



HYDRATION 101

WHY HYDRATION MATTERS

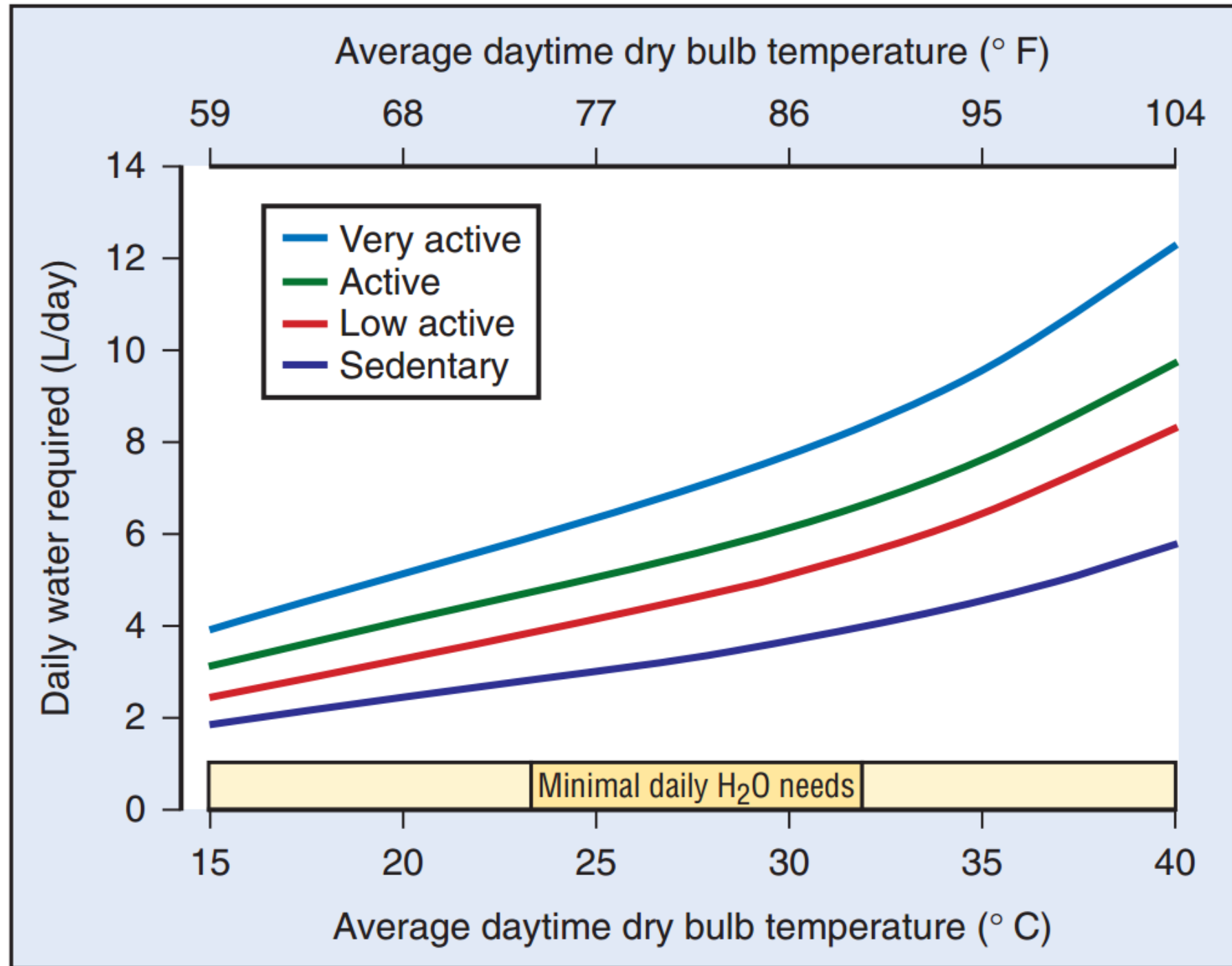
1. Why is hydration important?
2. Hydration is more than just fluid
 - Importance of electrolytes
3. How we monitor hydration state
 - What does it mean to be hydrated?
 - Urine refractometer
4. What do our athletes need?
 - Rehydration state
 - Sodium levels



OVERVIEW OF WATER AND ELECTROLYTES

- Water is the most important nutrient
- 60% of adult body weight is water
- Too great a water loss is detrimental to performance and health
- Electrolyte balance is important
- Each athlete must have an individualized plan
 - Each plan **VARIABLES** for each athlete
 - No one-size-fits-all remedy for hydration

