

MEDICAL CHALLENGES OF THE 2023 DRAGON'S BACK RACE

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The course is brutal ... Massive landscapes with big mountains, steep, technical ascents, technical ridge crossings and technical descents. Probably the worst were the steep, grassy descents, where there was no path, the easiest way down was to slide There were large tracts of open grass land, with chest high bracken ferns, tufts of grass hillocks under foot, sheep paths and bogs where moss, grass, mud and water waited ahead, and it was unclear if your foot would sink 2 inches or 2 feet until you stepped in it...

Mark Griffiths – DBR Participant

The Dragons Back Race (DBR) is a 6 day ultramarathon that takes place in Wales each year. The route covers a distance of 380kms and has an elevation gain of 17,400m. Distances for each day vary between 49 and 70kms. Evenings are spent in temporary campgrounds where participants have access to food, water and a place to sleep. A drying area is also available together with access to medical facilities. Personal kitbags containing spare clothing, sleeping equipment and additional food are transported between campgrounds by the organisers. To be recognised as a finisher in

the DBR ("Dragon Finishers") participants must complete each day within a specified time. Those who are unable to complete the day within this limit have the option to either withdraw or continue over a shorter distance and be recorded as a "Hatchling Finisher". In 2023, there were 87/298 (29%) "Dragon Finishers" and 147/298 (49%) "Hatchling Finishers".

Any participant who starts a day on the DBR is eligible for medical support. This not only includes access to an on-site facility at the start and end of each day but also additional support at a midpoint along each day's route. In the event of a medical incident occurring out on the course, members of the safety team are available to assist in treatment and evacuation. The 2023 DBR medical team consisted of a group of doctors, nurses and physiotherapists - all of whom shared a keen interest in sports medicine. Whilst mandatory qualifications were not stipulated, all volunteers were registered with their respective professional bodies and had obtained suitable indemnity cover prior to the race. Since the DBR was established in 1992, the organisers have meticulously documented the medical

encounters of all participants. This has provided a fascinating insight into the impact this event has upon participants and the demands it places upon the healthcare professionals that care for them.

I hobbled around camp at the end of Day Five wondering how I would have the energy to complete Day Six. It felt so close and too cruel to fail now but I'd hit a point of physical and mental exhaustion [that] I could not relate to. My right quad felt like it was seizing up and I'd been struggling with a pain around my right ankle since Day Three. My feet, whilst not as bad as they could have been, had some painful blisters in a few areas, most noticeably between the big and second toe of my left foot. On previous days I'd taken the time to clean and tape my feet to refresh them, at the expense of sleep, but this evening I didn't have the energy for it.

Nathan Whittaker – DBR Participant

INJURIES

The sport of long distance multi-day mountain running has witnessed a surge of popularity in recent years. Alongside this increasing enthusiasm, growing



Image: Start of the Dragon's Back Race.

numbers of injuries and illnesses have been reported. The incidence of medical events varies widely between different multi-day mountain running events. This may be explained by differences in terrain, distance, support, environmental conditions and contact with healthcare professionals.

Soft tissue injuries are commonplace. During the 5 day 219km "Al Andalus Ultimate Trail" ultramarathon, 34% of participants reported the presence of a blister after the first day. By the end of the fourth day this had increased to 76% with the most commonly affected areas being the toes (65%), ball (16%), sole (14%) and heel (5%) of the foot. Musculoskeletal injuries to the lower limb joints are also commonly reported. In a recent review of ultramarathon participants, the commonest sites of injury were found to be the ankle (34.5%), knee (28.1%), hip (5.8%) and lower back (2.7%). Musculoskeletal injuries to the lower leg (12.9%), thigh (8.6%) and foot (4.3%) were also reported. The commonest pathologies were anterior compartment

tendinopathy (19.4%), patella femoral pain syndrome (15.8%) and achilles tendinopathy (13.7%). In a study of 32 ultrarunners who participated in a race between Sydney and Melbourne (approximately 900kms) almost 20% of injuries were associated with the extensor retinaculum of the anterior ankle. This led to a new term entering the medical language - "ultramarathoner's ankle".

It should be noted that in a large proportion of cases, musculoskeletal injuries sustained during endurance events are often exacerbations of chronic conditions.

