Principios Básicos de Hidratación y Calambres Musculares

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Tópicos

- Efectos de la deshidratación
- Calambres musculares y su relación con pérdidas elevadas de Na^+ en sudor
- Judo y otros deportes de combate
- Test de sudoración para determinar las necesidades de líquido de cada atleta

Ejercicio puede provocar altas tasas de sudoración y pérdida considerable de electrolitos, especialmente cuando hace calor

- 0.5-2.0 Litros/hora. Algunos hasta 4 litros/hora.
- En función del sexo, edad y deporte.
- Es difícil proporcionar "una guía para todos“.
- Si no repone perdida de agua y electrolítos, atleta sufrirá los efectos de la deshidratación

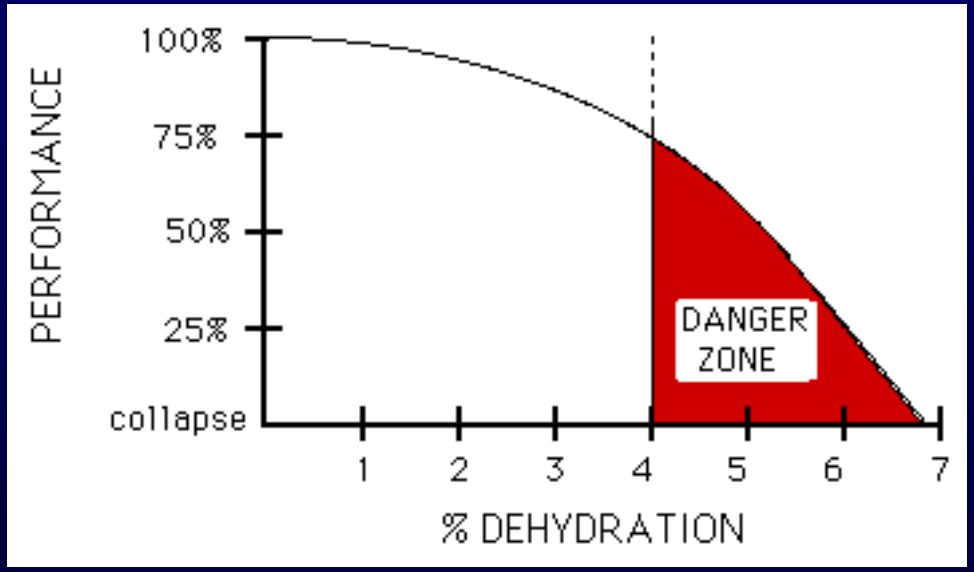
Exercise and Fluid Replacement, Med Sci Sports Exerc, 2007

Indice de Sudoración

Bajo: < 1.0 Litros/hr

Moderado: 1-2 Litros/hr

Alto: > 2.0 Litros/hr



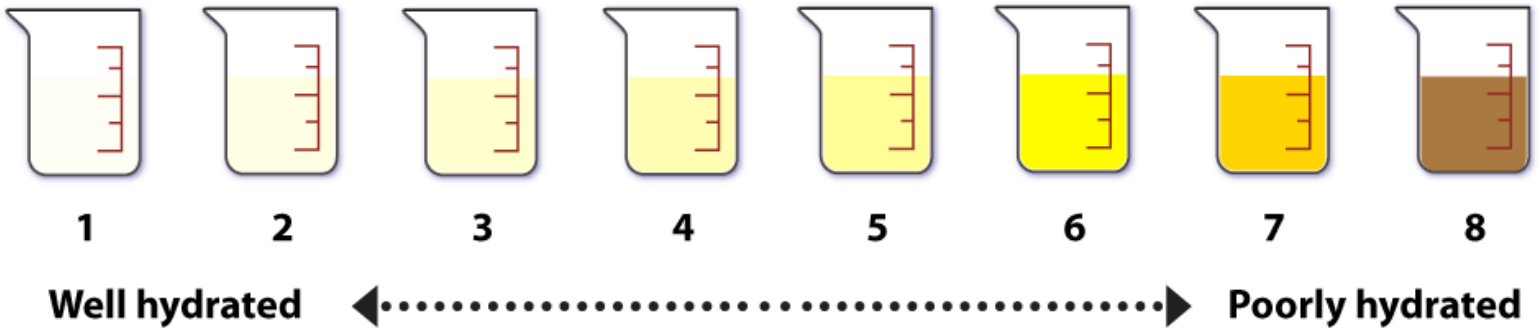
Effects of Increasing Dehydration on Physical Performance

BODY WATER LOSS	EFFECTS
0.5%	Increased strain on the heart
1%	Reduced aerobic endurance
3%	Reduced muscular endurance
4%	Reduced muscle strength; reduced fine motor skills; heat cramps
5%	Heat exhaustion; cramping; fatigue; reduced mental capacity
6%	Physical exhaustion; heatstroke; coma

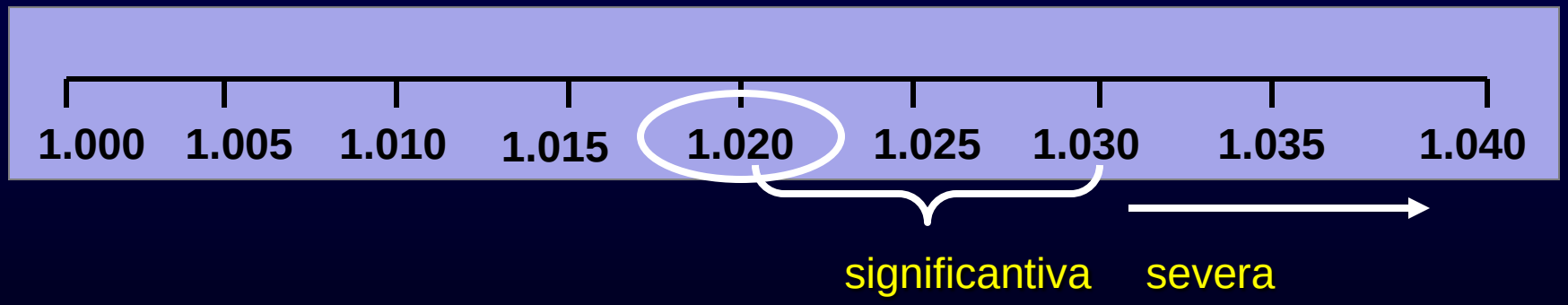
Excerpt from The Performance Zone by Dr. John Ivy

Como el atleta puede saber si está deshidratado?