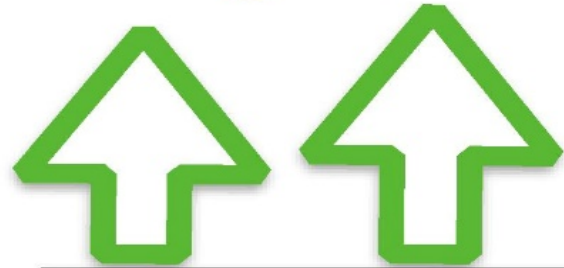
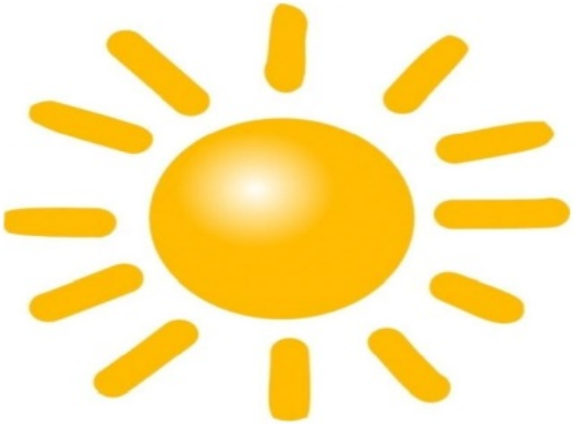
ATHLETES & DAILY WATER BALANCE



HEAT & PERFORMANCE

Effects of heat on running performance

Guy et al Sports Med 45: 303-311, 2015

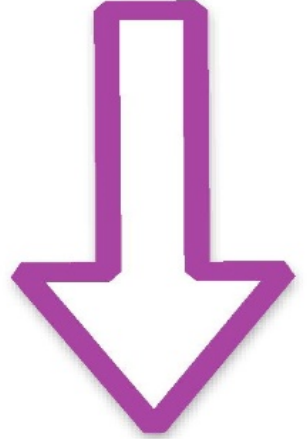
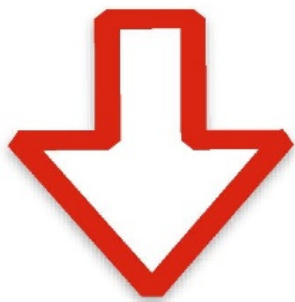


Performance improvements in sprint events

No difference in middle distance events

These data are for illustration purposes only
Results from men and women showed similar trends and were averaged

100m 200m 400m 800m 1,500m 5,000m 10,000m marathon



Performance decrements in long distance events



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CONDITIONS THAT INCREASE FLUID LOSS VIA SWEAT

- **Air Temperature:** Higher temperatures= greater sweat loss
- **Intensity:** The harder your workout, the more you perspire
- **Body Size & Gender:** Larger people sweat more. Generally speaking, men sweat more than women.
- **Duration:** The longer the workout, the greater the fluid loss
- **Fitness Level:** Well-trained athletes sweat more than less trained
 - Athletes of a higher fitness level are more efficient at cooling their bodies via sweat. Thus, fluid needs become higher based on fitness level.

	Calories	Sodium	Potassium	Calcium	Magnesium
PowerAde	80	150mg	35mg	0 mg	0 mg
Body Armor	70	15mg	300mg	0mg	32mg
5th Quarter Fresh	272	417mg	684mg	700mg	80mg
Fairlife Chocolate Milk	140	280mg	0mg	400mg	0mg
Mott's Apple Juice	120	15mg	290mg	0mg	0 mg

	Calories	Protein	Fat	Sugar	CHO	% CHO
PowerAde	80	0g	0g	21g	22g	6.1%
Body Armor	70	0g	0g	18g	18g	7.5%
5 th Quarter Fresh	272	20g	0g	42g	43g	10.0%
Fairlife Chocolate Milk	140	13g	4.5g	12g	13g	5.2%
Mott's Apple	120	0g	0g	28g	29g	12.1%

OVERVIEW OF WATER AND ELECTROLYTES

Table 7.1 Electrolytes Involved in Fluid Balance

Cations

Sodium (Na^+)

Potassium (K^+)

Calcium (Ca^{2+})

Magnesium (Mg^{2+})

Anions

Chloride (Cl^-)

Bicarbonate (HCO_3^-)

Phosphate (PO_4^{3-})

Protein

Cations are positively charged electrolytes, and anions are negatively charged electrolytes.

