Supplement to Central Orienteering Club's September 1979 Newsletter.

The Danger of Training with a Temperature

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THE RISK ATHLETES RUN SHRUGGING OFF A COLD

Christopher Brasher

Three apparently unconnected happenings – the death of a close friend after a training run, the inexplicably bad form of Ian Thompson in the Olympic marathon trial, and the death of an acquaintance after an orienteering race – have now been shown to be connected.

Inevitably, the evidence is circumstantial and cannot be considered an absolute scientific fact, but the connection between these three events has wide implications for every sportsman and woman in the land.

One Sunday in March Mike Wells-Cole, one of the leading orienteers in Britain, went training while still suffering from the after-effects of flu. He died that evening of a heart infection.

In April Ian Thompson, the European and Commonwealth marathon champion, was going so well in training that he smashed his own record for a hilly 18-mile road circuit over Dunstable Downs. He was running each mile in a startling 4 min 43 sec, which means that, if he had been capable of carrying on at this pace for the whole marathon distance, he would have recorded a time under 2hr 3mins, which is over five minutes better than the world's best performance.

Ten days later he was attacked by a viral infection and had to take two days off work. Ten days after that he ran in the Olympic trial 'knowing that I didn't feel quite right'. It was a hot sunny day and after only five miles Ian was surprised to discover that, although those around him were sweating profusely, his skin seemed to be dry. At about the same time he felt a tightness, a pain, in his upper thighs. Never before or since has he experienced any trouble with these muscles.

His final time was 2hr 19min which was at least seven minutes slower than he expected to do on that course. It was the first time that he had been beaten in a marathon race.

He has had some terribly races since then but last Sunday, in Japan, he beat the Olympic champion Waldemar Cierpinski by more than two minutes and once again became Britain's top marathon runner with a time of 2hr 12min 54.2sec.

Last Sunday Dave Menzies, who has been the leading orienteer at Edinburgh University, ran in a club event just after suffering from a very heavy cold. That evening he died.

Most of the medical experts whom I have consulted believe that all three of these athletes were suffering from myocarditis (inflammation of the heart) as a result of a viral infection. Dr Griffith Pugh, the world famous physiologist who has recently retired from the medical research council, says that his interpretation of Thompson's symptoms is that he nearly had a circulatory collapse. 'These viral infections are known to be capable of upsetting the circulation in various ways about which we know little. What happened to Thompson was that the body's protective mechanism shut off the blood flow to the skin to preserve the flow to the brain.

Sir Roger Bannister, who has been very concerned with heat regulation and who has written scientific papers on the subject, says that Thompson's failure to sweat indicated a disturbance of heat regulation which may well have been the result of the earlier viral infection but without evidence of direct myocardial involvement.

Dr Peter Sperryn, the only doctor on the Sports Council, and co-editor with Dr John Williams of the classic 'Sports Medicine', referred me to a paragraph in the chapter writ-caridologist at St Bartholomew's, and Dr Thomason, director of the Human Performance Laboratory at Salford:– 'Exercise associated with an attack of myocarditis, which is often associated with myalg' [muscle pain], can precipitate hea failure and is unlikely to be beneficial'.

This could be very scaring to any athlete (and I use the word in the American sense to cover all aportsmen and women). No athlete likes to interrupt his training because of a cold and a cold is a viral infection.

As Dr Sperryn, himself an athlete, says: 'We have all run many times with a cold and many of us have used the technique of wrapping up in two tracksuits and "sweating the cold out". But there are dangers of which we should all now be aware. We can comfort ourselves by saying, "look how few deaths there are", but now that the evidence is accumulating we should give full publicity to some simple guidelines'.

His own guideline when he is medically in charge of a team is that if anybody has a fever (i.e. a temperature) then he absolutely forbids training or competition. Again he refers to the chapter in 'Sports Medicine' by Dr Tunstall Pedoe and Dr Thomason: 'However these symptoms [exhaustion on effort] arising after a viral infection must raise the possibility of a viral myocarditis, and competition and even training at the time of, or shortly after, a pyrexial [feverish spell] is probably unwise...

Sir Roger Bannister says: 'The ordinary individual knows when he is feeling unwell and does not have the capacity or willpower to drive himself to exhaustion. But the athlete has trained himself to ignore and overcome pain over many years and therein lies the particular danger to him. As in all training and medical matters, it is commonsense to understand when it may be dangerous. And one must remember that it takes as much courage to stop training as to go out when you're not feeling up to it'.

BRIAN PORTEOUS (BOF Professional Officer) adds this rider –

Our sport has had two similar, very tragic deaths during 1976 but it would be totally wrong to assume that it was only orienteering which exposes people to this danger. Deaths due to similar causes have occurred to highly trained athletes in other activities but the size of our sport means that the unfortunate coincidence of last year comes more immediately to notice and assumes greater proportions. We are still awaiting detailed advice from cardio-respiratory and sports medicine experts but one doctor very involved with sports medicine and athletes gave me a simple rule – If you have flu or a temperature do not train and make the build up back to fitness very gentle.

The experts all seemed agreed that highly trained athletes training or competing with flu or a temperature are exposing themselves to the danger of further virus infection which in extreme cases could be fatal.

HEAT EXHAUSTION

Dr Eric Isaachsen M.B , B.S. and Dr Louise Farrell M.B., B.S. of O.A.W.A.

Heat exhaustion is important to the Orienteer in 2 ways

a) The ability to recognise the symptoms

b) The awareness of conditions which predispose to heat exhaustion and necessary avoidance precautions

Even under the best working conditions only 20 – 25% of total energy output of the human body takes the form of mechanical energy that can be transferred to the environment as work. The rest produces heat. At an oxygen uptake of say 4 litres/minute, corresponding to about 20 kcal./minute, 15 – 16 kcal./minute of heat is produced. As the specific heat of the human body is about 0 8 kcal./kg. it follows that a man weighing 75 kg would increase his body temperature by 0 8°C. every 5 minutes if heat were not dissipated.

