



Photo: Wilho Worms

Professor Hein Daanen: The heat kills more elderly, but why?

Since June this year TNO has two new climate chambers at its disposal in Soesterberg. In the larger of the two chambers (six by six metres) there are two solar radiators, control equipment and three bicycles where you can pedal till you sweat. The somewhat smaller chamber is completely empty. All the electronic control and measuring equipment is hidden behind the white-sprayed iron panels of the walls. Any terrestrial temperature can be simulated: for example Afghanistan, Sudan, Antarctica or the tropics. Professor Hein Daanen is delighted with these new climate chambers. He is a scientist at TNO and since 2003 visiting professor of Thermal Physiology at the Faculty of Human Movement Sciences at the VU University.

What is thermal physiology?

'It is the study of the human body's heat regulation. If you exercise, like cycling or jogging, you produce heat, which may run up to a thousand watts or so. Heat and cold affect people, and our climate chambers hold us in good stead to study these effects.'

What kind of research are you doing?

'The large one we tend to use for practicals, for instance, for my students from Amsterdam. We can have test subjects cycle and measure the amount of oxygen they use or we can check how efficiently they have cycled. The efficiency tends to be between twenty and twenty-five per cent, the rest being converted into heat.'

And the smaller climate chamber?

'That's where the real experimentation is done. It is much more accurate and we can even regulate the humidity. We expect to use it for about six hundred hours per year. We have looked at the resilience of soldiers and the effects of heat on their performance and on sleep. The test subjects also have to spend the night in this chamber. It is known that people, like soldiers, can estimate their ability to perform fairly well. But to what extent can their commander decide what the troops are still capable of? Our initial observations suggest that a commander is also able to make a good estimate of these capabilities too.'

PERSONAL DETAILS

EMPLOYED AS:

senior research scientist, Human Performance department, TNO Defence, Security and Safety, Soesterberg

BORN:

13 July 1958 in Mierlo

EDUCATION:

1978-1984: Motion sciences, Vrije University Amsterdam; specialising in exertion physiology

DOCTORATE:

1997: Medicines, Vrije University Amsterdam in the regulation of blood circulation in the finger in the cold

FORMER JOBS:

1985-1986: various teaching jobs
1986-1990: computer programmer/scientific assistant Laboratory for Motion Analysis, University of Leiden

JOINED TNO IN:

November 1990

PROFESSOR:

Since June 2003, visiting professor of Thermophysiology, faculty of Motion Sciences, Vrije University Amsterdam (0.2 fte)

MARITAL STATUS:

Since 1991 married to Elly Rentes (51), child physiotherapist

CHILDREN:

Paul (17) and Emma (15)

HOBBIES:

basketball (player and trainer-coach), cycling, running

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How did you get into the world of thermal physiology?

'When I finished my studies there was little work around, so I took a programming course and became a programmer in 1986 at the Laboratory for Motion Analysis at the University of Leiden. From programmer I slowly rose to the position of researcher and got a tip in 1990 that there was an opening at TNO. At the end of that year I was taken on in Soesterberg as a cold physiologist. I had the benefit of an internal course, with great support from my 'anchor' Dr Wouter Lotens in the field of thermal physiology. In the beginning the Canadian researcher Michel Ducharme worked here. It is due to him that I was able to do research in Canada and the United States for a year in 1995. It was at his institute in Toronto that I spent four months writing my thesis about the regulation of blood circulation of the finger in the cold. You probably know the feeling: you're cycling, have really cold fingers and suddenly that cold sensation is gone. How is that possible? If our hands are

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exposed to the cold, the blood vessels in the fingers close to maintain body heat but after about ten minutes these blood vessels open up again. First the tips of the fingers become warm and then the entire hand. In this way the body prevents cold injury. I still publish a good deal of work on this subject.'

Whenever it's really hot or cold here, you're always appearing in the media....

'I don't go looking for them but I almost never refuse them; I think at TNO we should spread our knowledgeable words through the media. I am pretty well labelled in the C for cold or H for hot box. Look, the main problem with heat is that your performance decreases. Your vigilance recedes considerably and you have a greater risk of accidents. When it's hot, car drivers tend to zigzag on the road more. And, in fact, it's the same story for the cold; cold hands and feet reduce your dexterity and this increases the risk of accidents. Particularly in the heat – and cold – more people die than normal. But exactly why we don't know. And if we don't know this, we can't really intervene effectively. The province of South Holland has recently made funds available for a kick-off session in Rotterdam for doctors, epidemiologists and thermal physiologists to discuss this problem. Initial progress, thus.'

You also keep yourself occupied with how clothes and equipment, like a helmet, fit.

'Absolutely, how clothes fit determines to a considerable extent how well body heat can be lost to the environment. While in the United States in 1995 I came across a 3D scanner, the one that can make a three-dimensional scan of a person. Goodbye tape measure. In 1999 TNO had the first 3D scanner in Europe. According to the Central Bureau for Statistics, since the turn of the millennium the average Dutch person's height has been increasing much less but our weight rises by a kilo every three years. That has an impact on the size of our clothes. In 2002 we scanned twelve hundred people – a representative survey of the Dutch – in the Nedscan project in Soesterberg. This generated useful measurements. We have been working for the lingerie industry over the past couple of years helping it, among other things, to compare the push-up effect of different bras. Bra sizes were conceived sixty years ago but quite erroneously. We are collaborating with a lingerie company to rethink the system of measuring bra size. We are also actively involved in the area of internet sales of clothing. The challenge is to ensure that the garment will fit even with a minimal amount of information.'

What are the main future trends in your field?

'In calculating the human thermal equilibrium, the weakness is that we don't have a good enough picture of how heat is distributed in the body. A swallowed pill is currently used to measure the temperature in the body and the temperature of the skin is measured. But we would prefer to know more about muscle temperature and whether, as humans, we indulge in selective brain cooling. Heavy exertion leads to core temperatures of over 40°C. It is not clear whether the temperature in the head is lower. In goats and many other animals that does happen. I already said we wanted to gain greater insight into the reasons why people – older people especially – die from heat and cold. And in the field of clothing we would like to be able to convert a 3D scan of a person directly into perfectly fitting 3D clothes. The use of 3D scans will also make great leaps, not only for sizing clothes but also in the recognition of criminals.'

What is your main concern?

'We are subject to excessive control in the Netherlands. My eighty year-old mother gets help and care at home. This involves umpteen organisations that all have to give their consent or run a checks on this and that. It seems as if the majority of the money for this care is spent on these control bodies. I find that really oppressive. Trust people a little more.'

If you were not in this job, what would you have done?

'As a child I had asthma. I noticed that exercise was really good for me so I was a fanatic at sport: basketball, volleyball and race walking. It helped me considerably improve my condition. I wanted to attend the sports academy and become a sports teacher but I could not cope physically with the study. I guess therefore I would have opted to be a medical specialist, helping find the best cure for people with particular disorders.'

