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## Return to Training after

# HEAT ILLNESS

TEXT BY DR SIMON SOSTARIC | PHOTOGRAPHY BY ITU MEDIA/DELLY CARR AND SHUTTERSTOCK.COM

**W**hen is it safe to resume training after suffering heat illness? If anything will increase the profile of human vulnerability to exercise-induced heat stress, it's the confronting images of an elite athlete dramatically staggering or collapsing in the heat of battle, for millions of viewers to witness.

Picture this. British supremo triathlete, 26-year-old Jonny Brownlee, was leading the 2016 World Triathlon Series grand finale race in Mexico - within a minute or

two of the finish line, before hitting the staggers, and literally veering off course. Without his brother Alistair rendering significant assistance (who was conveniently lurking close behind in third place), it's unlikely Jonny would have made it to the finish line, let alone score a podium. With rapid medical attention, by all accounts, Jonny recovered without complications.

More recently, during the closing stages of the 2018 Commonwealth Games marathon, Scottish runner Callum Hawkins succumbed mercilessly under

the hot Gold Coast sun. He was leading the race with only 2.5km to the finish. As much as his mind was willing to battle it out, he staggered precariously, before collapsing to the road, unable to continue. With medical care, thankfully he has since recovered enough to soldier on with his life in one piece.

The question is this: How much physiological damage was done, and when is it safe for Jonny, Callum, and others similarly affected by exertional heat stroke (EHS), to return to regular training and competition?

### UNDERSTAND THE RISKS OF EXERTIONAL HEAT STROKE:

At some stage, many athletes are likely to have experienced that overwhelming feeling of overheating in a training session or during competition. Fortunately, most will recover within a day or two, and carefully consider an action plan that mitigates the risk of developing repeat episodes of significant heat illness.

When prepared appropriately, the human body can tolerate significant environmental and metabolic heat loads very well. Athletes expecting to compete in warm/hot weather need regular heat exposure to acclimatise, with careful monitoring in place during training to adjust intensity, duration, recovery and hydration, amongst other things. For highly motivated, ambitious athletes, strategic periodised training in artificial heat under the scrutiny of an experienced exercise physiologist is also a worthy investment - not only for accentuating the heat acclimation process, but also quantifying one's specific physiological responses and adaptations.

Exercise intensity, and subsequent metabolic demands, contributes significantly to internal heat generation. Therefore, adjusting the intensity and subsequent pace for the conditions is imperative. While not privy to the exact cause/s of Jonny Brownlee and Callum Hawkins demise during their respective events, one can only assume that they were both well prepared for competing in the heat, but may have been overzealous with aggressive race pace, and subsequently production of an unsustainable amount of metabolically induced heat. Whether Jonny or Callum

were affected by other means remains to be confirmed.

When prepared appropriately, and with pacing carefully considered, athletes can tolerate extremely hot environmental conditions without serious consequences. For example, athletes competing in the notoriously hot Badwater 135 mile (216 km) running race in Death Valley, California, are rarely affected by serious heat illness, despite relentless temperatures in the range of 40-50 C. The common observations of athletes finishing the race is characterised by typically expected soreness, though not heat decimated bodies because the sustainable pace is very slow in absolute terms, and metabolic demands much lower than shorter endurance events.

That said, the following points are established contributors to impairment of thermoregulation during exercise and sport. These contributing factors may independently or collectively contribute to increased risk of succumbing to EHS:

- Inadequate training preparation for competing in the heat
- Inadequate hydration
- Recent illness
- Certain medications, including: psychotropics; ACE inhibitor; angiotensin blocker; anticholinergics; diuretics
- Use of recreational drugs or alcohol
- Genetic predisposition to heat intolerance (gene defects)
- Sleep disturbances
- Inappropriate intensity for the conditions (i.e. too fast)
- Warm/hot weather
- High humidity (even when cooler ambient temperature)

Those most at risk include children, athletes affected by spinal cord injuries (e.g. racing in wheelchairs), unfit individuals, fit but overzealous athletes.

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### TIMELINE OF RETURNING TO SPORT AFTER HEAT ILLNESS:

Following an acute episode of EHS, numerous physiological changes may occur, including temporary or permanent heat intolerance. The duration of time spent above critical thresholds of core temperature, and the time taken to receive appropriate medical attention will

“ Following a significant EHS event, athletes should avoid exercise for at least one week. ” — Simon Sostaric

ultimately determine the magnitude of physiological disturbances. Athletes are advised to comply with the following return to sport guidelines:

- Medical clearance prior to return to sport and exercise
- Athlete should be clear of cognitive, anatomical and physiological dysfunction
- Blood tests must be normal (e.g. kidney and liver function; muscle enzymes, et al)
- Following a minor EHS event, athletes are generally able to resume short duration, light physical activity after 48 hours, under the supervision of an exercise physiologist with expertise in thermoregulation
- Following a significant EHS event, athletes should avoid exercise for at least one week



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- Once ready to resume sport after one week, under the guidance of an exercise physiologist, athletes should progress through a series of stages during the forthcoming weeks, including (1) light exercise in temperate conditions; (2) strenuous exercise in temperate conditions; (3) light exercise in heat; (4) strenuous exercise in heat - with the 3rd and 4th stages monitored with precision physiological equipment.