ELECTROLYTE LOSS

MILLIGRAMS OF

Na

Sodium

K

Potassium

Ca

Calcium

Mg

Magnesium

315 ml/
11 oz of Sweat



SWEAT RATES

- Range from 0.5 L to 2.0 L/hr
- Makes it difficult to provide a uniform recommendation
- All influence sweat rate for given activity
 - Body weight
 - Genetic predisposition
 - Heat acclimatization state
 - Metabolic efficiency (economy at undertaking a specific task)



HYPOHYDRATION, EUHYDRATION, AND HYPERHYDRATION

■ Hypohydration

- Body fluid level below normal
- Inadequate intake, excessive loss or both
- Cell function is impaired
- Affects performance and health



■ Euhydration

- A “normal” amount of water to support fluid balance and to easily meet required physiological functions
- This optimal level of hydration is typically achieved by consuming fluids in excess of need and allowing the renal system to excrete the unneeded amount

■ Hyperhydration

- Body water above that considered normal and is typically a short-term condition
- Renal system responds by increasing urine output

N.A.T.A. HYDRATION INDEX

Table 2. Indexes of Hydration Status

Condition	% Body Weight Change*	Urine Color	USG†
Well hydrated	+1 to -1	1 or 2	<1.010
Minimal dehydration	-1 to -3	3 or 4	1.010-1.020
Significant dehydration	-3 to -5	5 or 6	1.021-1.030
Serious dehydration	>5	>6	>1.030

