



# How Slow Can You Waterski?

The Guardian

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# How Slow Can You Waterski?

Edited by Simon Rogers



## Introduction

**CONTROLLED EXPLOSION PACKAGE PROVES HARMLESS**  
**CHOCOLATE IS THE NEW HEALTH FOOD**  
**ASTRONOMERS ARGUE OVER NEW PLANET**

Do these headlines seem familiar? Have you ever stopped to think about what they really mean? Or do you just glance at the story and turn the page of the paper? Have you ever wanted to find out exactly how you control an explosion? If chocolate is really good for you? Or even what makes a planet a planet? We did, and this is how we came to start up *This Week – the science behind the news*. It began as part of the *Guardian's Life* supplement, launched by Emily Wilson and carried on by me, and swiftly became one of its most popular columns, surviving *Life* to become part of the paper's main news section. And the reason for its success? It answers those nagging questions that lurk behind every news story but rarely make it into the paper.

At one level it is serious stuff. Politicians may claim that the only solution to the energy crisis is to go nuclear, but what exactly are the risks, and can we be sure that new nuclear power stations will deal with them? Every few months there seems to be new superbug set to cause a pandemic, but what is the real threat, and can we protect ourselves if we need to? At the other end, when a royal is forced to take her dog to a pet psychologist, don't you want to know what they actually do there?

Despite the scientific community's obsession with communication, there is a lot of bad, sensationalist science reporting in the UK media. 'Miracle cures' and 'startling new developments' are miraculously and startlingly frequent. You need a bit of background knowledge to untangle the ends of a story, and *This Week* is part of the attempt to provide that.

Yet all of the articles have their own existence, independent of the story which inspired them. At the time the pieces were commissioned and written, we treated them like news stories, and although they may seem short, enormous amounts of real reporting by the *Guardian's* science team went into them every week.

We agonised over the currency of the pieces and the issues – would they stand up or just seem dated by the time the *Life* section came out? 'Do books improve your mind?' was written about a celebrity who had never read a book but was writing an autobiography. 'Can acupuncture help you to beat cocaine addiction?' was written as model Kate Moss struggled with the drug.

But current as the pieces were designed to be, most of them live beyond the week they were published. I will always be fascinated by what happens if you drill a hole in your head or how many vaccinations a baby can have.

These are the big questions of life. And the little ones too.

Simon Rogers

## About the Book

When the powers that be reduced the speed limit on Lake Windermere to 10 knots, waterskiers complained that their sport was now completely scuppered. So just how slow can you waterski before you start to sink beneath the waves?

And, while we're about it, how long can you survive in a freezer? What are the chances of being struck by lightning in bed? And why is it so easy to read words even when the letters are muddled up?

Everyday life can pose some mind-boggling questions – but where do you find the answers? *The Guardian's* popular 'This Week' column has been looking into the science behind the news for three years, and *How Slow Can You Waterski?* draws together a selection of the most imaginative questions and the most surprising answers. If you've ever wondered what makes a planet a planet, why submarines keep bumping into things or even if it's safe to eat mud, *How Slow Can You Waterski?* will prove irresistible - and enlightening - reading.

All the articles here were written by the *Guardian's* science team – Tim Radford, Ian Sample, David Adam, Alok Jha and James Randerson – with guest appearances by other *Guardian* and science writers, particularly Kate Ravilious, Ben Goldacre, Sarah Boseley, Steven Morris, Lucy Rogers, Bill Hanage and Laura Bach.

## Minds & Bodies

### *Do books improve your mind?*

WE ALL LEARN to read, but what happens in adult life when we fail to keep it up? Does the brain shrink like a withered prune? Studies in America found that continued intellectual activity between the ages of 20 and 60 may protect against dementia in later life. One found that continuing intellectual pursuits reduced the risk of Alzheimer's disease by a third. In another study, relatively inactive patients were 250% more likely to develop Alzheimer's.

Damaged brains can adapt and learn. Researchers who have used brain scanners have found that other parts of the brain can compensate. But exercising the brain, in much the same way as one would exercise a damaged muscle, perhaps by repeating a list of items, does not help regrowth.

Are you going to benefit more by reading Shakespeare than *Vogue*? It probably doesn't matter as long as the brain is exposed to new information that stimulates your cells. Luckily, physical activity also counts. Whether physical exercise is as beneficial as intellectual activity remains unknown.