1) Cambio de peso corporal- refleja pérdida de sudor, peso corporal al levantarse es util para establecer euhidratación; Δ>2% de es deshidratación
2) Color de orina
3) Gravedad específica de la orina


1
2
3
4
5
6
7
8
Well hydrated
Poorly hydrated

Gravedad específica de la orina (g/ml)



34 atletas evaluados por GSSI PR 2013- PRE-EJERCICIO

24

10

3 = severa

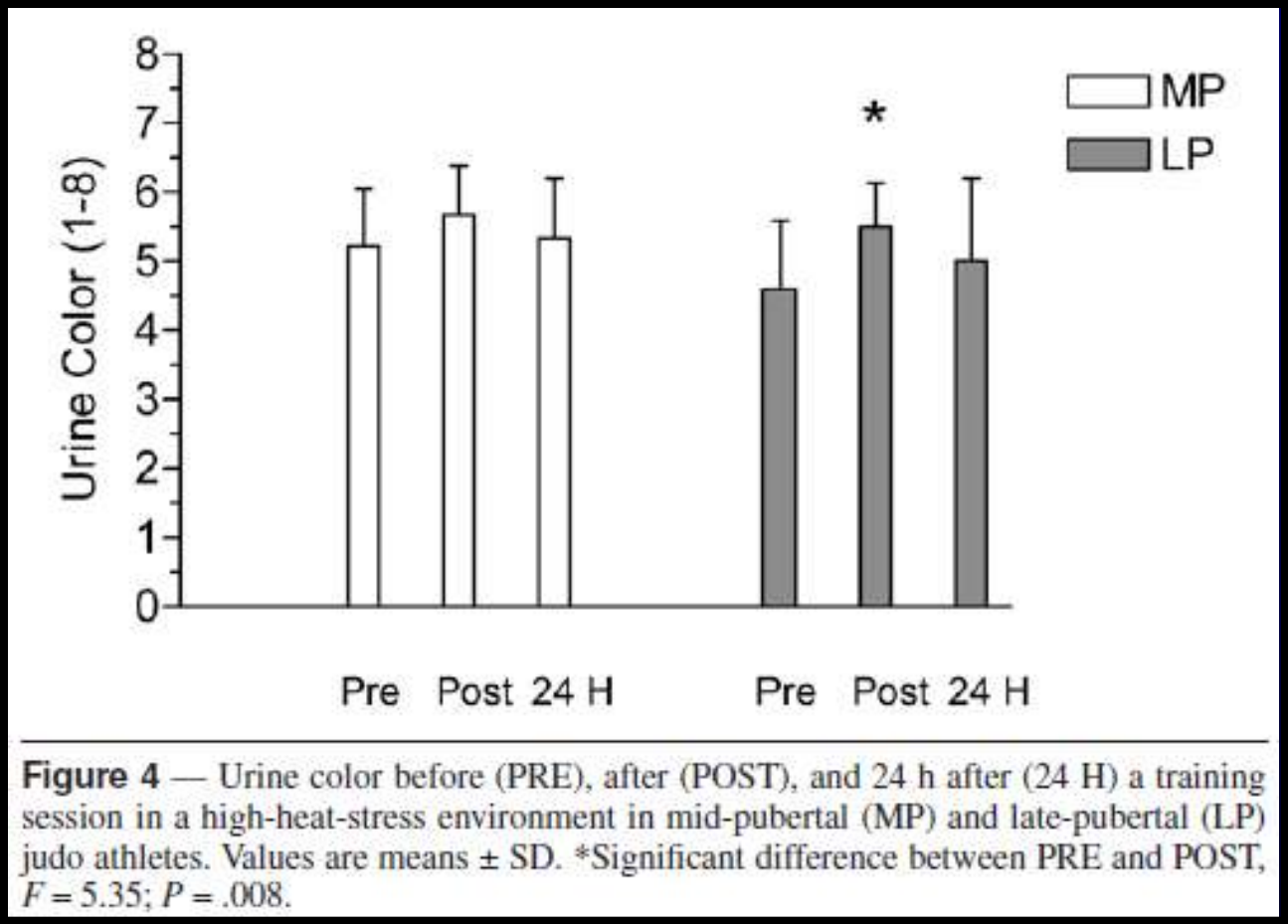


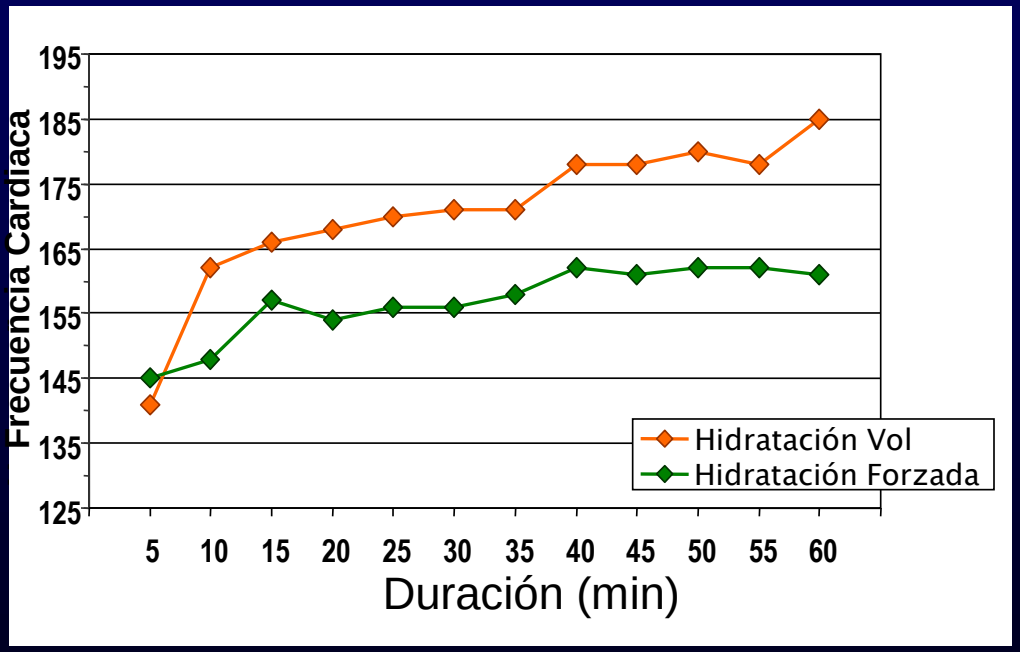
Figure 4 — Urine color before (PRE), after (POST), and 24 h after (24 H) a training session in a high-heat-stress environment in mid-pubertal (MP) and late-pubertal (LP) judo athletes. Values are means ± SD. *Significant difference between PRE and POST, $F = 5.35$; $P = .008$.

Rivera-Brown, A.M. y De Felix R.A. Int J Sports Physiol Perform, 2012

¿Alguna vez te has deshidratado?

Dolor de cabeza
Debilidad
Irritable
Falta de coordinacion
Calor intenso
Piel de gallina
Dificultad respiratoria

2% deshidratación aumenta tensión fisiológica y esfuerzo percibido, se degrada rendimiento físico y función mental



Data: Centro de Salud Deportiva y Ciencias del Ejercicio, UPR-RCM

Eventos que requieren del metabolismo aeróbico mas afectados que eventos anaeróbicos o de fuerza