HYDRATION STATUS CAN BE MONITORED VIA URINE COLOR

1

USG <1.01

2

3

USG 1.01-1.02

4

5

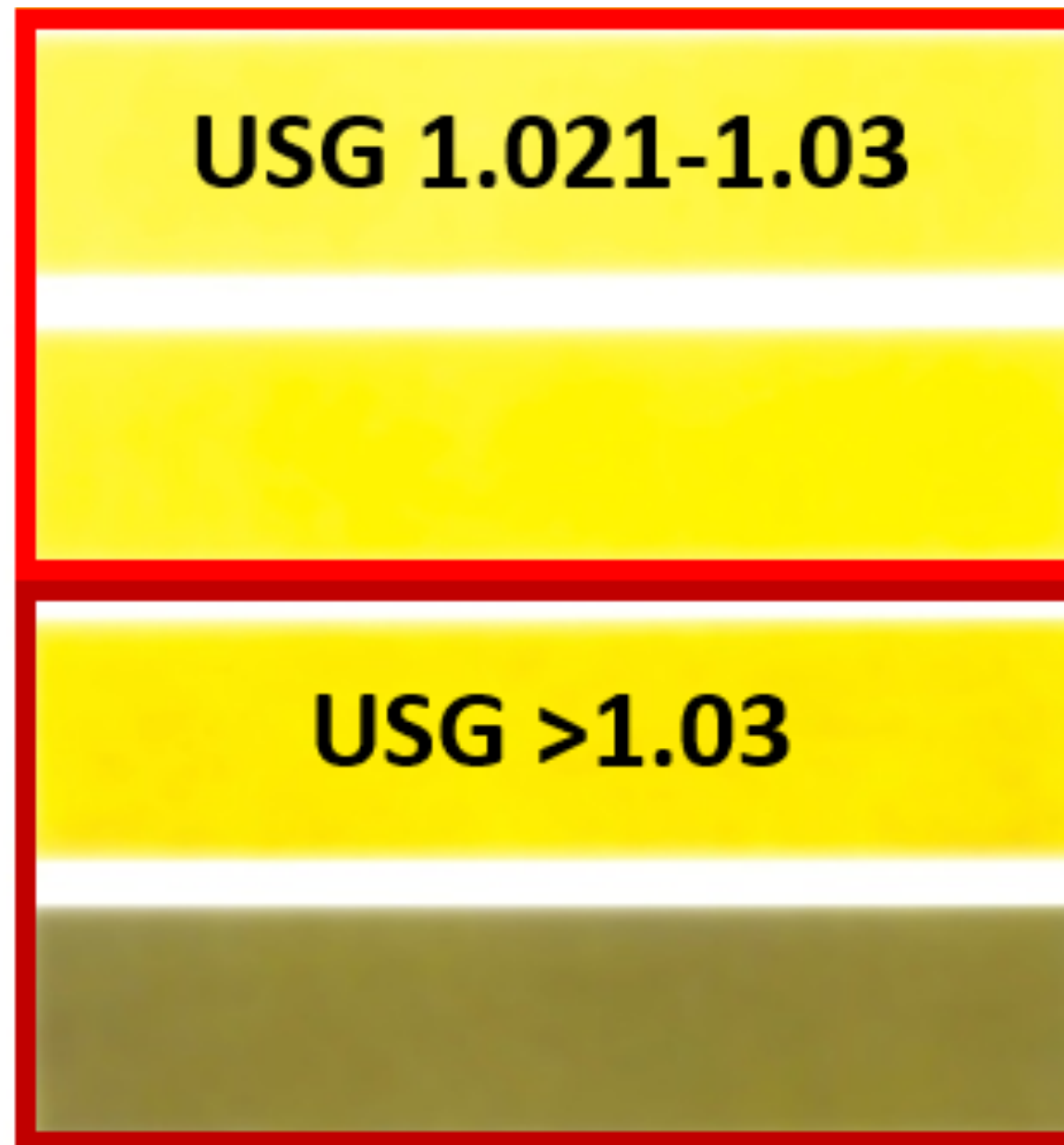
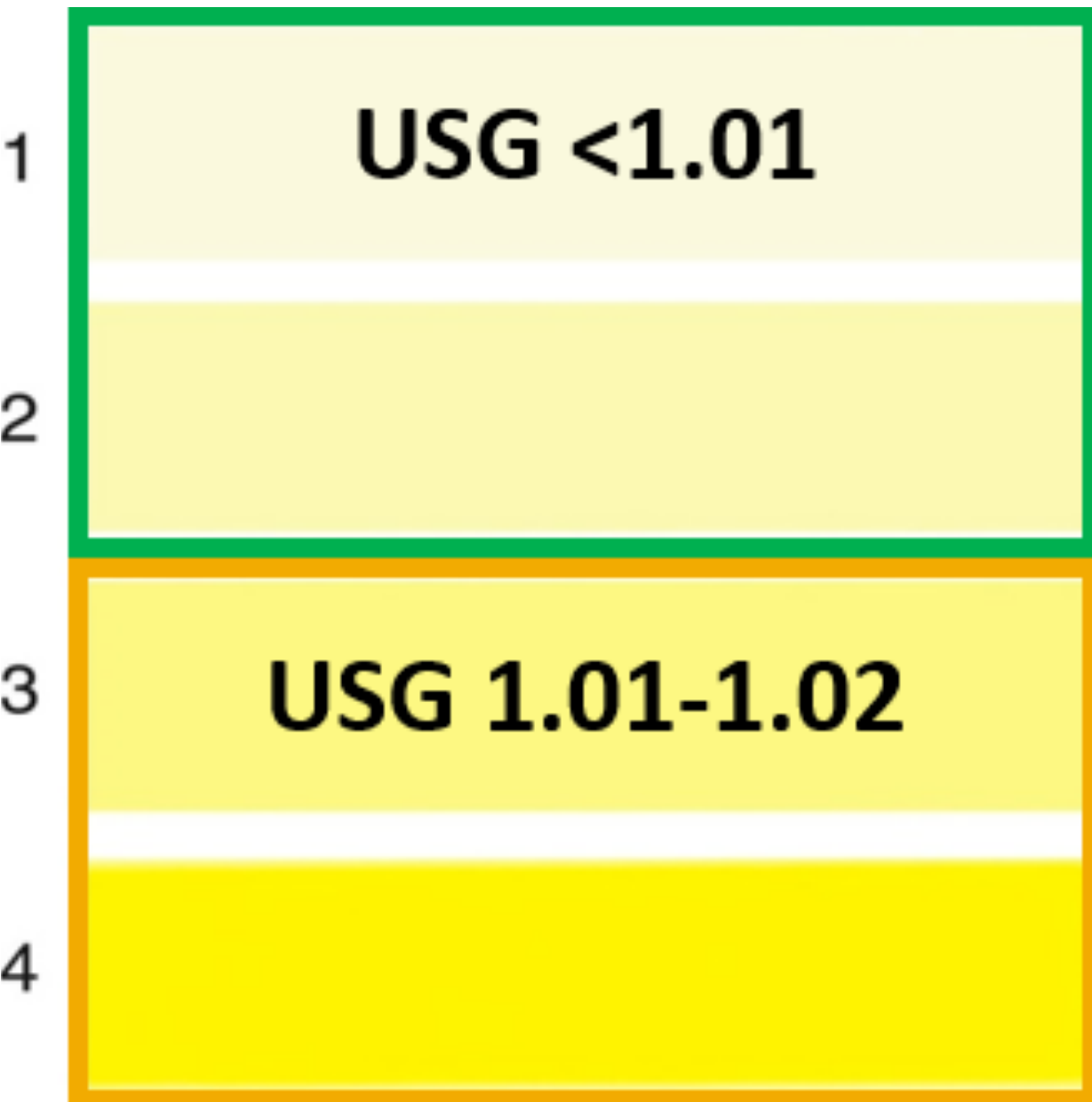
USG 1.021-1.03

