Hydration for Exercise Performance

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Importance of Sports Science for Monitoring Exercise

1. Monitor & assess performance
   - Aerobic (VO$_{2\text{max}}$ & Yo-Yo – “beep” tests)
   - Anaerobic (windgate, speed tests etc)
   - Strength & conditioning programmes

2. Nutrition assessment

3. Help prevent injury & improve recovery


Sports Science for International Organisations
Athletes don’t do a good job replacing what they lose in sweat

Total Body Fluid Volumes by Age and Sex

% body weight

Premature Infant Neonate Child 1-12 Puberty 30 Male Puberty 30 Female 40-60 Male 40-60 Female >60 Male >60 Female
Dehydration

“Dehydration, if sufficiently severe, can impair performance in most events, particularly in warm and high-altitude environments. **Athletes should be well hydrated before exercise** and drink sufficient fluid during exercise to limit dehydration to less than about 2% of body mass. Chilled fluids may benefit performance in hot conditions.”

(IOC Consensus Statement on Sports Nutrition, Lausanne, 2010)

Dangers of Dehydration

Ever Stringer, an offensive tackle for the Minnesota Vikings, died early yesterday, a day after collapsing from heatstroke at the Vikings’ training camp in Mankato, Minn. His death sparked discussion and review of training camp procedures in extreme heat throughout the National Football League.

Stringer, 27, a 6-foot-4-inch, 335-pound league all-star who was entering his seventh professional season, complained of exhaustion after being unable to complete practice on Monday morning in the Vikings’ first practice of training camp and was carted off the field. He did not practice Monday afternoon, and he vowed to return on Tuesday for the morning session, which he did. It lasted nearly two and a half hours, and players were in full pads.

Temperature hovered above 100 degrees and the humidity was stifling. The heat index, combining the effects of temperature and humidity, hit 110. Stringer warmed up twice in practice and walked to an air-conditioned shelter. There he complained of dizziness and
How Much to Drink?

The Boston Marathon and Drinking Too Much Water

By James Downie

This morning, almost 27,000 entrants ran in the 115th annual Boston Marathon. Geoffrey Mutai of Kenya won the men's race in a world record time of 2:03:01, denying American Ryan Hall, who finished 4th, the chance to become the first American to win the race in almost 30 years. (Mutia's time equates to around an astonishing 4:45 per mile.) On the women's side, New Zealand's Kim Smith led for most of the race, but had to fall back towards the back half of the course, and Kenya's Caroline Kilel won in 2:22:36. Yet while the attention was on the elite runners, thousands of entrants were far more ordinary: despite the marathon's qualifying standards, in 2010 almost 6,000 runners were nonqualifying entrants, "who either bought entry numbers from foreign tour operators or were granted invitations by organizers, sponsors, vendors, licensees, consultants, municipal officials, or marketers peddling entries for profit." Of course, even most of these inexperienced entrants know to stay hydrated during the run. But is there a limit to hydration? Can you drink too many fluids?

Electrolyte Loss in Athletics

- Sweat loss replaced with plain water can result in a prompt diuresis due to
  - ↓plasma sodium concentration
  - ↓plasma osmolality
    (Nose et al. 1988).

- Where rapid re-hydration is vital (eg. in marathon), CHO-electrolyte solutions have been found to be more appropriate for fluid replacement (Costill et al. 1973; Gonzalez-Alonso et al. 1992)
Electrolyte Loss in Athletics

- Level of electrolyte loss depends on sweat rate, sweat composition and fluid intake during exercise.

- Sweat patch is more practical for measurement in a field setting (Shirreffs et al. 2005; Maughan et al. 2004)

Electrolyte Loss in Athletics

- Sodium (Na⁺) is the most important electrolyte lost in sweat (Shirreffs and Maughan 1997)

- Maintenance of electrolyte balance can help to limit the deterioration of athletic performance (McGregor et al. 1999; Ostojic and Mazic 2002; Welsh et al. 2002)
**Guidelines**

**International Olympic Committee** “Nutrition for Athletes” (April 2012) based on the International Consensus Conference, Oct 2010


**Fluid Intake Before Competition**

- Athletes should **drink sufficient fluid with meals on the day before training or competition** to ensure adequate hydration on the morning of competition

- Athletes should continue drinking water or carbohydrate-containing fluids during the hours leading up to warm-up before training or competition
Fluid Intake
Before Competition

- It is recommended that athletes have a final large drink about 60 minutes before the start of training or race.
- Before training or race, athletes should having an extra drink during the 15 minute period immediately before the start of the event.

How Much to Drink?

- Drinking should “almost” equal sweating
- Don't gain weight during exercise
  - Measure body weight both before and after
- Practice drinking (!!) during the 15 minutes before training.
What to Drink?

- During training and competition, all drinks should contain some carbohydrate and sodium (salt).

- This helps to maintain pace and concentration instead of succumbing to fatigue.
During Training & Competition

****Be Careful of Advertising!!****

Rehydration after Training & Competition

- This process is part of the preparation for the next exercise session.
- All athletes will perform below their best if they are not well hydrated when they begin exercise.
Rehydration after Training & Games

- Aim to drink about 1.5 litres of fluid for each kg of weight loss in training or competition.

- Drinks should contain sodium (the main salt lost in sweat) if no food is eaten at this time.

- A little extra salt may usually be added to meals when sweat losses are high, but salt tablets should be used with caution.

Urine Colour

- If you are passing urine less often than normal, you may be dehydrated.

- If urine colour becomes darker than what is normal for you, then you may not be drinking enough. Check your urine colour against the chart.
How to Monitor Hydration Status

- How did you feel?
- How did you perform?
- What was your weight loss over the session?
  - This should generally not exceed about 1-2% of body mass.
- Did it make you feel uncomfortable?
- Did you take time out to drink?

Take Home Messages (1)

- Maintaining hydration is important for performance
- Fluid intake **before, during (where appropriate) and after** exercise is especially important in Hong Kong
- Salt replacement is important when sweat losses are high
Take Home Messages (2)

- For athletes in Hong Kong, fluid should be **freely provided** when they exercise in the heat regardless of the flavor of the drinks.
- Athletes should to take a water break after exercising for **every 30-40 minutes**.
- Clothing should be lightweight and limited to one layer of absorbent material to facilitate evaporation of sweat.

Take Home Messages (3)

- Drinking too much can be harmful or uncomfortable.
- **Every athlete is different** because they have different sweat losses.
- A **personal hydration plan** would work best.
- Temperature of drink is recommended to keep at 10°C-15°C.
## Acknowledgements

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<pre><code>                                                                  | Players &amp; Coaches, Hong Kong Football Association;                     |
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Thank you!
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