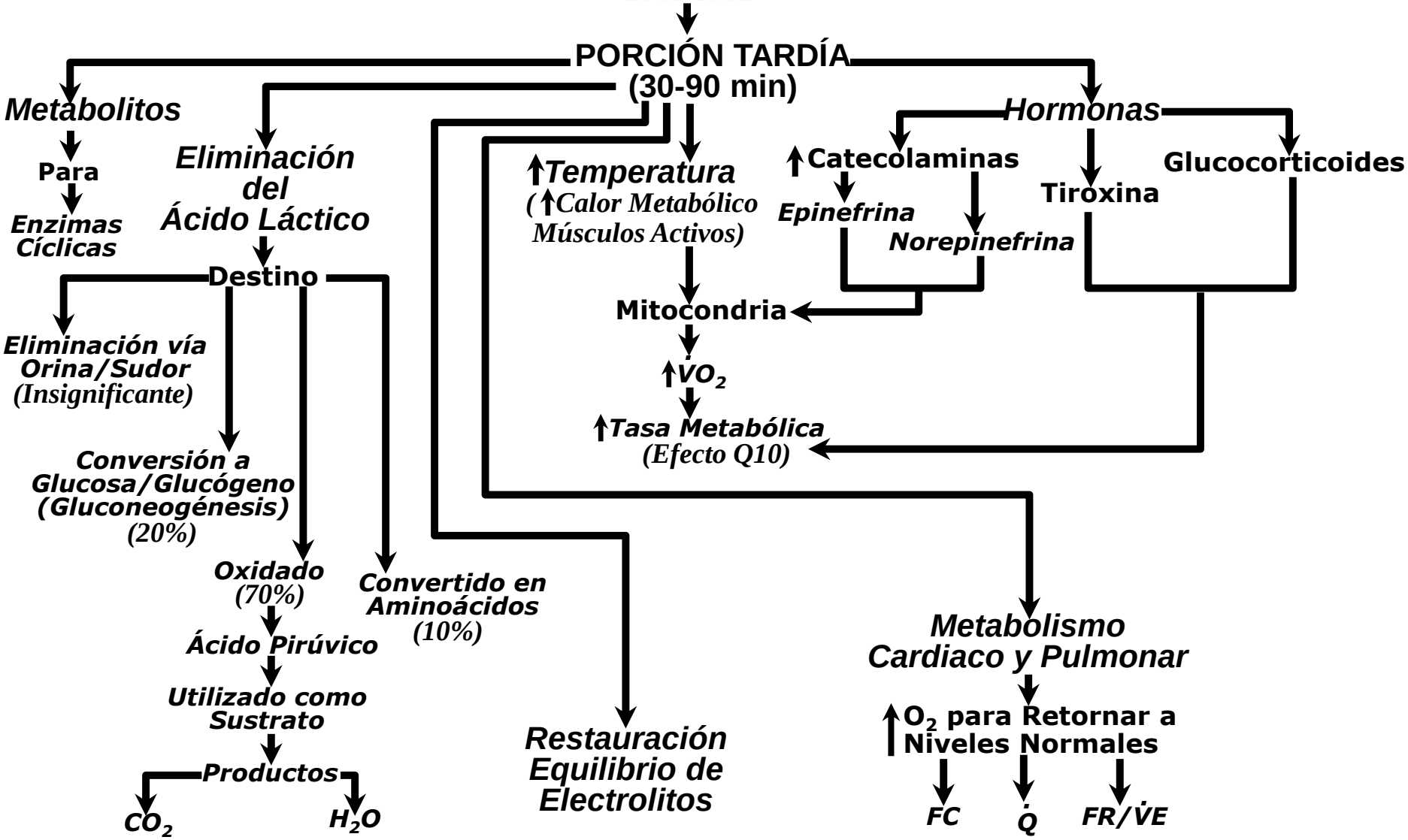
OXÍGENO DE RECUPERACIÓN: Exceso O_2 Normalmente Consumido en Reposo



CONSUMO DE OXÍGENO EN EXCESO POSTERIOR AL EJERCICIO (COEP)