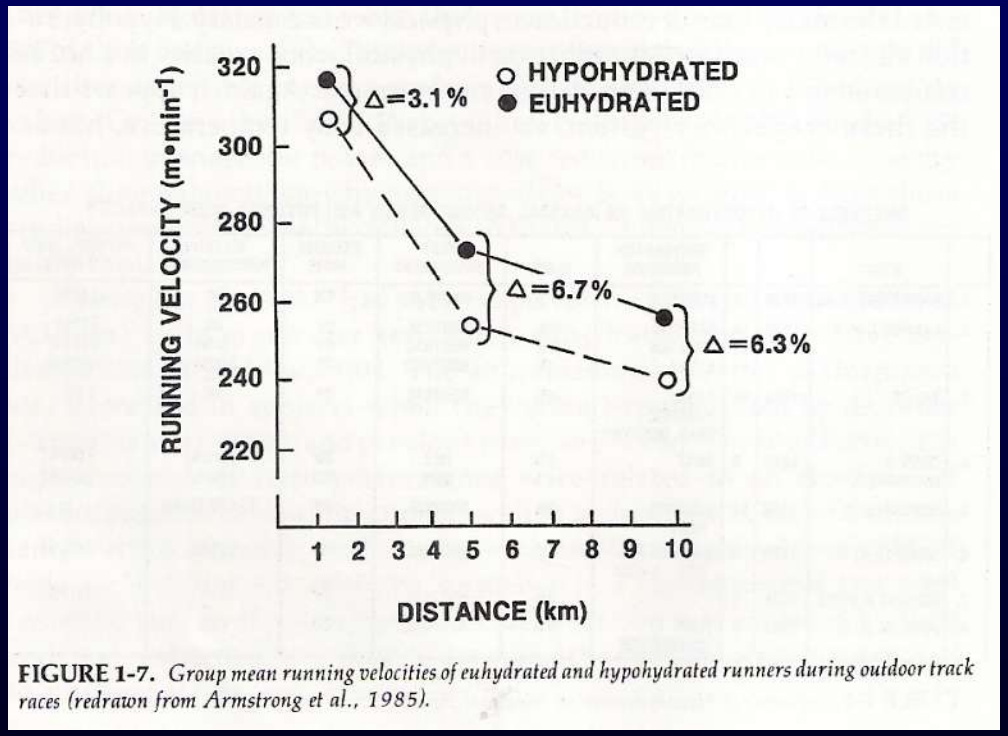


FIGURE 1-7. *Group mean running velocities of euhydrated and hypohydrated runners during outdoor track races (redrawn from Armstrong et al., 1985).*

Casa et al., J. Athl.Train., 2010

2% empeora 10%

Calambres de cuerpo entero podrían deberse a deshidratación y déficit de sodio

Composición del sudor

Agua- (1 a 4 L/hr)

Electrolitos:

1. Na+ = 40-100 mmol/L
2. Cl- = 30 mmol/L
3. K+ = 3-4 mmol/L
4. Ca+ = 1 mmol/L
5. Mg+ =0.8 mmol/L

Sudar en exceso y pérdida alta de sodio relacionados a calambres de cuerpo entero

- Pérdida alta de sodio mas comun en ambiente caluroso y deportes de duración prolongada- tríalo, ciclismo, tenis, atletismo fondo.
- Terminales nerviosos en los músculos se afectan y activan los músculos a contraerse. Calambres.

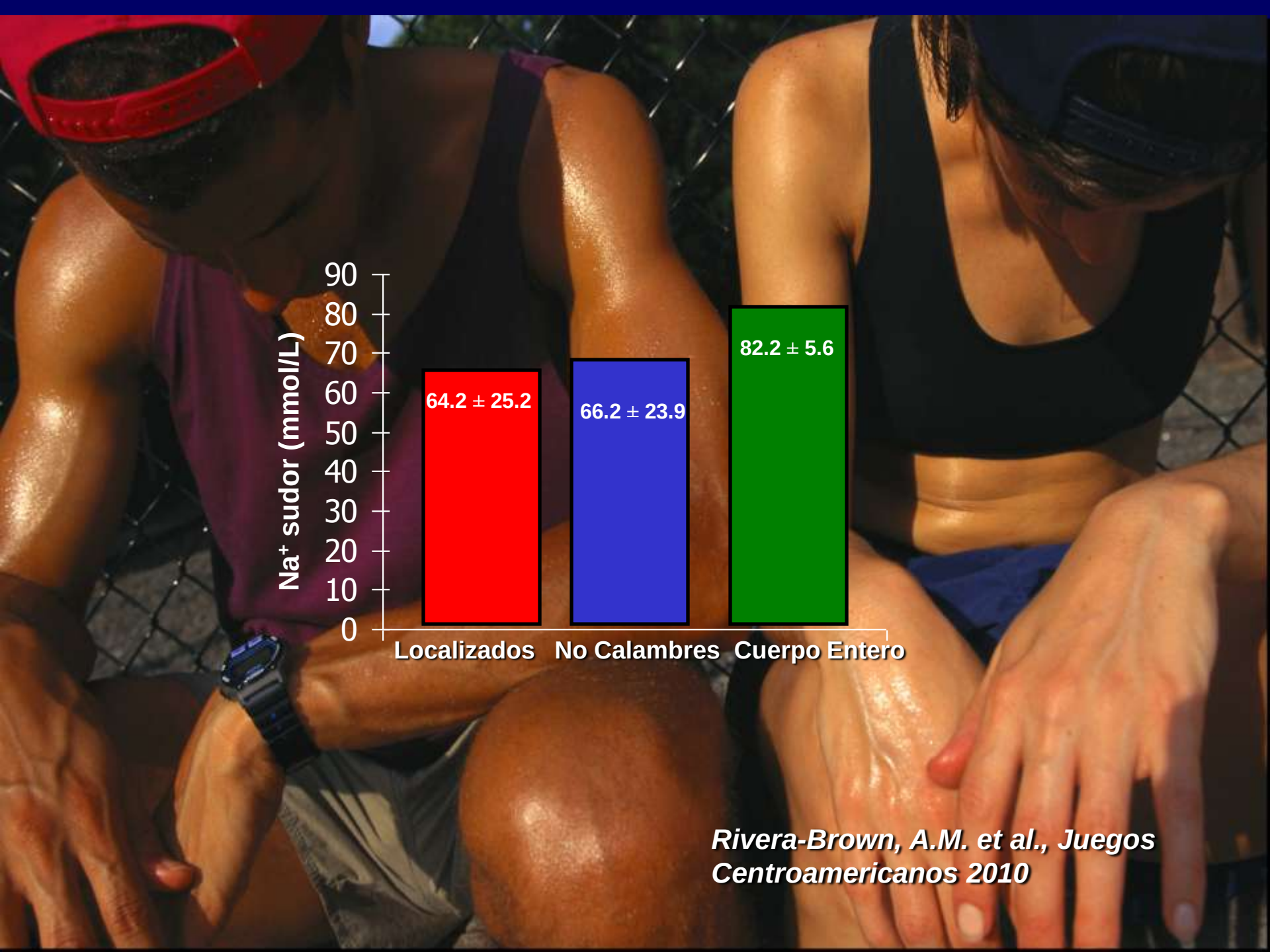
"Salty Sweater": Na^+ en sudor es bien alto

¿Quién es un “salty sweater”?

- Normal= 10-70 mmol/L
- Promedio= 35 mmol/L.
- Sudor salado [Na^+] > 60 mmol/L.

Sport	[Na^+]-Thigh
Running	64.4
Triathlon	41.4
Cycling	60.0
Tennis	68.0
Soccer	51.7
Volleyball	54.7
Basketball	75.9
Handball	55.2
Judo	49.5
Fencing	77.8
Total	59.6

Rivera-Brown, et al., Med Sci Sports Exerc (abstract), 2012



Rivera-Brown, A.M. et al., Juegos Centroamericanos 2010

Calambres Localizados

- Contracción dolorosa que dura entre 1-3 minutos
- Atleta se ha ejercitado por tiempo prolongado, alta intensidad
- Gran esfuerzo, no acostumbrado
- Localizado a un grupo muscular en particular
- Deshidratación no necesariamente presente
- En ambiente caluroso, termoneutral o frío

"Se curan con Gatorade"??

Prevención de la deshidratación y calambres musculares

- Test de sudoración.
- Tomar bebidas que contengan electrolitos y carbohidratos.
- ¿Cuanto tomar? Debe estar basado en test de sudoración.

