

Start of exercise



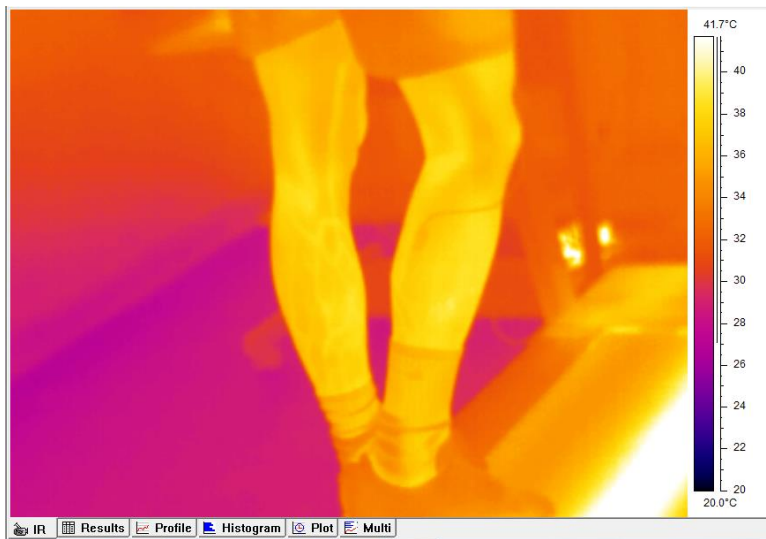
You already have warm skin at the start of the exercise. Particularly, your head, chest and back.

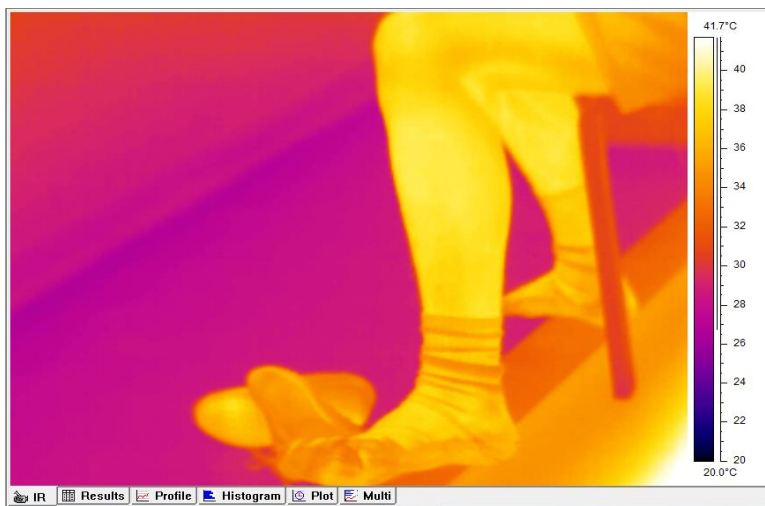
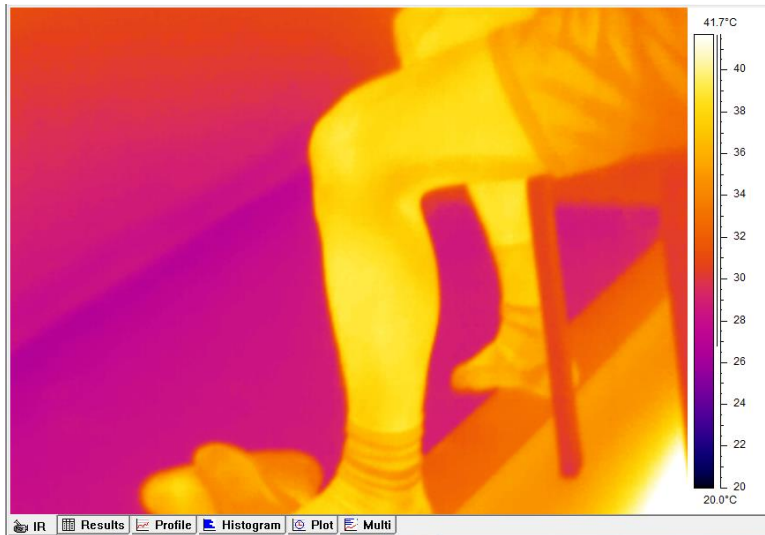


Your legs also look warm. Precooling may be an option, although care will be needed to prevent you injuring yourself at the start of exercise.

