

Father Christmas's health

All year round and especially at Christmas, Mr C is at risk of freezing, hypoxia, and deep vein thrombosis. Not even his mince pies and sherry can save him. He avoids health hazards skilfully

We all know Father Christmas: the jolly, fat man who flies around on a reindeer drawn sledge, eats mince pies, drinks sherry, and doles out the presents. He is an uncomplicated fellow, content in his work, and devoted to the happiness of others.

But is there more to him? Is he indeed the healthy, happy, altruistic chap that we see on the surface? Here we dig a little deeper and look at the impact that Mr C's job and lifestyle have on his physical and mental health—and overall wellbeing.

Homeland

First of all—his homeland in the heights of the North Pole. Christmas is in the middle of months of 24 hour darkness. During winter in the United Kingdom, it's hard to drag yourself out of bed when it's dark outside—especially knowing that the darkness will fall again in the early evening. But what if there wasn't even the solace of a few hours of daylight? Would perpetual darkness create the right conditions to be motivated, chirpy, and planning for the biggest delivery of the year? Or would you, starved of light and warmth, descend into madness, à la Jack Nicholson in *The Shining*; or take on Gollum-like traits of bitterness, gloom, and crazed obsession?

Then, the physical side of it—an older, overweight man flying around the world, faster than the speed of light, in sub zero temperatures, carrying parcels of heavy games consoles and bicycles. How would that affect the body and mind?

We put some of these questions to Edward Gilbert, research fellow at the Centre for Altitude, Space and Extreme Environment Medicine at University College London, who—along with his colleagues—was able to shed some light on the effects of the extreme speed, temperature, and sherry drinking. His partners in extreme

environments are Daniel Martin, director of the Centre for Altitude, Space and Extreme Environment Medicine and senior lecturer/honorary consultant in anaesthesia and critical care medicine at University College London and the Royal Free Hospital, and Oli Firth, hyperbaric physician at the London Diving Chamber.

Pulling together some rough statistics, the team estimates that about 380 million children across the planet would receive presents—taking into account cultural and religious variances—and that that would equate to roughly 92 million homes.¹ Because of the rotation of the earth and the different time zones, Santa Claus would have 31 hours to work with. So we're looking at delivering to 824 homes per second. "However," points out Dr Gilbert, "recent data from the Large Hadron Collider appear to confirm speeds faster than light are achievable, thus raising the possibility that Santa has delivered all his presents and arrived home before he's even left."

The team points out that there are three main problems with travelling at this

height and speed: the cold, the anoxic environment, and the pressure.

The cold

Wouldn't Mr C's faithful beard shield him from the worst of the cold? Dr Gilbert challenges this: "While living at the North Pole will have conferred some degree of tolerance to hypothermia, one cannot expect exuberant facial hair alone to afford sufficient protection against the low temperatures," he explains.

Dr Gilbert goes on: "As any object in space will radiate heat until it cools to the surrounding heat, the temperature in space is close to absolute zero at 3 degrees Kelvin or minus 270 degrees centigrade." He goes on to say: "Putting this into context, in anaesthesia we utilise ethyl chloride spray, which boils at 12.5 degrees centigrade and feels most uncomfortably cool when sprayed on an unsuspecting colleague, while surgery utilises cryoprobes that operate around a temperature of -40°C to freeze tissue.