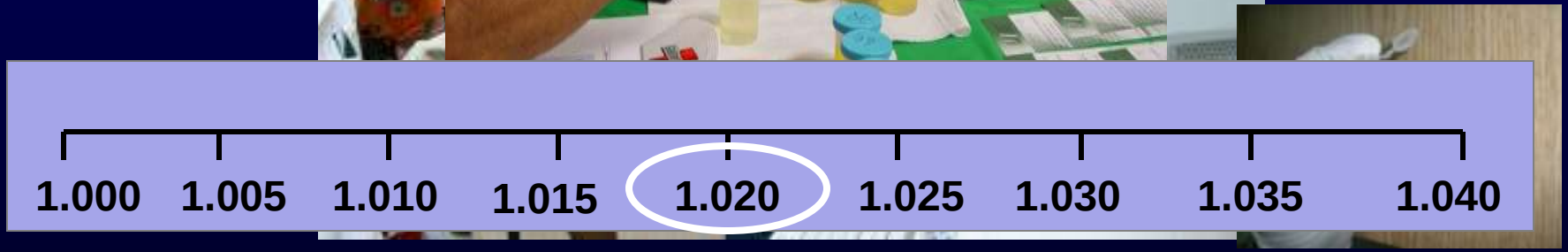
Test de Sudoración o “Sweat Test”

-¿Cuán deshidratado llegas al entrenamiento?
-¿Cuánto sudas y cuánto Na^+ pierdes en sudor?
-¿Cuando y qué debes tomar?

Test de Sudoración

Monitor de pulso

Parcho de sudor



Cambio peso (kg) + Líquido ingerido (kg)= Sweat loss (kg o L)

1.0 kg **+** **0.5 kg** **=** **1.5 L**/ tiempo

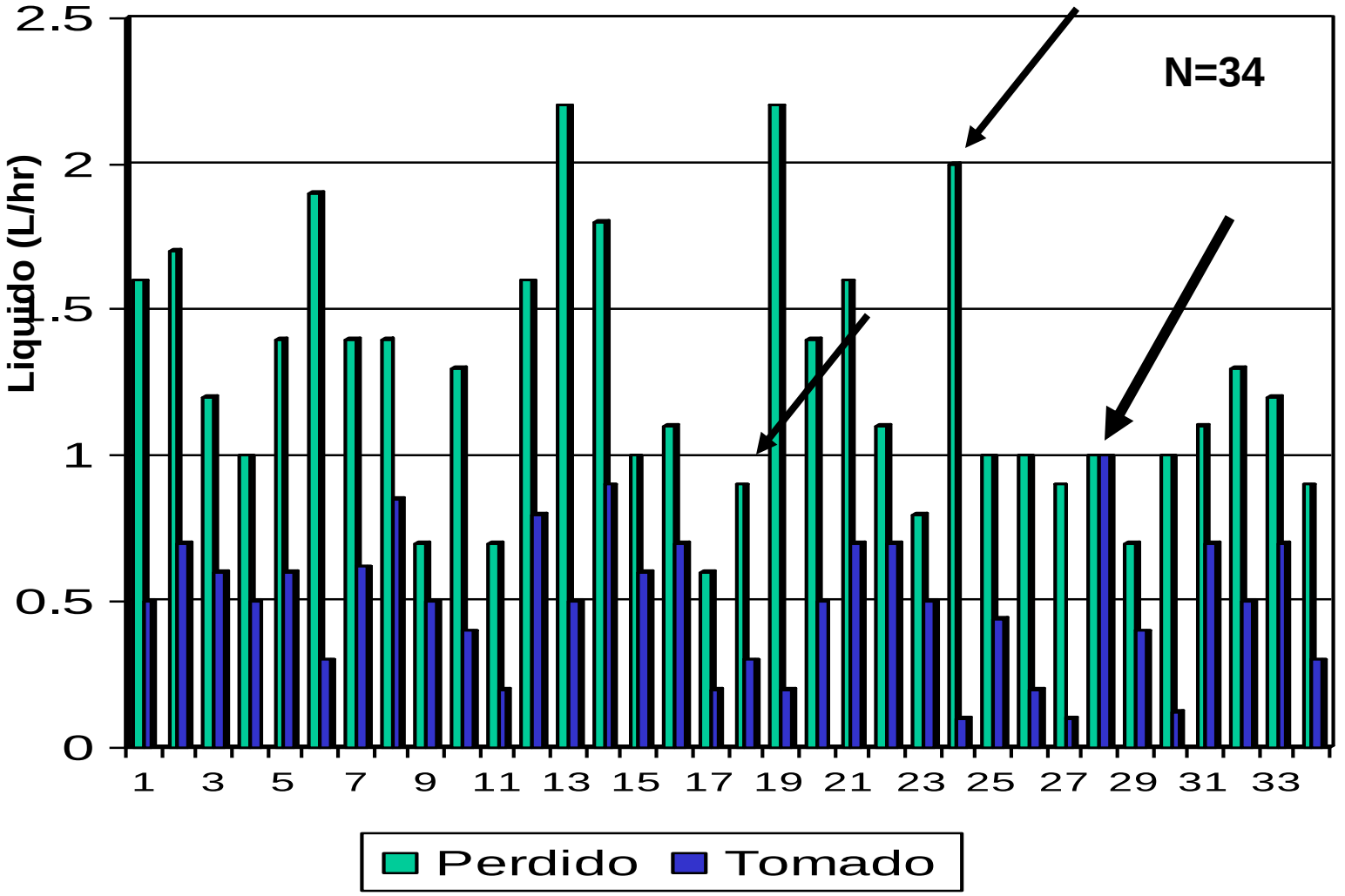
Pruebas en Campo de Juego

¿Eres es un “salty sweater”?

- Normal= 10-70 mmol/L
- Promedio= 35 mmol/L.
- Sudor salado [Na^+] > 60 mmol/L.

Mutación genética ΔF508 (Fibrosis Quistica)

¿Se hidratan bien los atletas?



Prevención de Calambres Cuerpo Entero

- Mantenerte bien hidratado
- Ingerir bebidas con electrolitos
- Comer alimentos/meriendas saladas

- Pretzels
- Galletas saladas
- Jugo de tomate
- Sopas
- Salsa de tomate
- Queso cheddar
- Pizza de pepperoni

Prevención-Calambres Generalizados

- Mantener balance de líquido y electrolitos
- Reconocer “espasmos”

Gatorade + Sal

Table 1 Suggested Fluid Mixtures for Exertional Heat Cramp-Prone Athletes Using Gatorade® and Table Salt (NaCl).*

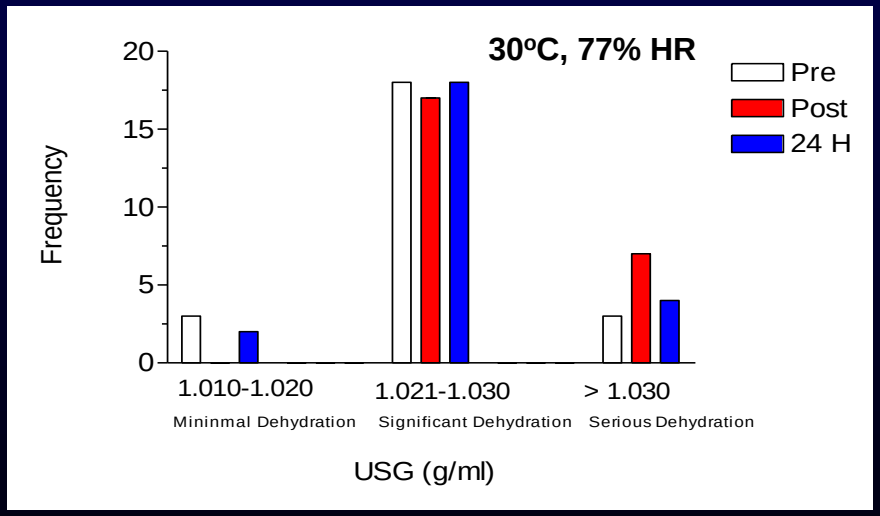
Purpose	Gatorade®	Table Salt*	Frequency or Number	
Emergency (resolve twitches or cramps)	16 oz. (~0.5L)	0.5 tsp. (3 g)	One time—immediately	= 1,200 mg
During activity	32 oz. (~0.9L)	0.25 tsp (1.5 g)	Up to 1 per hour	= 600 mg
Recovery from activity	32 oz. (~0.9L)	0.5 tsp (3 g)	~One per kg post-exercise body weight deficit	= 1,200 mg