### *Do animals make you feel better?*

The idea might sound like new age mumbo-jumbo. But scientists now believe that swimming with dolphins really does alleviate depression.

It supports a theory put forward by the sociobiologist Edward O. Wilson. According to his idea of biophilia, human health and well-being are dependent on our relationships with the natural environment. This means that animals and natural scenery help us feel better, and our happiness around nature is somehow hard-wired into the brain. A growing body of clinical evidence suggests that Professor Wilson might have a point. In a paper published in the *American Journal of Preventive Medicine* in 2001, public health scientist Howard Frumkin of Emory University, Atlanta, reviewed the evidence for the health benefits of four kinds of contact with the natural environment: contact with animals, plants and wilderness and viewing landscapes.

He pointed to research which concluded pet owners have fewer health problems than non-pet owners. They had, for example, lower blood pressure, improved survival after heart attacks and better ability to cope with life stresses. At Purdue University in Indiana, patients waiting for dental surgery were found to experience a clinically significant drop in blood pressure after staring at fish in an aquarium for 20 minutes. In another study, University of Washington scientists found that children with autism who were allowed to play with dogs became more verbal and engaged with therapists.

In Japan, researchers compared the responses of people who looked at a hedge with those staring at a concrete fence. The former experience caused relaxation, while the latter produced stress. Similar responses occurred when subjects looked at a vase filled with flowers as opposed to an empty pot.

Why any of this should happen is largely unknown but Professor Frumkin had some ideas. 'Early humans found that places with open views offered better opportunities to find food and avoid predators,' he said. 'But they needed water to survive and attract prey, and groups of trees for protection. Modern research has shown that people today, given the choice, prefer landscapes that look like this scenario.'

### *Can you die from heartbreak?*

With the caveat that it is difficult to establish a link between emotional stress and physiological health, all the evidence suggests that the answer is yes.

The first study to look at the issue was published in the *British Medical Journal* in 1969. Researchers followed 4,500 widowers, all 55 years or older, for nine years and found that the risk of dying in the first six months after bereavement was 40% higher than expected, then it gradually fell back to normal.

A bigger study, published in 1996, confirmed these results. Scientists looked at more than 1.5 million people aged between 35 and 84, and found that, in the six months after losing a spouse, the risk of dying from a heart attack increased by 20 to 35%. They also found that the risk of dying from an accident, violence or from alcohol-related problems nearly doubled. And in most cases, the risk of death was greater for men.

Why bereavement might trigger death or illness is largely unknown, but speculations are rife. When people lose the lifetime support offered by a partner, they are more likely to get stressed. This might have acute effects on the body and, the more elderly the person, the more pronounced those effects may be.

People suffering from stress due to losing a loved one have reported a range of health problems – from gastro-intestinal complaints to muscular pains. The sudden stress could also trigger more serious underlying problems, such as heart disease.

How psychological pain turns into a physical problem is also an active area of research. The accepted wisdom is that the brain, after registering the psychological and social variables around it, will signal instructions to release certain hormones into the bloodstream and these affect mood as well as subsequent health.

Psychologists have found, for example, that people going through a rough patch in their relationship were more likely to catch a cold or flu. In a study of 2,000 people in various emotional states at the Medical Research Council's social and public health sciences unit in Glasgow, researchers found that stress or bereavement was linked to a decrease in the levels of an antibody called immunoglobulin A, which is the body's first defence against foreign microbes.

Why this happens is unknown, but researchers believe it might be down to high levels of the hormone cortisol, which tends to increase during stressful situations.

### *Does having wonky elbows matter?*

That depends. Are you a man? Do you have a wife or girlfriend? And, most importantly, are your ears and fingers as mismatched as your arms?

If the answers to all of the above are yes then your (unbalanced) ears will have pricked up at the news that your partner is most likely to be unfaithful. A study of 54 couples by the University of New Mexico found that women whose partners have mismatching ears, fingers or elbows tend to fantasise about sex with other men when they are ovulating. Those whose men happen to be neatly proportioned do not, and still prefer their partners to other men, even in the middle of their monthly cycle.

Studies of sexual desire are not new. Dave Perrett at St Andrews University suggests that women prefer symmetrical faces because this indicates healthy genes in their partner.