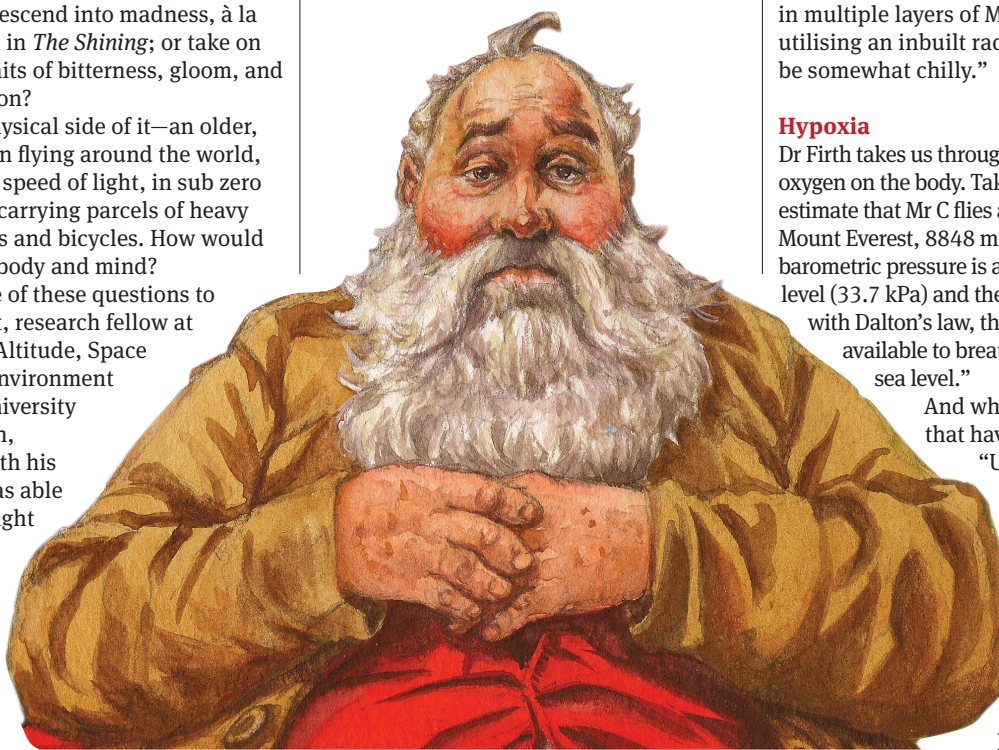
"Sadly therefore, I suspect that unless Santa has been wrapped up by his wife in multiple layers of Merino wool and is utilising an inbuilt radiator, he is going to be somewhat chilly."

Hypoxia

Dr Firth takes us through the effects of low oxygen on the body. Taking a conservative estimate that Mr C flies at the height of Mount Everest, 8848 m, he says: "The barometric pressure is a third of that at sea level (33.7 kPa) and therefore in accordance with Dalton's law, the amount of oxygen available to breathe is a third that at sea level."

And what effect would that have on the body?

"Unconsciousness would ensue within a few minutes. Even with this degree of hypoxia, whilst people have stood on Everest for brief periods of time, they certainly haven't spent 31 hours in this hypoxic



environment, and any mechanism of energy expenditure—let alone delivering presents to 91.8 million homes—really gets them puffing.”

Would there be any other major effects? “Prolonged altitude exposure is a sure way to lose weight; however Santa would have to spend a number of weeks at altitude for this to make a noticeable difference to his ample frame.”

Pressure

“In space there is essentially no pressure. Thus, as boiling occurs when a liquid’s vapour pressure equals atmospheric pressure, any body fluids—for example blood—would boil,” Dr Martin explains. “This unimaginably grotesque event is likely to finish him off way before he suffocates from lack of oxygen.”

And there’s more: “The boiling process would cause the fluids to lose heat rapidly and thus they would freeze before they totally evaporated. The boiling fluids would also distend Santa’s tissues and organs, such that he would certainly have to loosen his belt buckle by a number of notches.”

There are other things to contend with. Dr Gilbert elaborates: “The main risk factor relating to whether someone is at risk of developing acute mountain sickness . . . is climbing too high too quickly. Whilst we contemplate spending two to three months climbing and acclimatising to Mount Everest, Santa is going to be popping up and down 100 km between the Karman line [the boundary between the atmosphere and space] and the Earth’s surface every 800th of a second.

“This is both high and quick.” He adds: “Perhaps his frequent visitations to high altitude will in some way be protective, but he may be advised to take a sneaky acetazolamide tablet with his mince pies every 12 hours for good measure.”

And how would he cope with travel sickness? Dr Gilbert explains: “Sleigh-sickness is a rare but debilitating condition but is rumoured to be eased by chewing substances such as raw garlic.”

When asked about the chances of developing deep vein thrombosis (DVT), Dr Martin states: “As long as he got off his sleigh for each delivery the chances would be—unlike Santa—slim.” Dr Gilbert adds: “He may, however, be at risk of developing DVTs the other 364 days of the year as he relaxes, sleeps in, and recovers from his almighty hangover.”

Dr Firth adds a wise reminder about the sherry effect: “As Christmas is the ‘season to be jolly,’ I think it only prudent to discuss alcohol consumption,” he cautions. “We all know Santa is partial to a spot of sherry at Christmas. In the United Kingdom, a 50 mL glass of sherry is equal to one unit of alcohol. Thus on

his home visits, assuming Santa approves of each brand placed before him, he would consume 91 000 000 units in one evening—over 31 hours. With the legal limit of alcohol in the blood being 80 mg per 100 mL blood [4 units], Santa would be in the region of 20 million times over the legal driving limit.”