Injuries to the abdomen, chest, head and upper limbs are rare. In most instances these are sustained following falls. Typically, these range from minor injuries such as abrasions and lacerations, to more serious injuries such as fractures and dislocations. Rarely, life threatening injuries to the abdomen, chest and head have been reported.

ILLNESSES

Along with injuries, healthcare professionals also encounter a small but significant

number of illnesses during ultramarathon events. Whilst chronic illness is rare in ultramarathon participants, as numbers of participants grow, exacerbations of common illnesses such as asthma, diabetes and epilepsy are likely to increase.

Exercise Associated Hyponatraemia (EAH) is seen across a wide range of endurance activities. It is defined as a plasma sodium concentration of less than 135mEq/L and typically occurs during, or up to 24 hours after, prolonged physical activity. The majority of those who develop EAH are asymptomatic. However athletes with mild EAH may experience symptoms such as blurred vision, fatigue, headache and nausea. In severe cases, individuals may develop seizures, loss of consciousness and death. Life threatening symptoms are most likely to develop in those who experience a rapid and significant fall in their plasma sodium concentration. EAH is widely thought to be due to a combination of excessive water intake and a decrease in urine output. Researchers have recently



Image: Medics should be prepared for all eventualities.

highlighted the role anti-diuretic hormone (ADH) plays in EAH. ADH is released from the posterior pituitary gland and increases the reabsorption of water by the kidney. ADH secretion may be increased by factors such as exercise, pain, emotion, nausea and vomiting. Symptomatic EAH is thought to occur in less than 1% of marathon runners, however in those competing in events of 160kms or greater, the incidence has been reported to increase to more than 20%.

Without access to accurate core temperature measurement, exertional heat illness can often be confused with EAH. Heat exhaustion (core temperature 37-40 degrees C) and heat stroke (core temperature >40 degrees C) share many of the symptoms seen in EAH. Like EAH, ambient temperature together with the duration and intensity of activity are amongst the leading risk factors for exertional heat illness. In multi day desert races, the incidence of exertional heat illness has been reported to be as high as 54.5%. Unfortunately, in recent years there have been a number of reported

fatalities due to a combination of EAH and heat illness.

Alongside heat illness, there are other conditions in the mountains that can be triggered by environmental factors. High altitude illnesses such as acute mountain sickness (AMS), high altitude pulmonary edema (HAPE) and high altitude cerebral edema (HACE) may be seen in those ascending to an altitude of more than 2500m. Rapid ascent and high levels of physical activity can dramatically increase the development of these conditions. HAPE and HACE can be fatal if left untreated. Given the cold, wet and windy conditions often seen in the mountain environment, cases of frostbite and hypothermia are sometimes seen. The consequences of hypothermia should not be underestimated. In 2021, more than 20 participants died from hypothermia during a single 100km ultramarathon in Gansu, China.

Damage to muscle and connective tissue is widely seen during prolonged periods of physical activity. In some instances this

can lead to breakdown products, such as myoglobin, accumulating in the circulation and causing damage to the kidneys. Cases of rhabdomyolysis may be exacerbated by a reduction in fluid intake and the consumption of drugs such as non steroidal anti-inflammatories (NSAID's). Although unlikely to cause permanent renal damage, the condition may lead to an acute kidney injury that requires medical management.

Acute gastrointestinal symptoms such as nausea, vomiting and diarrhoea are commonly seen amongst those undertaking prolonged physical exertion. In a recent analysis of the 212km Manaslu Trail Race in Nepal, 18% of participants reported episodes of diarrhoea during the event. Whilst these are unlikely to cause long term harms, they may predispose individuals to dehydration and electrolyte disturbance.

Changes in a number of immunological markers are widely believed to lead to a transient increase in the risk of infection. This is borne out by a study conducted on those participants who completed the

160km “Western States Endurance Run”. No fewer than 24% reported symptoms of an upper respiratory tract infection in the two weeks following the event.

Clearly, the large number of injuries and illnesses that occur in the mountain environment highlight the need for effective medical care. Without this support participants, spectators and event organisers all face significant risks to their health.

We battled through the searing hot days, carrying more water than we'd anticipated (training runs were not geared to hot weather) and we continued, one foot in front of the other over mountain ranges including Cadair Idris and Bannau Brycheiniog, where shade evaded us and our only relief from the heat was to dip our clothing in the rivers...