Bergeron, M., J Sport Rehab, 2007

Prevención de la Deshidratación

Tomar antes del Ejercicio

- Comenzar a tomar varias horas antes del ejercicio
- Tomar bebidas con sodio y/o alimentos salados con bebidas para estimular la sed y retención del agua.

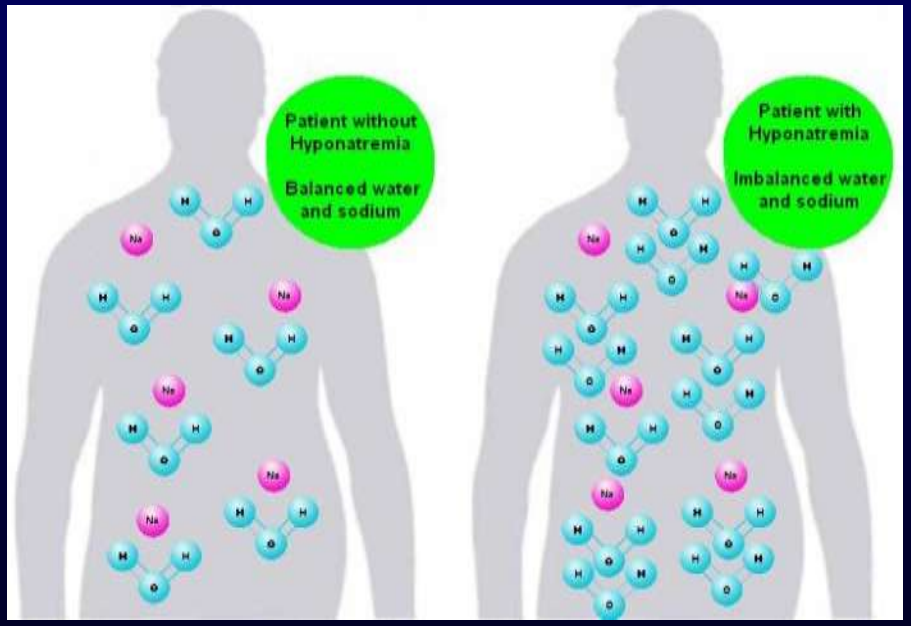


Rivera-Brown, A.M. y De Felix R.A. Int J Sports Physiol Perform, 2012

¿Hiperhidratación previo al ejercicio?

- Tomar exceso de agua
- Agua estimula producción de orina
- Tomar agua + agente que retiene agua (Glicerol, bebidas hipertónicas)
- Puede retrasar la aparición de la deshidratación, pero no proporciona ventaja termorreguladora
- Nausea, hinchazón

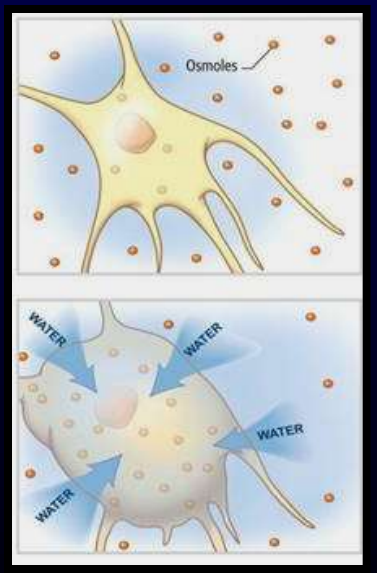
Consumo de líquido que excede la tasa de sudoración es el principal factor que conduce a *hiponatremia*



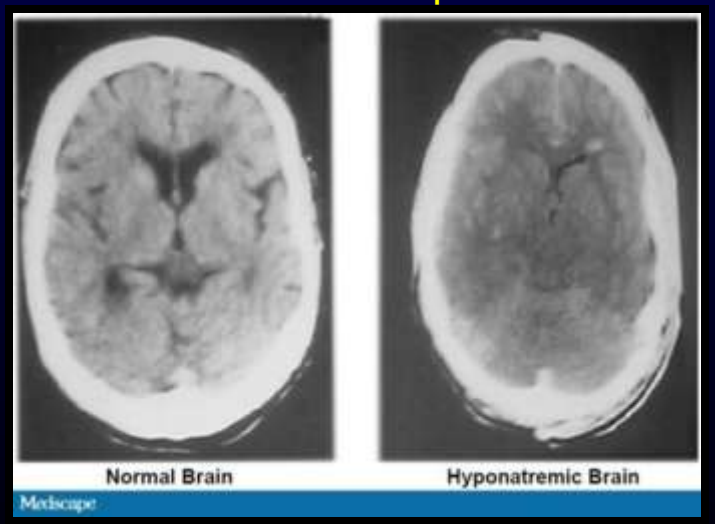
Caída en Na^+ en sangre a < 135 mmol/L

Síntomas de hiponatremia

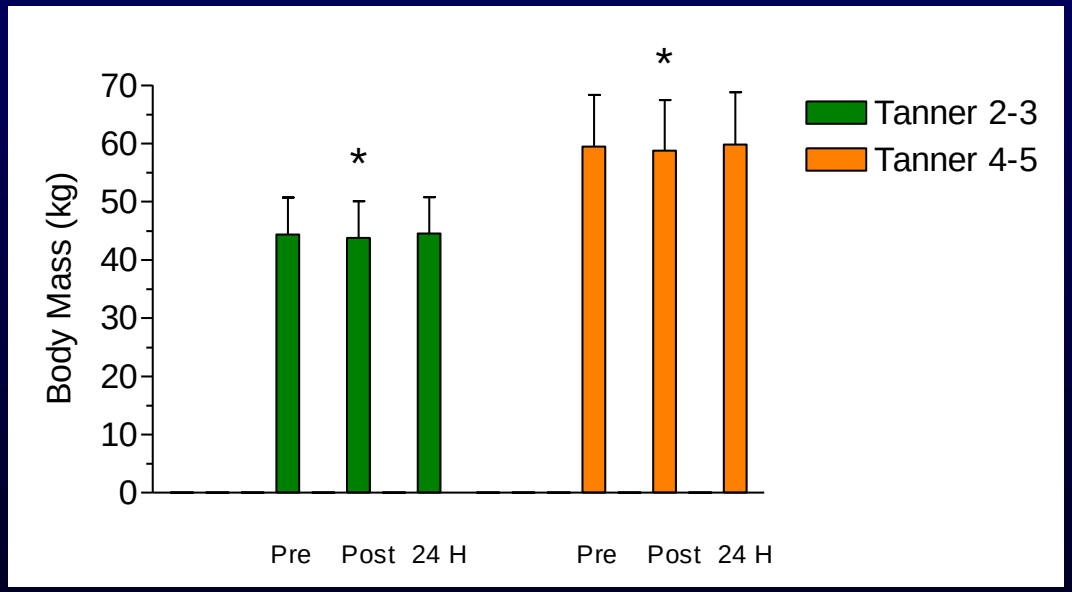
- Manos y pies hinchados,sortijas, relojes, zapatos apretados
- Dolor de cabeza
- Vómitos
- Confusión y desorientación