Sex hormones are linked to feminine and masculine facial features – youth and fertility signalling good long-term health. By exaggerating such facial features, researchers have found that women are attracted to strong masculine faces but too masculine a face can be a turn-off, indicating a cold and dishonest mate.

### *Can you stop yourself sweating?*

If horses sweat, men perspire and ladies glow, then all three have their autonomous nervous system to thank. That means that sweating (or perspiring or glowing) is a reflex action and independent of direct messages from the brain. Some people have a more responsive nervous system than others, so while some are cool under pressure, others may find embarrassing stains on their shirts. And alcohol can effectively reset the nervous system to produce yet more sweat.

But for politicians caught sweating on prime-time news broadcasts, short of crash diets, lowering the lights and asking the audience to leave, is there anything that can reduce the visible proof that politics is 1% inspiration and 99% perspiration?

‘There are a couple of medications that might work,’ says Antranik Benohanian, a dermatologist at Montreal University Hospital, who has treated more than 5,000 patients with hyperhidrosis, the clinical term for excessive sweating. Some of these can be used on specific areas of the body, mainly by targeting a neurotransmitter called acetylcholine, which is produced by nerve endings under the skin and turns on the taps when it reaches the sweat glands. Applying it to the hairline the night before a big speech could prevent a sweaty forehead the next day. ‘But there is no solution without side effects,’ warns Benohanian. Some treatments merely shift the damp patches to other areas, and some induce blurred vision and a dry mouth – hardly inspiring stuff for a would-be prime minister.

Another possibility is the botox injections favoured by the wrinkle-free rich. The toxin knocks out acetylcholine transmission in the target area, offering up to a year of reduced sweating. Liposuction can also destroy nerve endings beneath the skin, stopping the sweat message from being sent.

### *Can a blow to the chest stop your heart?*

‘It requires a lot of force in one place on the left-hand side of the chest,’ says John Martin, a cardiologist at University College London. ‘It’s very rare.’ Unfortunately, the

odds worked against a young cricketer in Liverpool, who was hit in the chest by a ball. He died after his heart stopped beating.

‘One in a million cricket balls hitting you on the chest would have this effect,’ says Martin. ‘Each cardiologist would see one in a career.’

The heart beats because of an electrical impulse generated at the top of the organ in the atrium. This electrical signal passes down the atrium and then into the ventricle, essentially a pump made of muscle. The signal ensures that the heart contracts all at once to force blood out into the bloodstream.

Under certain conditions, the signal is disrupted, most commonly through disease but, very rarely, through an external stimulus.

‘The impact of the ball has caused disorganisation of the electrical signal passing through the heart,’ says Martin. ‘Each little muscle fibre contracts independently of all the others. So there’s a great fluttering of this great muscle instead of a contraction.’ This flutter, or ventricular fibrillation, is the most common cause of death in the hours after a heart attack.

‘The tragedy is that it can be reversed fairly easily by a defibrillator,’ says Martin. Immediately after an accident, keeping the heart pumping until medical attention arrives can save lives. Even if a heart’s electrical activity is disrupted, pumping the patient’s chest can keep blood flowing to the brain until medics arrive with a defibrillator. This device works by shocking the heart into re-organising its electrical activity.

‘Everybody should learn how to do cardiac resuscitation, how to go to a young man like this with no pulse, to press rhythmically on his sternum.’ says Martin.

### *How long can you survive in a freezer?*

A question that Richard Carter must have asked himself when some kids locked him in his ice-cream freezer.

Carter, who was trapped in the  $-28^{\circ}\text{C}$  chamber for 15 minutes, told a newspaper: ‘Another 15 minutes and I’d have been a goner.’

The first sign of trouble is frost-bite, says Bill Keatinge, physiologist at Queen Mary, University of London. In extreme cold, our bodies shut down the blood supply to our skin, and because our fingers are so small, they can freeze quickly if not covered up.

‘In experiments, I’ve frozen my little finger repeatedly, and it only takes about 70 to 80 seconds,’ says Keatinge.

Frozen fingers are a big issue in Yakutsk in eastern Siberia, the coldest town in the world. Drunks who collapse outside often have frozen fingers by the time they are found. ‘The local doctors do between one and three finger amputations a day, and it’s a small town,’ says Keatinge. ‘It’s a problem all over Russia.’

