



Training & Racing In The Heat

Multisport Mastery, Inc.

Training and racing in the heat requires a careful approach with hydration, fueling and pacing. Even small amounts of dehydration will strain your body's ability to perform. Without taking extra measures to protect yourself from dehydration and heat illness, you may find yourself facing a life-threatening condition or even death.

Basics of Your Body's Response To Heat

Within a short period of starting exercise, body temperature begins to rise from muscle contraction. In hot conditions, body temperature rises even more making for a dangerous combination of exertion and overheating. Sweat rate increases in order to cool the body. For every 1 percent of body weight lost from sweating, your body temperature rises about a half degree. As you sweat, you lose water from the body and become dehydrated. Dehydration causes your body temperature to rise even more. Because the human body is mostly water, when you lose water there are system-wide consequences. Exercise performance declines with as little as a 2 to 3 percent loss in body weight from fluid loss.

To prevent body temperature from rising too much during exercise, your central nervous system responds by constricting the blood vessels supplying your organs and dilating the blood vessels in the skin. Blood is therefore diverted away from the organs to the skin to increase cooling. As you core temperature increases, your skin temperature actually decreases from convective cooling. If you have experienced the chills or goose bumps on a hot day, you are experiencing this process.

In endurance sports, overheating and dehydration can lead to disastrous results. As more blood is sent to the skin for cooling, less blood is sent to muscles. Therefore, exercise intensity decreases and perceived effort increases. It is not uncommon to find yourself exercising significantly slower in the heat because of this. The body's effort to cool itself will always outweigh the body's ability to maintain exercise intensity. When overheated or dehydrated, no matter how hard you push, your body will need to slow down.

As the body continues to cool itself by pumping blood to the skin, less blood is available not only for muscle activation but for digestion. Many athletes digest poorly (leading to GI distress or bloating) when they overpace or underhydrate (which leads to increased body temperature and effects listed above). With less blood being supplied to the stomach, gastric emptying may be delayed and food just sits. In addition, less blood (and therefore oxygen) being supplied to the colon, can make it hypoxic and spasm, causing "the runs". As you can see, the effects of dehydration or overexertion in the heat can derail the best training and race plan.

With increased heat strain, the body also experiences cardiovascular strain. Sweat causes a loss of plasma volume from the blood and total blood volume decreases. When this occurs, stroke volume (or the amount of blood pumped by each heartbeat) decreases. A decreased stroke volume leads to less oxygen flow to your muscles which then forces you to decrease exercise intensity. The heart must also work harder to pump blood which then causes your heart rate to increase. This rise in heart rate during exercise, without an increase in intensity, is called cardiac drift. For every 1 percent of body weight loss from dehydration, you can expect your heart rate to rise 3 to 5 beats per minute. Therefore, in the heat, heart rate is a good indicator of hydration or heat stress but not necessarily effort.

Preventing dehydration is difficult in the heat because your sweat rate likely exceeds your ability to ingest and absorb fluids. High temperatures and intense exercise can increase your sweat rate to 40 to 67 ounces per hour compared to the usual 26 to 40 per hour from moderate exercise in normal conditions. However, your body can only absorb about 26 to 40 ounces per hour. You can see how the body can become stressed as it cannot absorb the fluid it needs to meet hydration demands in hot weather. For this reason, athletes with an usually high sweat rate may find racing in hot conditions very difficult.

Combined with heat, humidity presents another challenge. In humid conditions, the air is saturated with water which limits the amount of sweat evaporating from your skin. The body's ability to dissipate heat is therefore compromised. As a result, body temperature rises rapidly and increases the risk of heat illness (heat exhaustion or heat stroke).

Preparing To Train & Race In The Heat

Hydration

With the decrease in exercise performance and risk of dehydration, hydration is critical to your health and performance. Research has shown that starting a workout fully hydrated can delay dehydration, maintain better performance and decrease risk of heat-related illnesses. Pre-exercise hydration enhances your ability to control body temperature and increases plasma volume to maintain cardiac output. Two hours before exercise, drink 16 ounces of fluids. Within 10 to 15 minutes of exercise, drink 8 to 10 ounces.

During exercise, drink about 6 ounces of fluid every 15 to 20 minutes or 18 to 24 ounces of fluids per hour. Aim to match your fluid intake to your individual sweat loss. Keep in mind that sweat loss will vary by sport, weather conditions, exercise intensity and altitude. Performing a sweat rate test in many conditions will give you the best estimate of your individual fluid needs. Ideally, maintain 14 to 20 ounces of fluid in your stomach to optimize gastric emptying. Anything less may cause bloating and malabsorption. If you have ever felt bloated or sloshy during a race, you were likely dehydrated.