Edema Cerebral
~12 muertes reportadas



Es poco probable en deportes de combate



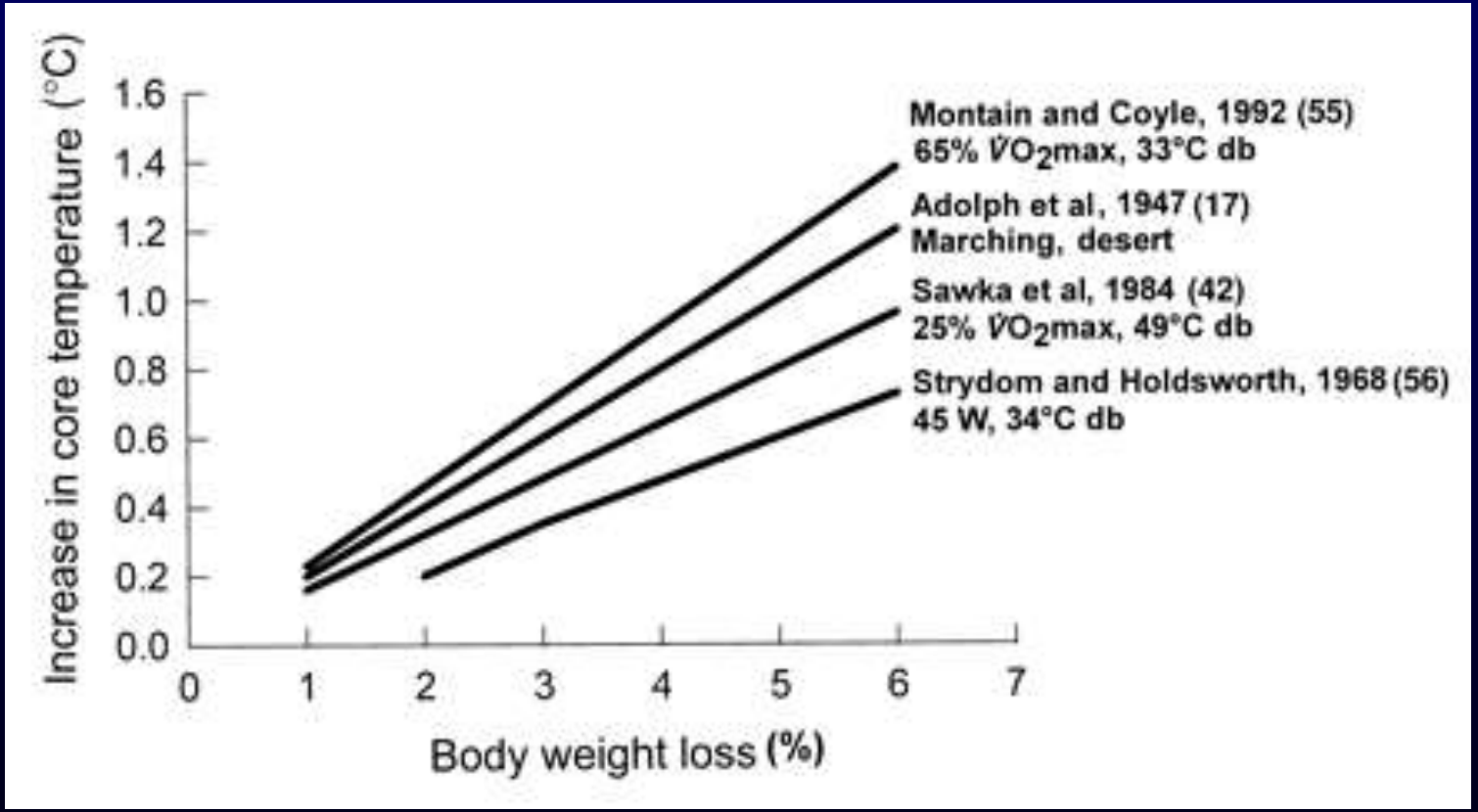
Rivera-Brown, A.M. y De Felix R.A. Int J Sports Physiol Perform, 2012

Prevención de la Deshidratación

Tomar Durante el Ejercicio

- Plan de hidratación debe estar basado en el índice de sudoración y pérdida de sodio en sudor determinado por una prueba de sudor.
- Tomar al menos 85% de lo que pierdes en sudor cada hora.
- Tomar en intervalos de 20 minutos.
- Tomar ventaja de oportunidades para reducir produccion de sudor (descansos, menos calentamiento, remover ropa y equipo protector, disminución de intensidad).

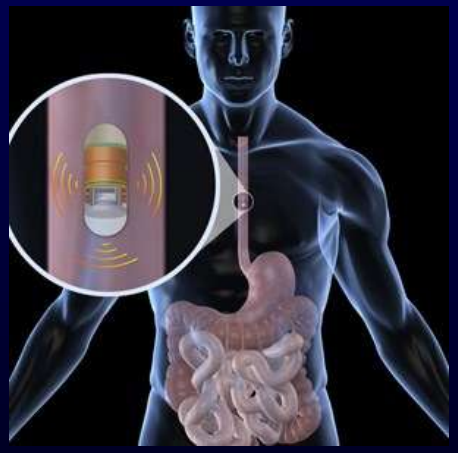
Deshidratación es factor de riesgo para enfermedad por calor

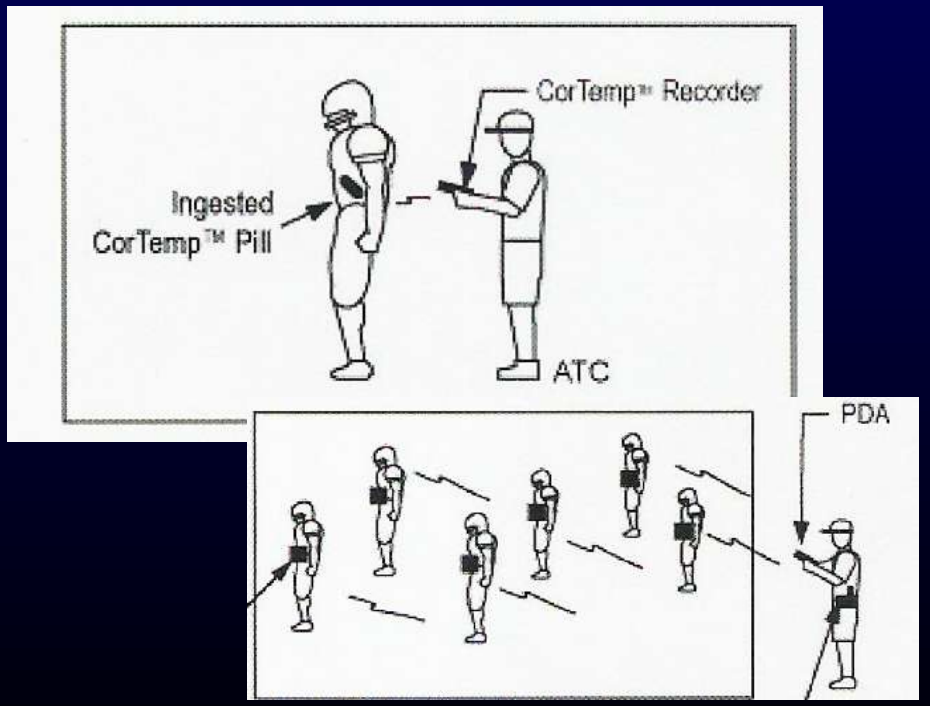


Uniforme y equipo protector aumenta tasa metabólica, disminuye perdida de calor y aumenta tensión cardiovascular