While shivering keeps you warm, boosting your body’s heat production tenfold, it uses a lot of energy, so can be exhausting.

When shivering stops, it’s time to worry. Even if you are fat, you will begin to lose heat quickly, falling into a state of hypothermia once your core body temperature drops below  $35^{\circ}\text{C}$ .

As the body cools further, breathing becomes laboured and it becomes hard to think straight. Ultimately, the heart muscles begin to seize up, and because blood is then pumped around the body so inefficiently, tissues and organs fail through lack of oxygen. ‘You’d be in real trouble within hours at  $-28^{\circ}\text{C}$ ,’ said Keatinge. ‘I’d be amazed if anyone survived as long as a day at that temperature.’

### *How long can someone survive without water?*

Not as long as aspiring Buddhas may claim. Reports from Nepal told of a teenage boy meditating for the last six months and said to have not drunk any water for the entire period. Suspicious locals asked for a scientific examination to determine if the boy was managing without water.

The magician David Blaine survived 44 days without food, losing one quarter of his body weight, but keeping a healthy body mass index. In 1976 obese people were put on an experimental starvation diet, with absolutely no food, for 40 days, and none of them had any trouble surviving. ‘It is possible to last much longer without eating than without drinking,’ says Martha Stipanuk, from the division of nutritional sciences at Cornell University in New York. But it does depend on your initial body condition. ‘A weak elderly person or thin young person might not be able to go very long without food,’ she adds.

The problem for wannabe Buddhas is that surviving for weeks without water is not an option. ‘People can last a few days without water depending on the environment in which they find themselves and whether [they are] injured or not,’ says Jeremy Powell-Tuck, professor of clinical nutrition at Barts and the London Queen Mary school of medicine, who supervised Blaine’s recovery.

Someone sitting quietly under a shady tree will be better off than an explorer caught out in the middle of a blazing desert, but none the less they won’t be able to survive for six months without a sip of water.

‘Without water anyone will run into problems pretty quickly. Their blood volume will shrink and their water and electrolyte balance will be upset. Eventually the body will just go into shock,’ says Professor Stipanuk.

### *How tall can a human grow?*

History provides a few pointers. According to the Bible, the tallest man was Goliath at ‘six cubits and a span’, which, depending on whose conversion you believe, puts him somewhere between nine and a half and eleven feet tall. Sadly though, the Bible was not peer-reviewed, so Goliath must be disqualified.

The tallest man on record is Robert Wadlow, an Illinois man who died at 2.71 m (8 ft 11 in) in 1940 at the age of 22. The record may not stand for much longer, however. Leonid Stadnyk, a 33-year-old living in a remote village in Ukraine, hit the news as the world’s tallest living man. At 2.54 m (8 ft 4 in), he is just 17 cm short of Wadlow’s record. In the past two years, he has grown 30 cm.

Like Wadlow, Stadnyk owes his extraordinary height to a tumour on his pituitary gland. The tumour churns out growth hormone but it’s a secondary effect that leads to the runaway growth that doctors call acromegalic gigantism.

Normally, the growth of our bones is limited by our sex hormones. A good burst of sex hormones at the right time tells the ends of our bones to stop growing. In acromegalic gigantism, as the tumour grows it destroys cells in the pituitary gland that stimulate the release of sex hormones. The bones, therefore, never get the signal to stop growing.

But surely there must be a limit to a person's height? John Wass, a specialist in acromegalic gigantism at the University of Oxford, reckons it would be impressive to survive for long if you grew taller than 9 ft.

First, high blood pressure in the legs, caused by the sheer volume of blood in the arteries, can burst blood vessels and cause varicose ulcers. An infection of just such an ulcer eventually killed Wadlow.

With modern antibiotics, ulcers are less of an issue now, and most people with acromegalic gigantism eventually die because of complications from heart problems. 'Keeping the blood going round such an enormous circulation becomes a huge strain for the heart,' says Wass.

### *How long can hair grow?*

Hair follicles on the scalp rarely push out more than 0.5 mm of new hair fibre a day and a follicle is active for at most six years before falling dormant. After a few months, it re-activates itself and produces a new hair.