6

7

USG >1.03

8



HYDRATION STATUS CAN BE MONITORED VIA URINE COLOR

1

Well

2

Hydrated

3

Minimal

4

Dehydration

5

Significant

6

Dehydration

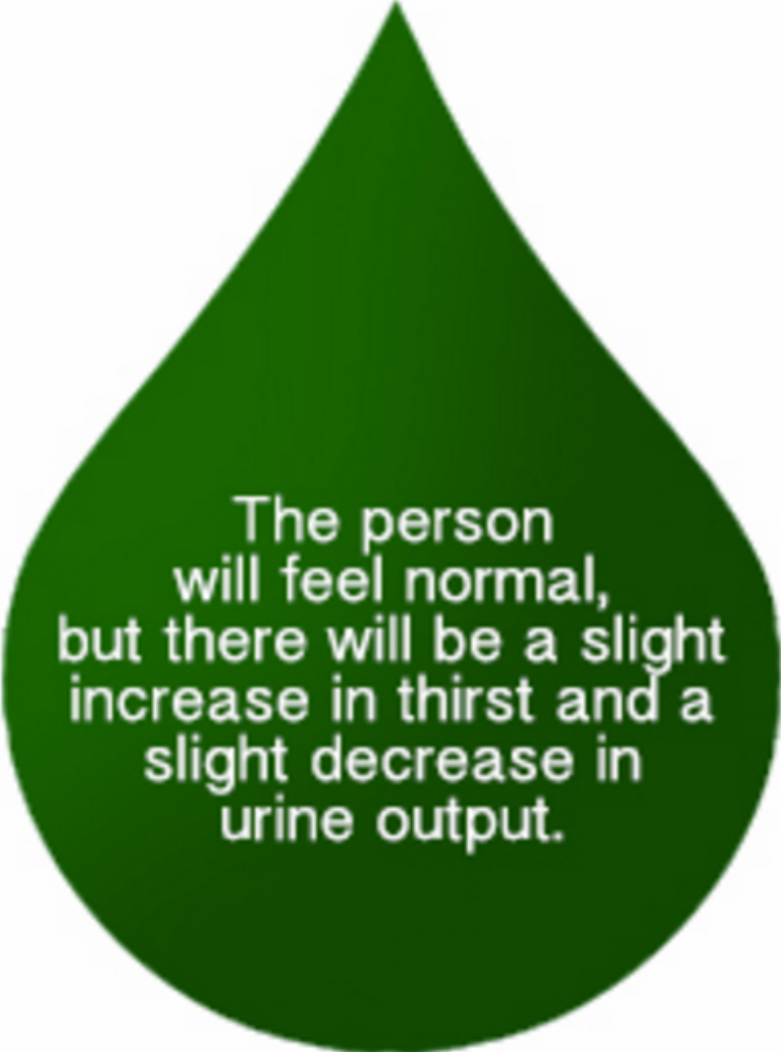
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Serious

8

Dehydration

SYMPTOMS OF DEHYDRATION



The person will feel normal, but there will be a slight increase in thirst and a slight decrease in urine output.

MILD



The person will feel restless and irritable, with sunken eyes and a slight increase in heart rate. There will also be a moderate increase in thirst, which may result to eagerness in drinking.

MODERATE



The person will feel abnormally sleepy/lethargic & will have deeply sunken eyes. The quality of pulse will moderately decrease, but with a notable increase in heart rate. A severe dehydrated person drinks poorly, or sometimes, not at all.