Exercise started

Hot legs, wetting your socks and shin pads and keeping them wet will help to remove some of the excess heat

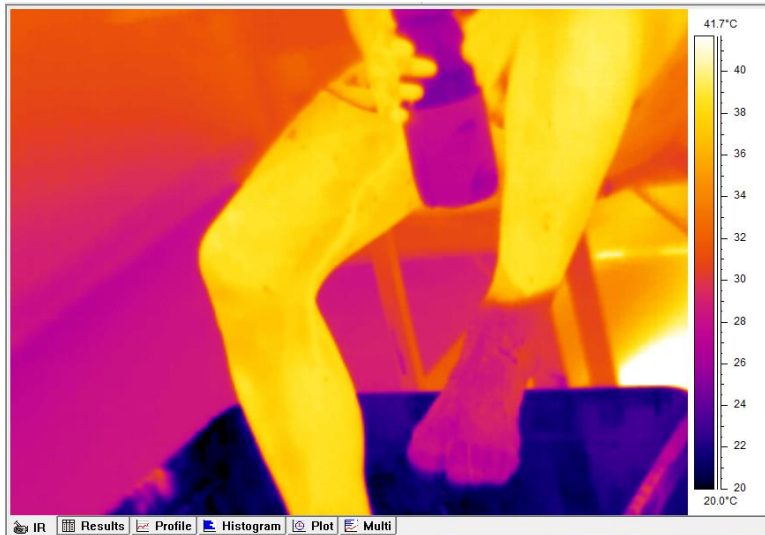




Sweat production on the soles of your feet, shown by the cooler colours



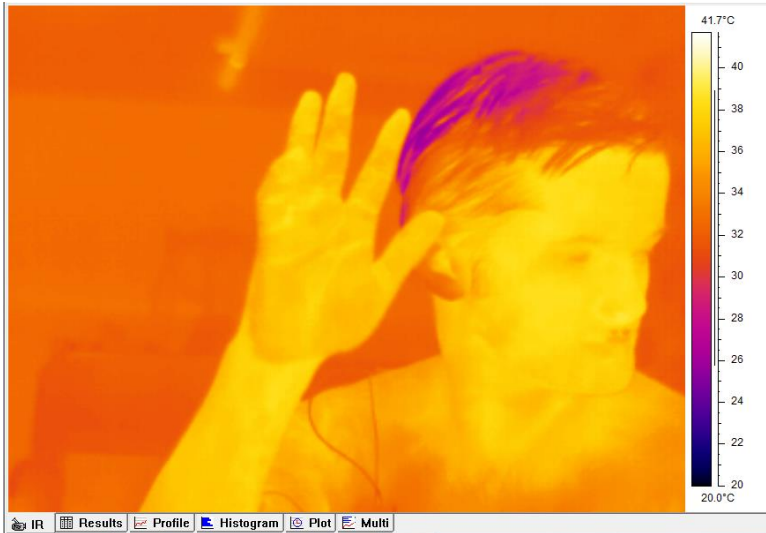
Sorry, the cooler colours on your shoulders and lips are from water. The more wet your skin the more opportunity there is for heat loss.