Once you get behind with your hydration, it is very difficult to catch up. For this reason, you should train yourself to empty up to 1 bottle per hour in training so it becomes habit for racing. Most sports bottles hold 20 to 24 ounces of fluid (measure yours to be sure). Teach yourself to take in the required amount of fluid every 5 to 10 minutes during exercise to get through one bottle per hour. Remember to start drinking within 10 minutes of starting your workout – or else you risk getting behind (and staying behind).

After exercise, drink approximately 16 to 20 ounces or fluids for every pound of weight lost. Get in the habit of weighing yourself before and after exercise sessions in the heat to ensure that proper hydration is maintained as sweat rate increases. Even without a scale you can monitor hydration. Look for urine to be a pale yellow color to indicate proper hydration prior to and after a workout.

To sum up:

- 2 hours prior to exercise: drink 16 oz of fluids
- 10 – 15 minutes prior to exercise: drink 8 – 10 oz of fluids
- During exercise: drink a minimum of 18 – 24 oz of fluids (vary depending on sweat rate/weather/altitude)
- After exercise: drink 16 – 20 oz fluids per pound of body weight lost

It is important to include sports drink and sodium replacement in your hydration. Hyponatremia is a life-threatening condition resulting from drinking excessive amounts of plain water leading to a low concentration of sodium in the blood. You can lose up to 2000 mg of sodium per liter (33 ounces) of sweat. Therefore, endurance athletes should use a sodium containing sports drink during events lasting longer than 60 minutes. Supplementation with sodium is also recommended when training for and racing in extreme endurance events (half to full Ironman). Most athletes require 500 to 1000 mg of sodium per hour during exercise. Depending on your individual sweat rate or weather conditions, you may need more (some athletes require up to 2000 mg per hour). Experiment with salt tabs (recommended brands include Thermolytes, Elete, or Salt Stick) to find your needs.

Acclimate

Exposing yourself to hot and humid conditions stimulates the adaptations required to lessen heat stress. Decreased heart rate and increased plasma volume occur within 3 to 6 days as your body adapts to the heat. Adaptations in core temperature and electrolyte concentration occur within 9 to 10 days. Complete acclimatization occurs within 2 weeks.

Slowly introduce yourself to the heat over a period of 2 weeks. During this time, perform low intensity workouts during the heat of the day. Studies have shown that after 4 sessions of 30 to 45 minutes of exercise in the heat, subjects showed signs of improved acclimation. Gradually increase the duration and intensity of exercise during these 2 weeks. Perform higher intensity workouts during cooler morning or evening hours. However, morning hours are best as endurance exercise capacity in the heat is much greater in the morning (based on lower core and skin temperatures).

Beating The Heat

There are many ways to trick yourself into feeling cooler when exercising in the heat:

- Wear a ventilated & light-colored hat or visor to keep your head & face cool.
- Apply sun block on all exposed areas; reapply throughout training or racing (spray bottles in transition or special needs bags)
- Wear sunglasses to prevent squinting or eye damage from ultraviolet rays
- Grab a cup of ice at the aid station & suck on the cubes
- Pour ice cubes into your top/jog bra
- Pour cold water on your head or face
- Consider using arm coolers & cover as much of your body as possible in the heat
- Wear well-ventilated & moisture wicking lighter clothing or race gear

While all of these tricks may give the illusion of feeling cool, they do not decrease body temperature. You actually need to ingest fluid to bring your body temperature down.

After training or racing in the heat, avoid plunging into cold water or an ice bath right away. The sudden change in temperature taxes your heart muscle while it's still recuperating from the strain of exercising in the heat. Instead, cool down first with some slow walking for 10 to 15 minutes to allow your core temperature to return to normal.

Preparing Yourself For The Heat

Learn to set realistic and safe expectations for your performance in the heat. It is dangerous and foolish to think your body will be able to perform at its best or fastest when racing in hot/humid conditions or prior to an adequate acclimatization period. Go into a training session or race willing to make adjustments to your effort level or pacing in order to stay safe. Expect pace may slow by 1-minute per mile or more. Because you cannot change the weather, it is best not to worry about "splits" rather focus on what you can control instead; your pacing, hydration and mental state.