SEVERE

WARNING SIGNS OF DEHYDRATION

Early

- Thirst
- Flushed Skin
- Premature Fatigue
- Increased Body Temperature
- Faster Breathing & Pulse Rate
- Decreased Exercise

Late

- Dizziness
- Weakness or Fatigue
- Labored Breathing During Exercise

CAFFEINE & ATHLETIC PERFORMANCE

Position stand of the International society of sports nutrition, 2010

Designed by
©YLM Sport Science



1 Caffeine can enhance performance when consumed 15-60 min prior to exercise

2 Caffeine is effective for enhancing various types of performance when consumed in low-to-moderate doses ($\sim 3-6$ mg/kg); moreover, there is no further benefit when consumed at higher dosages (≥ 9 mg/kg)

3 During periods of sleep deprivation, caffeine can act to enhance alertness and vigilance, which has been shown to be an effective aid during times of exhaustive exercise that requires sustained focus

4 Caffeine is beneficial for high-intensity exercise of prolonged duration (including team sports such as soccer, field hockey, rowing, etc.), but the enhancement in performance is specific to conditioned athletes



5 Caffeine is an effective ergogenic aid for sustained maximal endurance activity, and has also been shown to be very effective for enhancing time trial performance



6 Caffeine can enhance, not inhibit, glycogen resynthesis during the recovery phase of exercise



8 The scientific literature does not support caffeine-induced diuresis during exercise. In fact, several studies have failed to show any change in sweat rate, total water loss, or negative change in fluid balance that would adversely affect performance, even under conditions of heat stress

7 The literature is inconsistent when applied to strength and power activities or sports



FLUID LOSS CALCULATOR

[Download Entry Form](#)

*Required values to do calculation. The two inputs without * are optional, incorporating will make the calculator more accurate

* Pre Exercise Fluid Weight or Volume [g] OR [oz] OR [ml] OR [L]

Pre Exercise Food Weight [g]
(if applicable)

* Pre Exercise Body Weight [lbs] OR [kg]

* Exercise Duration [min]

Urine Loss During Exercise (if known) [g] OR [ml]

* Post Exercise Body Weight [lbs] OR [kg]

* Post Exercise Fluid Weight or Volume [g] OR [oz] OR [ml] OR [L]
(enter -0- if no fluid was consumed)

Post Exercise Food Weight [g]
(if applicable)

[Calculate](#)

	A	B	C	D	E
1		Athlete 1	Athlete 2	Athlete 3	
2	Weight Before Workout (lbs)	178.6			
3	Weight After Workout (lbs)	169.8			
4	Weight Change (lbs)	8.80	0.00	0.00	
6	Volume Consumed During Exercise (oz)	24			
7	Volume Voided (oz)	4			
8	Sweat Loss (oz)	154.95	0.00	0.00	
9	Exercise Time (minutes)	120			
10	Sweat Rate (oz/min)	1.29	#DIV/0!	#DIV/0!	
11	Fluid Recommendations (oz's/10 min)	12.73	#DIV/0!	#DIV/0!	
12	8 oz Cups Per Hour	9.55	#DIV/0!	#DIV/0!	
13					
19					
20					

INTAKE PRIOR TO TRAINING

- Be adequately hydrated before exercising
- If not fully hydrated, rehydrating to the greatest extent possible
- Avoiding gastrointestinal upset
- Consuming carbohydrate, if appropriate

INTAKE DURING TRAINING

- Goals are to replace fluid lost and maintain fluid balance if possible
 - Delaying dehydration to the extent possible
 - Avoiding the overconsumption of water
 - Replacing sodium if losses are large or rapid
 - Consuming carbohydrate if appropriate
 - Avoiding gastrointestinal upset

INTAKE AFTER TRAINING

- Restoring lost body water to achieve euhydration
- Replacing sodium and other electrolytes lost
- Consuming adequate carbohydrate to fully restore muscle glycogen
- Consuming adequate protein to build and repair skeletal muscle
- Avoiding gastrointestinal upset

SAMPLE HYDRATION SCHEDULE

■ 2 Hours Prior To Competition

- Want to be in a state of hyperhydration
- 500-600 ml (16.6-20 oz's) of fluid
 - Mix of water and electrolyte-containing drink– Remember osmolality!