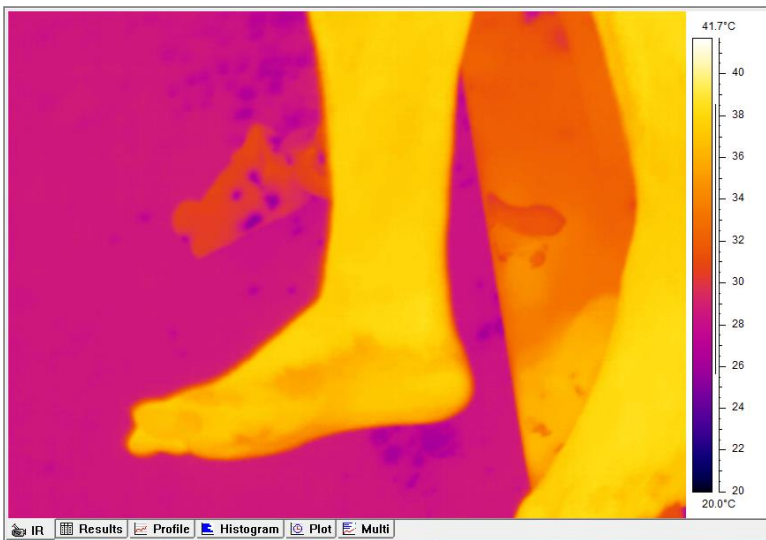
The efficiently you can cover your skin the more heat loss you will have, unfortunately that means jumping in to cool water, or under a cold shower will get you most wet and maximise the heat loss you can have.



Sweaty Palms



Sweaty hands and wet hair. Wetting your hair will help to keep you a little cooler



Sweaty feet, see the cooler colours on the soles of your feet



Warm skin at 38°C

Methods & Results

James undertook two bouts of intermittent treadmill exercise with a 20 min break between the bouts in environmental conditions of 30°C and 60% relative humidity.

The exercise (portion A was 30 min long and C was 15 min long on the Figure 1) consisted of 1 min walking (4kph), 1 min steady speed (10kph) and 30 s sprinting (16kph) followed by a 30s rest. This profile was repeated until James' deep body temperature reached 38.5°C.

Portion B on the graph was a recovery period, during which time James took off his shoes and socks and poured water over his chest and torso. Section D was the second recovery period without any cooling intervention.

Finally, section E was the water immersion to the waist for 7 min followed by continued cooling from having cold skin.

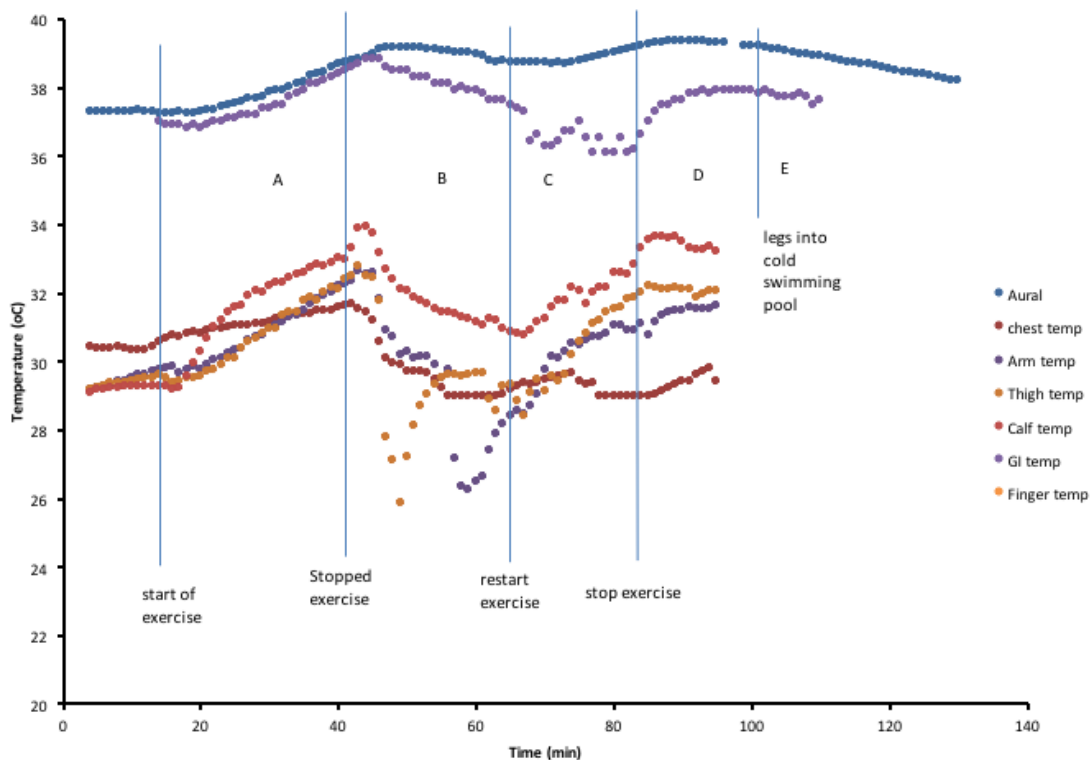


Figure 1. Deep body and skin temperatures during exercise and recovery

The top purple line represents the temperature (GI) pill, which works well until James consumes cold water. In future, if these pills are used they need to be swallowed more than 3 hours before requiring them. Therefore after the first exercise period the result from this should be disregarded.