Laura Briggs – DBR Participant

RACE STATISTICS

In total, 298 participants (237 men and 67 women) started the 2023 DBR. A total of 87 (29%) were able to complete the 6 day 380km route within the time limits set by the race organizers. The largest number of withdrawals occurred at the end of the first day - 103/211 (49%) (Figure 1).

Of those who withdrew from the race, 147/211 (70%) subsequently returned to complete shorter stages of the race (“Hatchling Finisher”). The remaining 64 participants took no further part in the race after their withdrawal. The winner of the 2023 DBR completed the course in 47 hours 38 minutes 44 seconds. However the majority of “Dragon Finishers” took between 70 and 90 hours to complete the course (Figure 2). Approximately 41 hours separated the first and last “Dragon Finisher”.

A total of 556 documented medical events were identified during the 2023 DBR. This corresponded with a rate of 31.7 medical events for every 1000 hours of running. Each day between 16.1% and 56.2% of participants sought medical attention (Figure 3).

The specific injuries and illnesses seen during the 2023 DBR were typical of those seen during other ultramarathon events. Details of these will be the subject of future presentations.

Unusually for multiday mountain races in the UK a number of heat illness cases were reported. A prolonged high pressure weather system settled over the UK during the first half of September 2023. As a result,

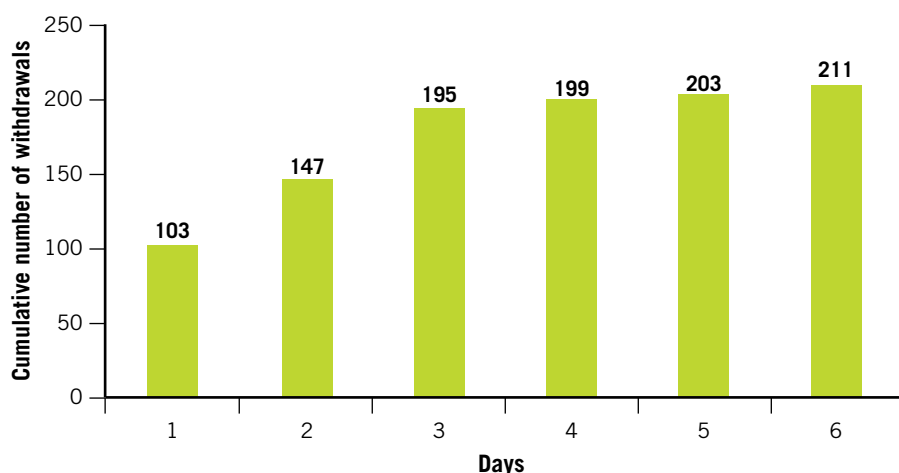


Figure 1: The attrition rate grew day by day.

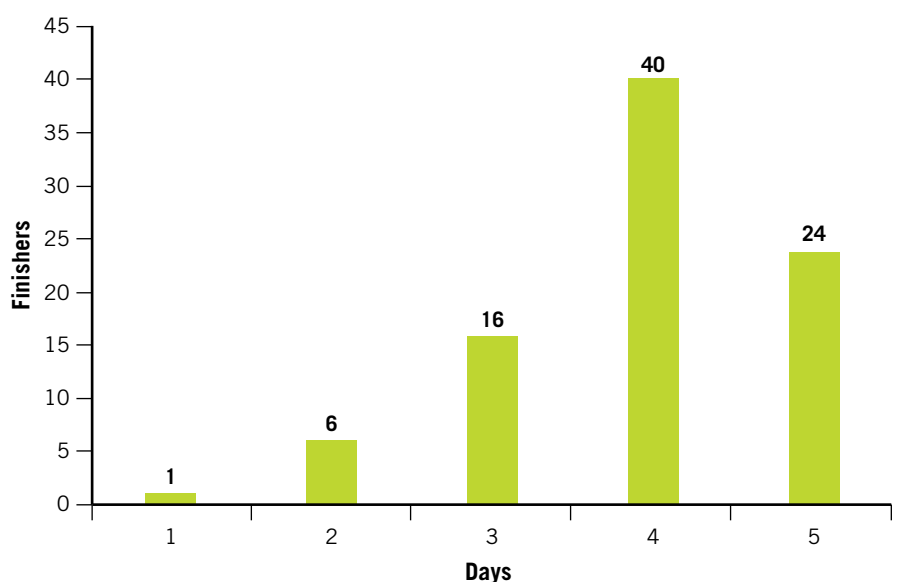


Figure 2: Most people who finished the race did so in 4 days.