OXÍGENO DE RECUPERACIÓN: Exceso O_2 Normalmente Consumido en Reposo

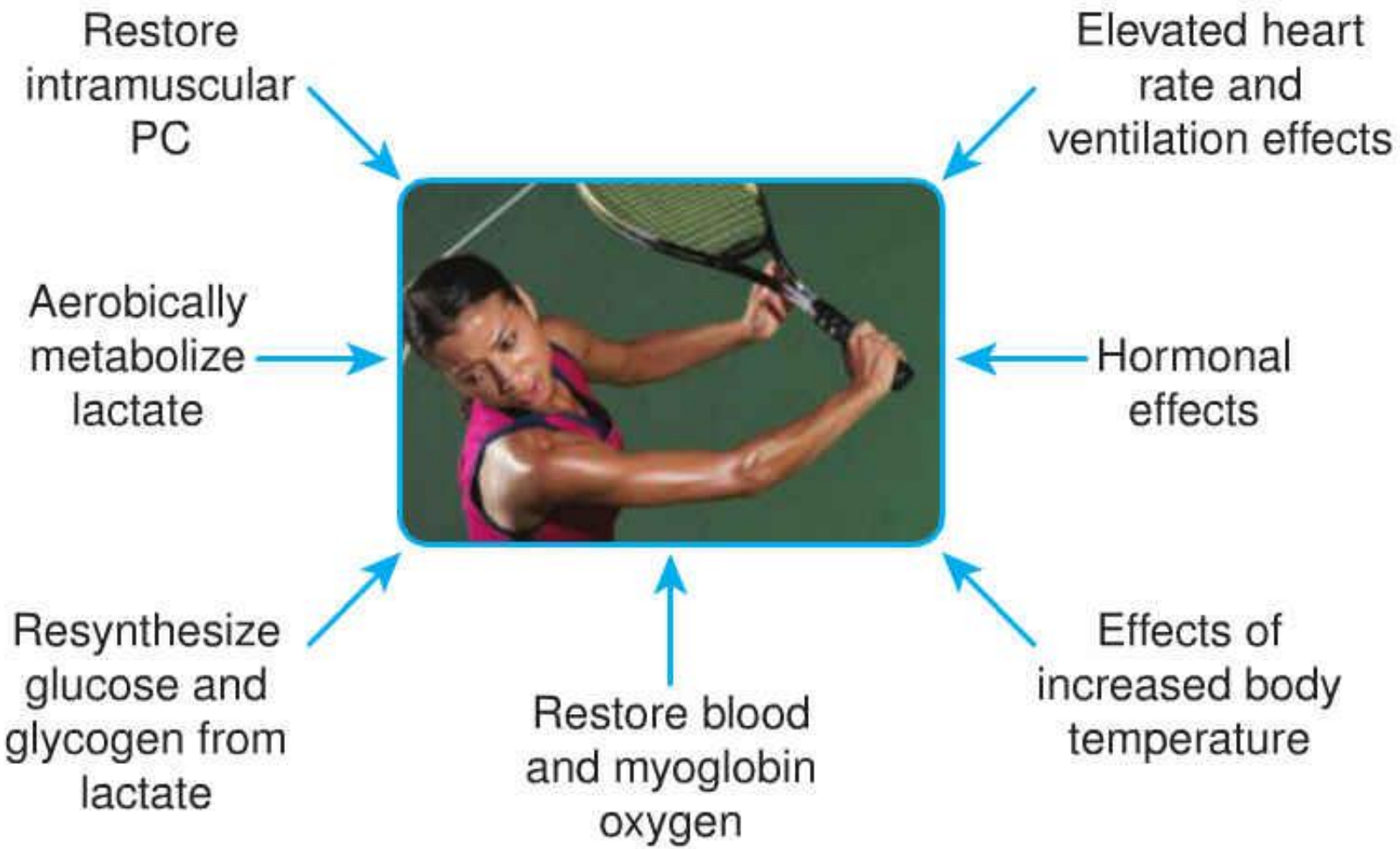
* CAUSAS *



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. Deschemes, 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

VITAMINAS Y MINERALES: *MITOS Y REALIDADES*

Mito: ***Las vitaminas proveen energía***

Realidad: ***Las vitaminas no contienen calorías***

Mito: ***Entre más vitaminas ingieras, en mejor aptitud física te te encontrarás***

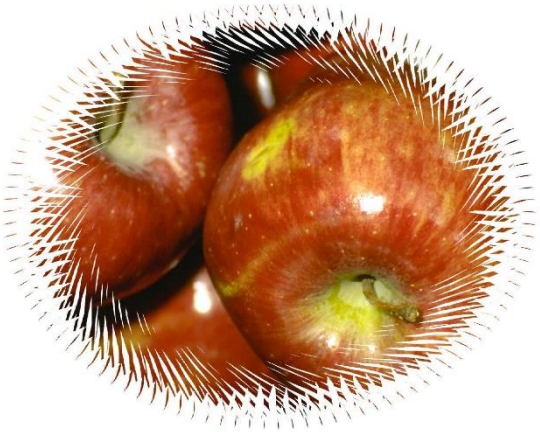
Realidad: ***El exceso de vitaminas puede afectar la salud***

Mito: ***Los alimentos en los supermercados no proveen todas las vitaminas que el cuerpo requiere***

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

Mito: ***Los atletas, en especial los CPLD, necesitan suplementos de vitaminas para mejorar el redimiento deportivo***

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

- Gimnástas
- 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

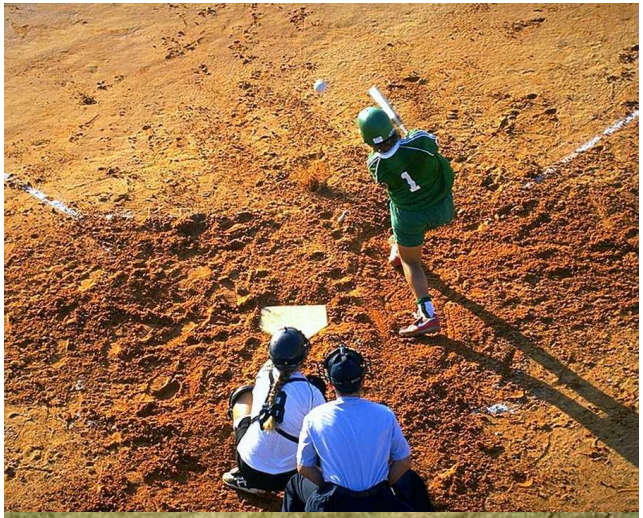
NOTA: Adaptado de: ***Nutritional Needs of Athletes***. (p. 8), por F. Brouns, 1993, New York: John Wiley & Sons. Copyright 1993 por John Wiley & Sons Ltd.

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**

VITAMINAS Y MINERALES:
SUPLETAMENTACIÓN: Dieta



- **Entre más alimentos consumas, mayor también será la cantidad de vitaminas y minerales ingeridos**
- **Para asegurar esto, seleccione raciones adecuadas de los grupos de alimentos presentes en la pirámide de alimentos**

VITAMINAS Y MINERALES: *SUPLETAMENTACIÓN: Dieta*

- **La suplementación no es necesaria**
- **Seleccionar una variedad de alimentos naturales en las cantidades y calidades adecuadas:**
  - ***Esto habrá de garantizar:***

    Las vitaminas y minerales que necesitan los atletas

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*

¿PREGUNTAS?