James' deep body temperature peaks at 39.15°C, which is clinically hyperthermic, during the exercise. There was no sign of a plateau in temperature and it continued to rise when stopped exercising. The recovery of deep body temperature was slow during the first stage of cooling despite drinking cool drinks and spraying the body with cool water and fanning.

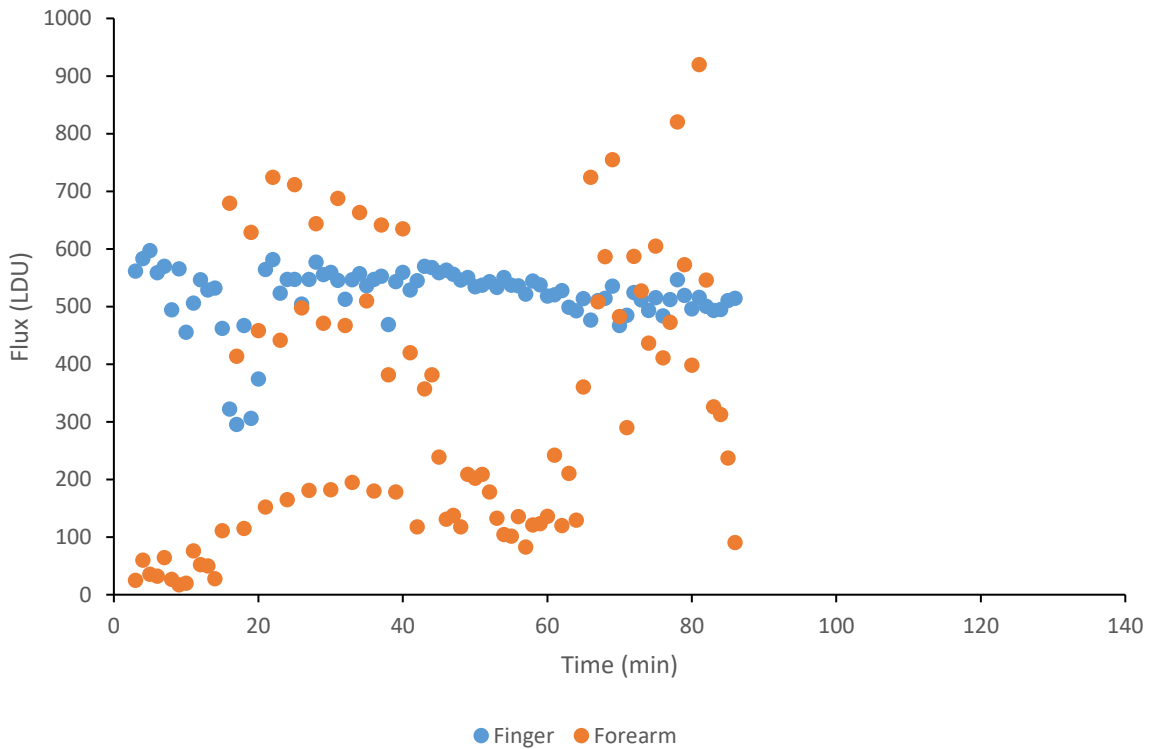


Figure 2. Skin blood flow

The skin blood flow is high throughout the rest and exercise periods. These high blood flows are maintained despite holding a cold drinks bottle and also wetting the skin. This means that wetting the skin would be a good way of dragging out excess heat. The more of the skin surface that is wet the better.