■ 1 Hour Prior To Competition

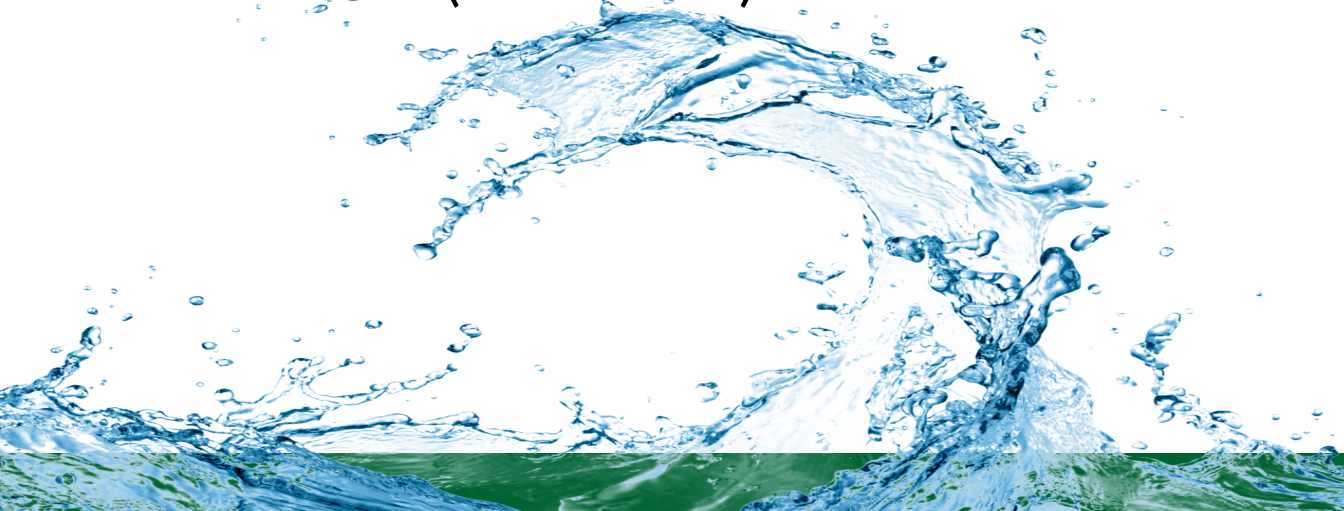
- Working to fill water reserves.
- 200-300 ml (6.7-10 oz's) of fluid

■ During Competition

- Intervals of 15-20 minutes of at least 20 oz's for every hour of the workout.
- Mostly electrolyte replacement during workout.
- Cooler fluids empty stomach faster than warm fluids.

■ After Competition

- VARIES BY COMPETITION LENGTH/ INTENSITY
- Generally speaking, 500-1000 ml (16.6-33.3 oz's) fluid replacement
 - Mix of water and electrolyte-containing drink.





	ACSM	NATA	Gatorade	NCAA
Before	500 ml : 2 hours	500-600 ml : 2-3 hours	17 - 20 oz : 2 to 3 hours	17 - 18 oz : 2 hours
		200-300 ml : 10-20 min	7-10 oz : 10 - 15 pre warm-up	
During	Regular Intervals	200-300 every 10-20 min	7-10 oz every 10-15 min	8 oz every 10-15 min
After	Equal to loss	150% of weight lost	20-24 oz / lb	20-24 oz / lb
Temp	59° - 72° F	50° - 59° F	Cooled	50° - 59° F
Contents	CHO and Sodium	CHO and Electrolytes	CHO (6-7%) and Sodium	-



NUTRITION FOR CHAMPIONS

DAY BEFORE
COMPETITION



Start with Hydration
Promote energy efficiency; prevent fatigue and dizziness



Athlete's Plate, Every Meal
Focus is on quality carbs, lean protein, fruits and vegetables



Snack Smart
Antioxidant filled fruits and vegetables, energy boosting trail mix or low sugar cereal



During 1hr Before Race



> 1 hr Before Race



1-2 hrs Before Warm Up

Just Before Comp

Sips of water / sports drink for hydration, carb and electrolytes

Between Warm Up & Comp

Prep muscle glycogen for competition with a carb boost

Before Warm Up

Light breakfast, but enough to hold you over through the competition

MORNING OF
COMPETITION

RECOVER AFTER COMPETITION



Immediately Post

Rehydrate,
carb recovery,
protein protection



Athlete's Plate Meal

ASAP: replenish
and rebuild with a
balanced plate



TAKES A TEAM TO WIN

Hold yourself and
your teammates
accountable. Will
you do what it
takes?