High fat and high sugar

We also thought it would be worth getting an occupational health perspective on this, so we spoke to Olivia Carlton, president of the Faculty of Occupation Medicine.

We asked if there would be a concern with his diet. After noting that Mr C may well have a balanced diet for the rest of the year, Dr Carlton says, “The problem with mince pies is there’s no protein and so basically it’s high fat from the point of view of the pastry—and high sugar. And so it isn’t really ideal as a sustaining food. So I think the advice would be that they would be taken with some other sustenance.”

When asked about the sherry consumption she says: “What would be my advice about drinking sherry? Don’t do it. Don’t fly a sledge if you’re going to be drinking sherry.”

The night shift on 24 December is a long one. How would an older person such as Mr C cope with a 31 hour, overnight shift? Dr Carlton says: “Older people find night working more difficult, and they find rotating shifts more difficult. And the other thing is that, if they have the normal circadian rhythm . . . people’s absolute lowest point is at about four in the morning. And that’s the point at which their concentration is poorest; their reactions are slowest; they’re most likely to have accidents.” She adds: “So, I suppose what you really want is for Father Christmas to work some kind of magic, so that they don’t have a circadian rhythm for that one day.”

It’s well known that back problems are a major cause of work absence.² So other than “bent legs and straight back” how can Mr C avoid hurting his back when lifting sacks of presents? “The other really important thing is the rotation,” says Dr Carlton. “You need to bring the weight close to your body and then you need to turn your whole body,” she says, explaining that this method, rather than turning when holding the sack at arm’s length, will help to avoid back and upper body injuries.

All in the belly and not the mind

Good mental health is crucial to Mr C, and Steve Eccles, clinical psychologist at Manchester Mental Health and Social Care



Trust, gives an insight into the potential problems.

Dr Eccles explains: "As Santa is based at the North Pole he will be working in a cold dark environment for prolonged periods of time. This may put him at risk of developing seasonal affective disorder (SAD).

"If he does develop SAD there are evidence based treatments available to him, including using a light box that emits artificial daylight, medication, and cognitive behaviour therapy. What Santa needs to be vigilant for is vitamin D deficiency, which may result from reduced exposure to sunlight."

What about working a long shift: how would that affect Mr C's mental health? "This is likely to be extremely tiring and stressful," Dr Eccles explains. "To minimise the impact of this he needs to ensure he and the reindeers are rested and that he has organised his many deliveries before he starts. Adapting to changing shift patterns in working life can lead to problems with our internal body clocks and our sleep-wake cycle. Fortunately, as Christmas is just for one night per year the impact should be negligible."

But isn't Mr C relentlessly cheerful? "Even with Santa's optimistic temperament, he will, like all of us, experience small fluctuations in his mood and energy levels. So it would be unhelpful if he or we expect him

to always be happy and jolly. Setting unrealistic and unachievable goals may lead to disappointment and a sense of failure, and erode his self esteem." Dr Eccles explains.

A good immune system

The conclusion, of course, is that none of this actually matters—because, as we all know, Father Christmas is immune to any of these mortal matters because he's magical. He can fly around the world more quickly than light and remain healthy. His knees and back will be fine, his organs won't freeze and his blood won't boil, he won't be depressed about the lack of daylight, and he won't suffer from his diet of mince pies and sherry. But if, in some unthinkable future world, his magical powers started to wane, the above advice would stand him in good stead.

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- 1 At what speed would Father Christmas have to travel to visit all the world's children (say, under 11 years old) in a 24-hour period? www.guardian.co.uk/notesandqueries/query/0%2c5753%2c-2536%2c00.html.
- 2 Palmer KT, Cox RAF, Brown I. *Fitness for work: the medical aspects*. 4th ed. Oxford University Press, 2007. <http://ukcatalogue.oup.com/product/9780199215652.do>.

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A Christmas star—renal stones caused by protease inhibitor atazanavir

Spot something seasonal in this CT scan

A 53 year old man with well controlled HIV infection presented with ureteric colic. Computed tomography showed a stone sitting within the renal cortex (figure). He had been taking atazanavir (a protease inhibitor) for two years, and renal stones are a recognised complication. Protease inhibitors are licensed for patients as part of highly active antiretroviral therapy (HAART), and atazanavir is a popular choice because of its performance in randomised controlled trials, tolerability, and side effect profile. We predict an increase in renal stones as more patients are prescribed this drug.

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