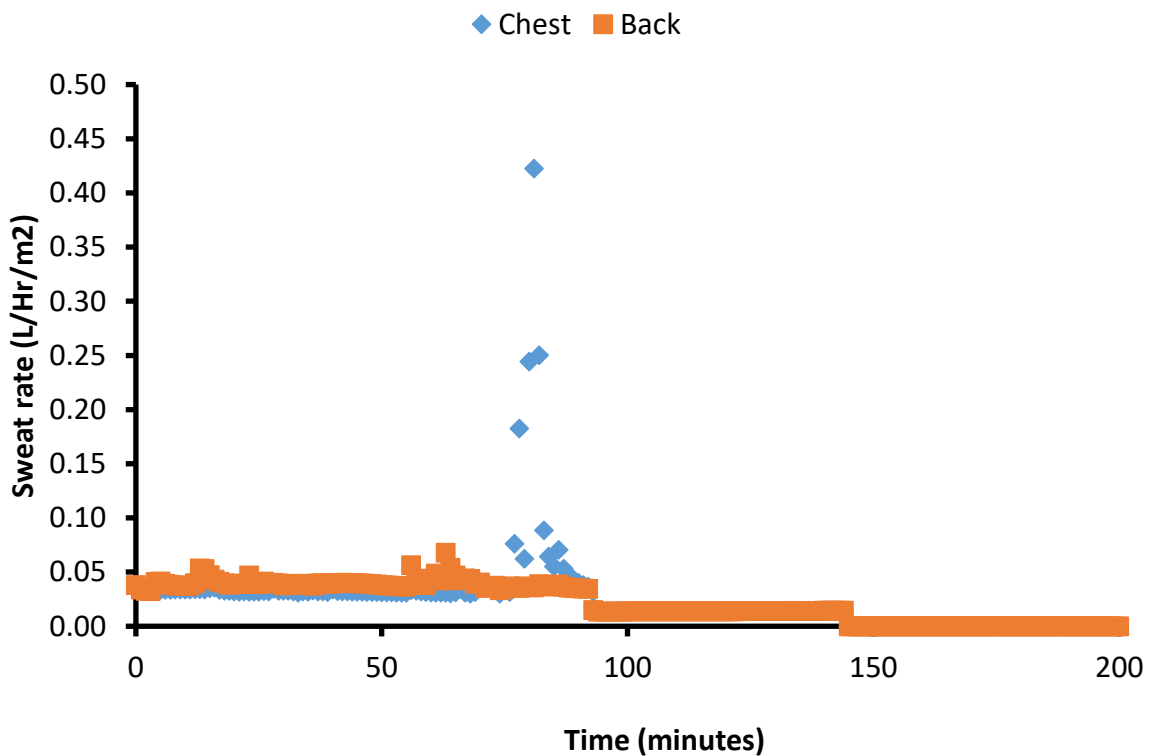


Figure 3. Sweat rates

The sweat rate is very low as expected, the blips are due to the water that was poured over the body and this can then be allowed to evaporate from the skin to extract heat.