**EVALUATING READINESS TO RESUME COMPETITIVE SPORT:**

When an athlete has been affected by a significant EHS event, with concomitant skeletal muscle (e.g. exertional rhabdomyolysis), kidney or heart (or other organ) disturbances, the individual will be advised to undertake a series of physiological tests, such as (1) running test under thermoneutral conditions to investigate metabolic and cardiovascular

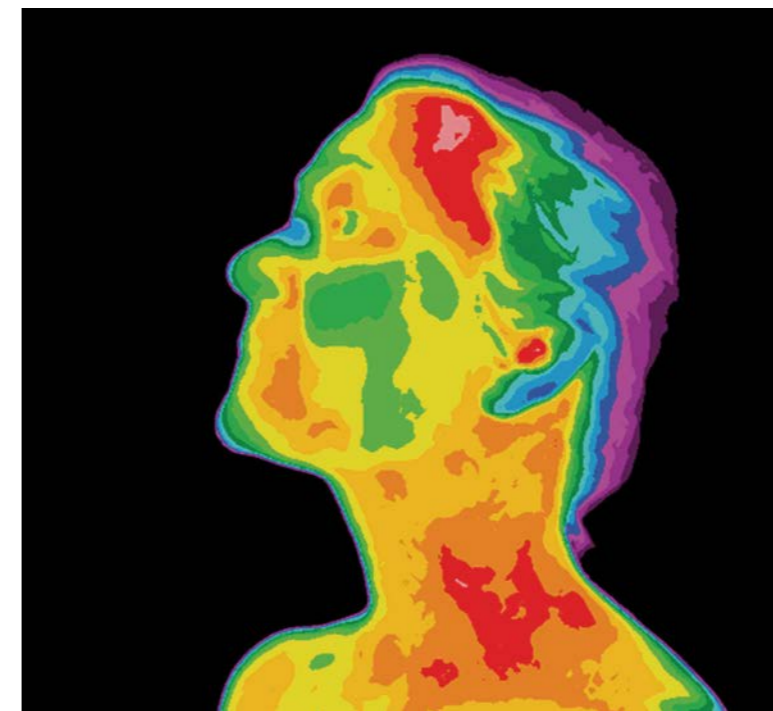
responses, and (2) heat tolerance tests, which encompass a range of intensities and durations in the heat, measuring core temperature, skin temperature, cardiovascular and thermal comfort (subjective feedback) responses. The thermoneutral exercise test can be undertaken once an athlete has resumed training at a stage that includes intense exercise in temperate conditions. The heat tolerance test can be undertaken 6-8 weeks after the EHS event. If the athlete is classified as heat intolerant, the test is repeated after an additional 6-8 weeks. The results of these tests provide critical insight into the athlete's readiness to return to competitive sport, or evidence to support appropriate modified exercise.

**MEDICAL EVALUATION AND HEAT TOLERANCE TESTING:**

Despite Australia's penchant for mass sports participation in warm-hot

**“ Most individuals make a full recovery from EHS. Some take longer than others to recover, depending on the magnitude of the EHS event. ”** — Simon Sostaric

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**OVERZEALOUS:** Aggressive race pace can produce an unsustainable amount of metabolically induced heat causing potential EHS

environmental conditions, very few clinicians are equipped to provide heat tolerance testing. Most recipients of heat tolerance tests are referred by their sports physician, GP, or cardiologist. In the experience of yours truly, following physiological tests and strategic management plans, most individuals make a full recovery from EHS. Some take

longer than others to recover, depending on the magnitude of the EHS event, and the initial timeliness of medical attention.

During physiological tests in thermoneutral conditions, some athletes demonstrate hypermetabolic muscle disorders (characterised by abnormal muscle oxidative metabolism; rapid lactate production; sympathetic

hyperactivity; delayed rise in skin temperature) in which case we refer for skeletal muscle genetic mutation screening and subsequent malignant hyperthermia susceptibility.

If you have been previously affected by undiagnosed exertional heat stress, and not quite feeling the same since; or have been affected by repeated heat stress episodes, it's best to check in with your GP for a referral to a sport and exercise physician, who will determine the most appropriate course of action regarding diagnostic investigations. **AT**

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