During the first 30-60 minutes of exercise not all extra heat is given off, as a certain amount is stored in the body and the temperature consequently rises. Thereafter the elevated body temperature is maintained within narrow limits in normal circumstances.

In heavy work at normal conditions, most of the heat is given off by the evaporation of sweat. A minor part is played by radiation and convection.

Heat exhaustion develops when the body mechanisms for the dissipation of heat are no longer able to keep the body temperature within the narrow limits. When the body temperature reaches in the vicinity of greater than 40°C. (normal – approx. 37°C.) physiological control is lost and body temperature may continue to rise – hyperpyrexia, as this is known, constitutes a dangerous threat to life.

The aware Orienteer should be able to recognise the symptoms and stop prior to this threat. The symptoms of heat exhaustion are:

a sudden feeling of weakness
muscular cramps
headaches
dizziness
an uncharacteristic loss of co-ordination.

In the event of these developing, the Orienteer should stop, cool the body by whatever means available, preferably by water immersion, and make up water and electroyte losses.

But let us review the methods of prevention. The various factors which determine an individual's ability to cope with personal body heat during muscular activity are. –

1. the amount of muscular activity
2. environmental temperature and humidity
3. physical properties of the individual
4. clothing

1. Duration and severity of muscular activity play an important role in the development of heat stress states. The metabolic heat production in the resting state is 1 0 kcal /minute (size dependent) The maximal values during severe exercise go as high as 20 kcal / minute, though this cannot be sustained for long periods and one hour of heavy exertion produces about 600 kcal /hour.

Thermal balance depends on the following equation: –

$$M - E = (R + C) = DS = O$$

M = metabolic heat production.
E = evaporative heat loss.
R + C = loss or gain by radiation and convection.
DS = change in the stored body heat.

The values for E, R and C are determined by the factors 2, 3, 4

2. Climatic factors play an important role in the ability of the body to dissipate heat. A greater external temperature lessens the differential between skin and environment and thus the loss by radiation and convection. (In extreme heat the body can actually gain by these processes). The radiant heat derives from the sun and the surrounding surfaces and ground.

Relative humidity plays a large role in the evaporative process of cooling. When high, the body's sweat cannot be readily evaporated.

Air movement is another variable to consider. Intolerable conditions whilst in still air are often made comfortable if a breeze is blowing. This facilitates the loss by convection. Warm air is then replaced by cooler air to increase body losses.

3. Individual tolerances vary. Body size and shape play a part in the rate of heat exchange. The loss by convection and by evaporation is greater, the larger the surface area of the skin or, in the case of radiant heat exchanges, of the radiating surface. A linear build, i.e. relatively tall per unit of weight, serves a useful purpose in the exchange.

Acclimatisation is the key to individual differences (nature aside). The ability to sweat increases with repeated exposures to high temperature. An acclimatised person secretes sweat with a lower concentration of salt and thereby is able to conserve sodium to an extent. Loss of acclimatisation occurs within 2 – 3 weeks.

Fluid balance is of importance. It is essential that the degree of hydration is high prior to competing. If fluid is taken prior to competing the blood viscosity is relatively lower (thin) and this helps positively towards perspiration as a means of heat loss. In the presence of any condition that predisposes to decreased circulating volume (diarrhoea, vomiting) then the risk of heat exhaustion rises.

This brings us to sounding a note of warning about competing in events when one has some concurrent illness. Some medications interfere with sweat production, thus making one more prone to heat stress: atropine and its derivatives, which may be used to treat a gastrointestinal disorder, or thorazine which is used to treat patients with nervous disorders. Both these groups of drugs impair the function of sweat glands.

Also a person who starts an event with a mild fever has a smaller margin of safe temperature rise than a person who is afebrile.

4. Clothing may interfere with the evaporation of sweat, may act as an insulator thus interfering with radiant and convective heat losses and by these means increase body heat stores.

The Orienteer is in the position where he must balance the need for protection against lacerations and abrasions from the vegetation and rocks, with the need in hot conditions to be clothed to allow maximum heat loss.

In given conditions, the amount of sweat required for heat balance is least when the sweat evaporates directly from the skin. However, since the Orienteer requires his limbs to be covered, then he or she should aim to have loose, floppy, porous clothing. Then the clothing allows air movement close to the skin and pumps the warm, moist air away from the skin. Such clothing will also protect you from extremely hot, dry winds.

Open weave materials are preferable to close weaves as they allow better skin ventilation.

So the wise Orienteer obeys the following rules.

1. Recognise climatic conditions that cause heat stress.
2. In high risk conditions, limits heat exposure – starts as early as possible; plots a course that limits exposure to radiant heat and allows some resting of the cooling system.
3. Wears suitable clothing.
4. Ensures adequate hydration prior to the event.
   This means taking a reasonable quantity of fluid (preferably a glucose-electrolyte solution) before competing (this goes against the grain of some runners).
5. When despite these precautions, recognises symptoms of heat exhaustion, STOPS – or invites tragedy

Organisers of Orienteering events must also take responsibility for recognising high risk climatic conditions and consider limiting starting times so that no one starts in the middle of the day when temperatures are highest. In very bad conditions they should even consider cancelling events. They should also be prepared to warn novices of the dangers of heat stress and possibly encourage them to compete on shorter courses if they have not done any previous training. They should be advised to pace themselves, starting slowly and increasing pace gradually.

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