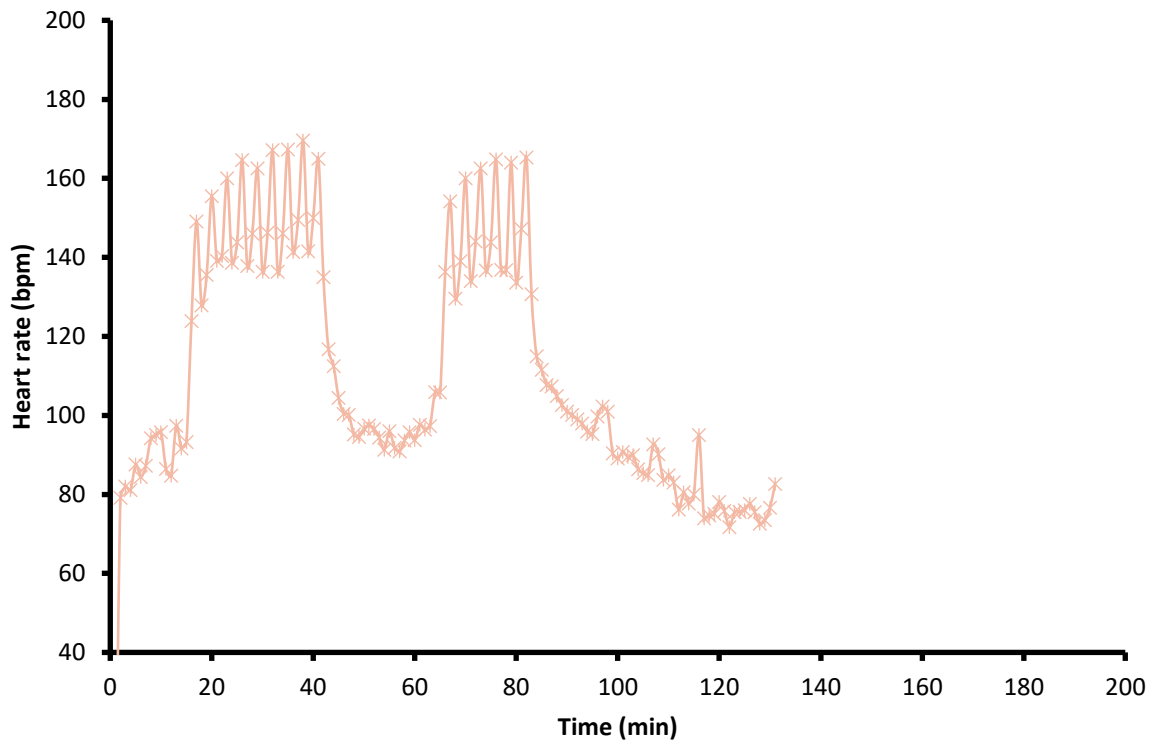


Figure 4. Heart rate

Shows the intermittent exercise periods and shows that James was intermittently working hard.

Whole body sweating accounted for 200 mL in the 115 min of the assessment. Normal values would be between 2-4 L for the same duration.

Comments

James is a physically fit young man that is currently undertaking training to be a professional football player. He does develop a high deep body temperature quite quickly following the onset of exercise in warm conditions. This results from the absence of sweat production. Unchecked this will lead to fatigue and reduced performance as well as potential for causing heat illness.

There are potentially a number of items to discuss:

James will need to have awareness of the conditions and take action to pre-empt them. James needs to recognise that the situation is going to be warm and what problems this could cause him and find a range of strategies that could help him. This could be a hot bus transfer, warm playing conditions, or the tempo of the match where he is required to undertake lots of high intensity exercise in moderately warm conditions. He will need to develop strategies to cope with all of these situations.

Precooling strategies, will cool the body before exercise, but as a consequence James will heat up more rapidly, it is not known if this will extend the duration of his performance. Precooling could be by immersion in cold water or cold shower or spray and fan the body

Cooling strategies. Wet all skin surfaces and clothing including socks and shin pads, continue to wet the skin and clothes for the duration of the exercise. Cold water immersion, if you can stand it, immersing the whole body in cold water is the fastest way for James to lose excess deep body heat.

Position on the football pitch, the proposed move from winger to wing back, may reduce the intensity of running on occasion and allow for free access to water to drink and pour on James body and clothing. This may well extend his performance time and reduce the likelihood of becoming too hot.

Consideration may need to be made as to the location of future employment in the sport, moving to cooler locations may be of benefit, allowing James to perform at the level he is required to.

Homework

James I have some home work for you to complete. I'm happy to come along and we can do this with the temperature pills, if you would prefer or speak to your Physio or Sports Scientist and they will be able to devise you more specific sessions that you can use to test yourself.

1. Using two similar exercise sessions, complete 1 with precooling and one without and see how long or how quickly you can complete the session. Precooling could be a 5-10 min cool shower or immerse yourself in cool water (up to your neck).

2. Again using two similar sessions. Wet all clothes including your socks and boot/trainers in one session and note down the duration of good quality work.

I hope you find all the information useful and please e-mail or phone if there are questions you have, and to tell me how you are doing. If you would like me to visit to help with some of the interventions, I'd be happy to.

Thanks

Heather Massey University of Portsmouth

heather.massey@port.ac.uk