“La pildora”

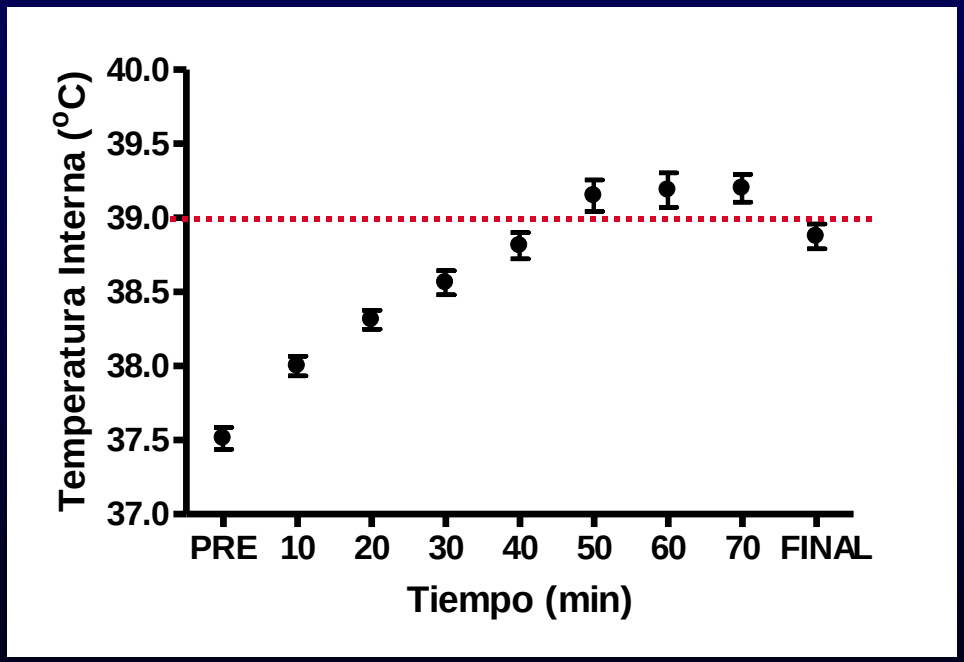
Temperatura interna en el campo de juego

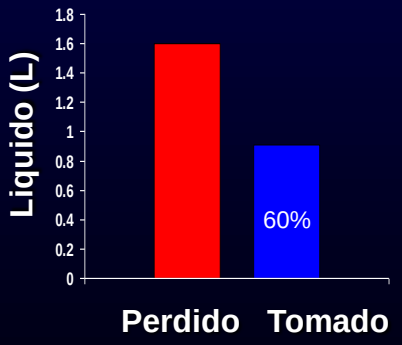




Cambios en Temperatura Interna durante entrenamiento Judo (N=9)

Temperatura=34ºC HR= 65% WBGT=30.0ºC





Rivera-Brown et al, 2010

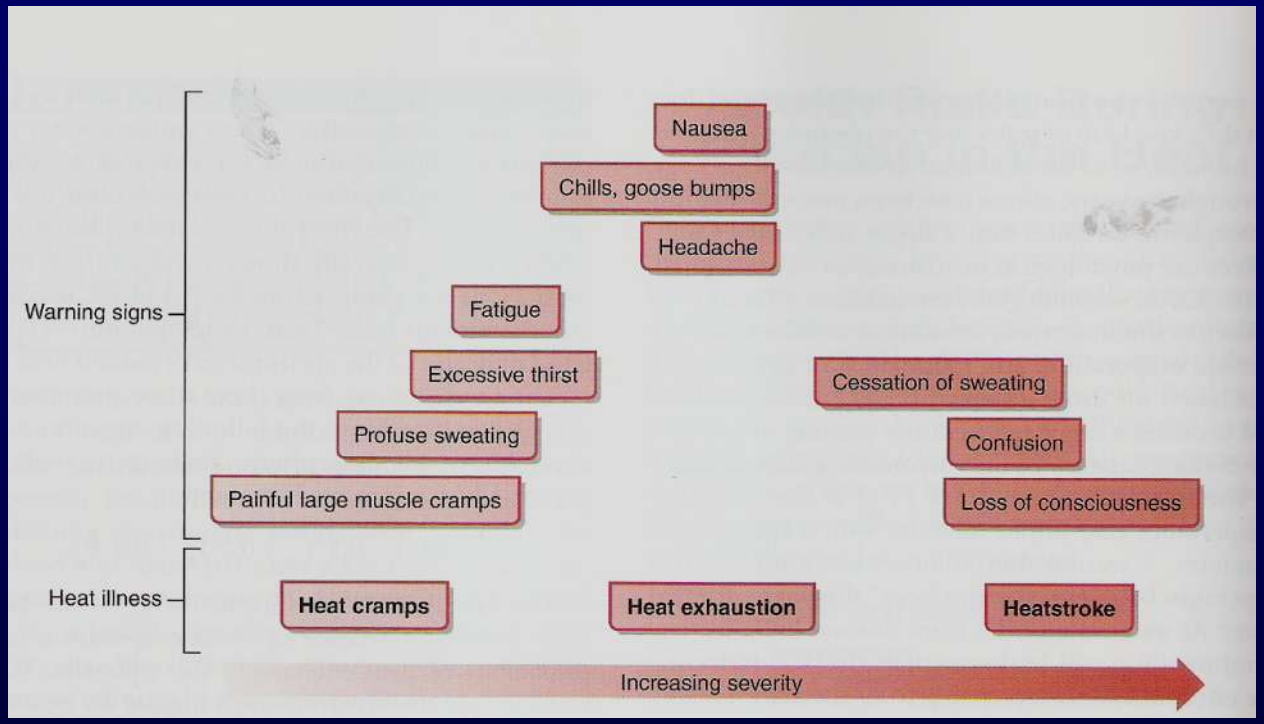
Cuanto tomar después del Ejercicio

•1.5 L de líquido por cada kilogramo de peso perdido.

• Tomar bebidas y comer alimentos con sodio para estimular la retención de líquido. Bebidas deportivas.

• Tomar varias porciones cada 30 minutos en vez de todo el líquido a la vez, para aumentar la retención del líquido y prevenir molestias estomacales.

Enfermedad por Calor



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Drink composition, voluntary drinking, and fluid balance in exercising, trained, heat-acclimatized boys

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competition for children who live ... sports in tropical regions.

Several studies have demons... ... thermoregulator ... environmental condit... ... do adults when ex... ... ch limits their rel... ... Additionally, chil... ... enough to replac... ... ition when wate... ... ercise in the heat ... ...ipate in sports ... ... a state of chroni... ... ete frequently ... ... s completely. ... ... storage, decre... ... ad exercise tol... ... hildren's risk ... ... ation and phy... ... ory response ... ... ily one study ... ... onses and ... ... uring exerc... ... un demon... ... mild volu... ... exposed ... ... s while ... ... ation and ... ... sweatin... ... s by ev... ... e patte... ... natized ... ... ning pr... ... mpera... ... mina... ... ll ma... ... n on ... ... d, ne... ... n a ... ... Re... ... vol... ... ve ... ... at ... ... f ... ... h ...