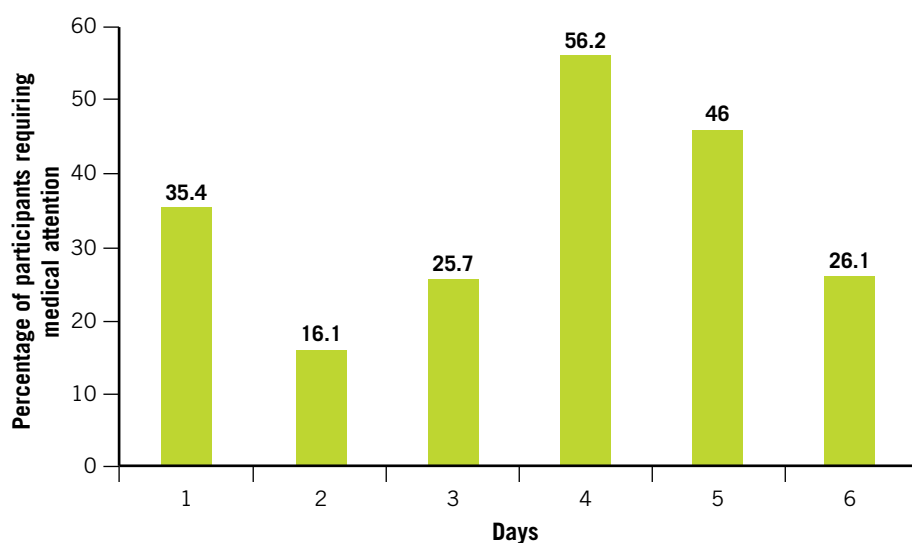


Figure 3: The race medics were busy.



Image: Foot problems were common.

Wales experienced its warmest September on record. During the six days of the DBR daily peak temperatures often exceeded 25 degrees C. Whilst this is common in other parts of the world, such temperatures are rare in the mountains of the UK. Many participants were therefore faced with conditions that they had not encountered before. Opportunities to acclimatize were limited. Despite modifications to the race, a small but significant number of participants were diagnosed with heat illness. In some instances, this led to their withdrawal from the race.

Diagnosing heat illness is often difficult in the mountain environment. Symptoms lack specificity. Fatigue, lightheadedness and thirst are widely seen in ultrarunners during a race. However most will not be suffering from heat exhaustion or heat stroke. Accurate core temperature measurement is essential if a diagnosis is to be made. However measuring devices are often unavailable and treatment is usually initiated on the strength of a supportive history and clinical examination. Similar symptoms are also encountered in those suffering from exercise associated hyponatraemia (EAH). Like heat illness, accurate diagnosis of EAH requires testing that is often unavailable in the field. Unfortunately, management of these conditions differs significantly. Heat illness

needs treating with measures that rapidly reduce core temperature. Sometimes this can involve the administration of large volumes of cold fluid. If treated in this way, individuals with EAH may experience a further fall in plasma sodium concentration and a worsening in their symptoms. The use of intravenous hypertonic saline is indicated in those with EAH who present with altered mental state, seizures and coma. Up to three 100ml boluses of 3% saline given ten minutes apart have proved lifesaving on a number of occasions. Any remaining correction can then be allowed to occur spontaneously. In the absence of hyperthermia, athletes who present in this way should be assumed to have life threatening EAH and treated accordingly.

CONCLUSION

Without question, the DBR is an extraordinary undertaking. Six consecutive days of mountain running places an extraordinary stress on the human body. As a result, healthcare professionals are faced with a wide range of medical conditions that require careful management. As ambient temperatures continue to rise in the UK's mountains, cases of heat illnesses and EAH are likely to increase. Healthcare professionals will need to be aware of these conditions and ensure that clear management strategies are in place.

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