ORIGINAL ARTICLE

Voluntary drinking and hydration in non-acclimatized girls exercising in the heat

Eur J Appl Physiol (2008) 103:109–116
DOI 10.1007/s00421-008-0682-1

ORIGINAL ARTICLE

Voluntary drinking and hydration in trained, heat-acclimatized girls exercising in a hot and humid climate

Anita M. Rivera-Brown · Farah A. Ramírez-Marrero · Bogusław Wilk · Oded Bar-Or

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Abstract This study examined the effects of beverage composition on the voluntary drinking pattern, body fluid balance and body temperature responses of heat-acclimatized trained girls exercising intermittently in outdoor conditions (WBGT = 30.9 ± 0.2°C). Twelve trained, heat-acclimatized girls (age = 10.6 ± 0.2 years) performed three 3-h sessions, each consisting of four 20-min cycling bouts at 40% VO_2max, alternating with 25-min rest. One of three beverages was assigned: unflavored water (W), flavored water (FW) or flavored water plus 6% carbohydrate and 18 mmol/l NaCl (CNa). Drinking was ad libitum. Total fluid intake was similar among conditions (W = 1026.5 ± 138.1; CNa = 900.4 ± 107.5 g). A mild hypohydration occurred during the three conditions (W = −1.12%; FW = −0.95%; CNa = −0.74% BW, $P > 0.05$). Sweat loss, higher than previously reported for sedentary girls, was not different among conditions (W = 1,051.5 ± 90.8; FW = 970.9 ± 72.8; CNa = 1,052.7 ± 52.6 g). The average amount of urine produced (W = 269.8 ± 85.9; FW = 320.8 ± 87.2; CNa = 85.6 ± 9.3 g) was 73 and 68% higher during FW and W, respectively, compared to CNa (CNa vs. FW, $P < 0.05$). The increase in rectal temperature, heart rate and all perceptual variables did not differ among conditions. In conclusion, flavoring of the water and addition of 6% carbohydrate plus 18 mmol/l NaCl do not prevent mild hypohydration in trained, heat-acclimatized girls with high sweating rates. However, there is a tendency towards a greater fluid retention with the CNa beverage.

Keywords Children · Sweating · Voluntary dehydration · Body temperature · Tropical

Introduction

Children, similar to adults, voluntarily do not drink enough to replenish fluid losses when offered only water during prolonged exercise in hot environments and show a progressive dehydration (Bar-Or et al. 1980; Rivera-Brown et al. 1999; Rodríguez Santana et al. 1995; Wilk and Bar-Or 1996). Following prolonged intermittent exercise in hot and humid environments, hypohydration levels of 1–2% have been reported in both unacclimatized sedentary boys (Bar-Or et al. 1980; Wilk and Bar-Or 1996) and in trained, heat-acclimatized boys with high sweating rates (Rivera-Brown et al. 1999) when water drinking was ad libitum. Impairment in aerobic performance (Wilk et al. 2002) and a greater increase in core temperature compared to adults (Bar-Or et al. 1980) have been observed in children at these mild hypohydration levels, thus underscoring the importance of optimal hydration during exercise. The current fluid replacement guidelines for children during exercise in the heat (American Academy of Pediatrics 2000) state that a child who weighs 40 kg should drink 150 ml of cold tap water or flavored salted beverage every 20 min and an adolescent who weighs 60 kg should drink 250 ml...

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Effect of Drink Pattern and Solar Radiation on Thermoregulation and Fluid Balance During Exercise in Chronically Heat Acclimatized Children

AMERICAN JOURNAL OF HUMAN BIOLOGY

ABSTRACT

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Hydration Status in Adolescent Judo Athletes Before and After Training in the Heat

Anita M. Rivera-Brown and Roberto A. De Félix-Dávila

Adolescent judo athletes who train in tropical climates may be in a persistent state of dehydration because they frequently restrict fluids during daily training sessions to maintain or reduce their body weight and are not given enough opportunities to drink. ***Purpose:*** Determine the body hydration status of adolescent judo athletes before, immediately after, and 24 h after (24H) a training session and document sweat Na^+ loss and symptoms of dehydration. ***Methods:*** Body mass and urine color and specific gravity (USG) were measured before, after, and 24 h after a training session in a high-heat-stress environment (29.5 ± 1.0°C; 77.7 ± 6.1% RH) in 24 adolescent athletes. Sweat sodium loss was also determined. A comparison was made between mid-pubertal (MP) and late pubertal (LP) subjects. ***Results:*** The majority of the subjects started training with a significant level of dehydration. During the training session, MP subjects lost 1.3 ± 0.8% of their pretraining body mass whereas LP subjects lost 1.9 ± 0.5% ($P < .05$). Sweat sodium concentration was 44.5 ± 23.3 mmol/L. Fluid intake from a water fountain was minimal. Subjects reported symptoms of dehydration during the session, which in some cases persisted throughout the night and the next day. The 24H USG was 1.028 ± 0.004 and 1.027 ± 0.005 g/mL for MP and LP, respectively. ***Conclusions:*** Adolescent judo athletes arrive to practice with a fluid deficit, do not drink enough during training, and experience symptoms of dehydration, which may compromise the quality of training and general well-being.

Keywords: dehydration, judo, sweat rate, young athletes, heat stress

Judo is a physically demanding sport that requires a high level of aerobic fitness, strength, agility, muscular endurance, and mental alertness for successful performance. Judo athletes compete in weight categories and frequently resort to routines of rapid weight loss a few days before the competition and hours before the official weigh-in to "make weight" in a category that is usually lower than recommended for their body structure and composition. A combination of increased sweating and fluid restriction are preferred methods for rapid weight loss in judo athletes. However, it is well recognized that dehydration hinders exercise performance and may also increase the risk for heat-related illness in hot and humid conditions.[1–3] Dehydrated athletes may show decreased work capacity,[3–5] reduced muscle strength,[3,5,6] and impaired athletic[6] and cognitive performance.[7] A body water loss of as little as 2% of body weight can compromise cardiorespiratory endurance and muscular function,[8] which can affect performance in judo. The rules of the International Judo Federation state that the official weigh-in for judo is on the same day of competition. The interval between weigh-in and competition is typically of 3 to 6 h,[9] giving competitors time to rehydrate in an attempt to minimize the negative effects of dehydration on performance.

The National Collegiate Athletic Association (NCAA),[10] the National Federation of State High School Associations,[11] and the National Athletic Trainers Association[8] have implemented programs to evaluate body hydration status preexercise and/or at weigh-in for wrestling to ensure that athletes begin exercise sessions well hydrated. Urine color, osmolarity, and specific gravity (USG) are generally accepted as markers of hydration status in the field.[12–14] Guidelines provided by NATA[8] recommend that athletes begin exercise with a USG ≤ 1.020 g/mL. At present, the International Judo Federation has not implemented evaluations of body hydration status of athletes preexercise during the competitive season or at weigh-in before competition.

Adolescent athletes that train in a hot and humi... environment and are acclimatized to the heat exhibit high sweat production,[15,16] which may be due to increas... capacity and sensitivity of the sweat glands[17] induced ... chronic exposure to a hot environment. Other factors t... contribute to a high sweating rate include the intensit... training, the high environmental heat stress, and the judo uniform. These young athletes may be in a persistent state

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