Vietnamese man Tran Van Hay has 6.2 m of the stuff at the time of going to press, although its length may be due to infrequent washing – he has not washed his for six years. 'Hair produces oils and can easily become matted. If you don't wash it, hairs that would have fallen out may stick to those still attached to the scalp,' says Mike Philpott, head of the hair biology research group at Queen Mary, University of London.

Some animals, like angora rabbits, have exceptionally long hair because a mutation in a gene called FGF5 causes hair follicles to be locked into the growth phase for longer. 'Maybe this guy also has a defective gene,' says Philpott. The existing world record, held by Hoo Sateow of Thailand, currently stands at 5.15 m.

### *Why do fair-skinned Brits burn while Swedes tan?*

People from further north tend to have paler skins, the better to absorb the weak sunlight and trigger vitamin D production. After that any subtle differences in skin type are a matter of genetic inheritance.

'Your Celtic phenotypes – Brits with pale skin, freckles, red hair – will burn and never tan,' says Mark Birch-Machin, reader in molecular dermatology at the Newcastle University and a researcher for Cancer Research UK.

Brits of a less Celtic extraction may burn and then tan when young, but will pay for it heavily with wrinkles when older. 'Each time you go out in the sun and get burned, you damage your DNA. Even before you get sunburned skin, you have damaged your DNA, so it is worse than it looks. You cannot say: "I am safe until I become a lobster." That is not true.'

But Birch-Machin is dubious about races such as the Swedes having any real advantage over us in the tanning stakes. After all, our blood is extremely muddled up in Europe, and the British public is generally exposed to only a small sample of (famous) Swedes – some of whom may sport artificial tans of course.

‘If you go out in the sun you may get skin cancer,’ he says. ‘But what is sure is that your face is going to look like an old sofa. You will have a 50-year-old face on a 30-year-old body, and particularly if you smoke.’

James Scott, director of the genetics and genomics research institute at Imperial College London, thinks that from a genetic perspective, the British should be more likely to toast to a gentle brown than their cousins from more northerly latitudes.

The genetic differences among northern Europeans are minuscule, he says, and any golden glow from the Baltic could be, he says, an ‘observer artefact’.

But he is not certain of that. ‘Either the genetics is subtly different in Swedes, such that they have blond hair and fair skin but the propensity to develop more melanin when they see the sun,’ Professor Scott says. ‘[Or] maybe there is a form of conditioning in which the genes get set by environmental triggers in a particular sort of way.’

### *How do you test someone’s intelligence?*

There are endless methods, each one claiming to have an edge over the others.

Mensa, the UK’s high IQ society, prefers to use the Cattell test developed by psychologists in the early 20th century. It avoids using questions that require previous knowledge and tries to measure how quickly and clearly someone thinks. But is it better than the Haselbauer–Dickheiser test for Exceptional Intelligence where each question in the test is a puzzle and the more questions you answer, the more intelligent you are?

‘We would say so,’ says a spokesperson for Mensa. ‘Because it’s measuring your speed of thought, which is very important in IQ testing.’

Munder Adahami, a researcher at the Centre for the Advancement of Thinking, King’s College London, says that both tests have flaws. ‘The problem with IQ tests is that they can be taught,’ he says. ‘You improve by 10 points by having some practice on them.’ In addition, he says, someone’s cultural background has an impact on how they interpret, and perform on the test.

Adahami uses the Jean Piaget technique. ‘Intelligence is neither a fixed or inherited quality nor is it something you acquire by experience alone. There’s some dynamic interaction between the two.’

It is that interaction the Jean Piaget test tries to tease out. The test does not require any previous knowledge and can eliminate the problems associated with cultural references.

But perhaps the biggest problem in measuring intelligence is actually defining what intelligence is. Many argue, for example, that there is a central processor somewhere in the brain governing our ability to interpret the world around us. Others say this function is spread across different parts of the brain. Working out who is right or wrong is enough to test anyone’s head.

## *Does dyslexia exist?*

Not according to some education experts. Instead, they argue, dyslexia is an emotional construct used, in many cases, to save children who are poor readers from embarrassment.

Unsurprisingly, scientists studying the biological basis of dyslexia beg to differ. ‘To say it’s a myth is pretty far-fetched,’ says Tony Monaco, head of neurogenetics at the University of Oxford and an expert on the condition.

According to the professor, children who are simply poor readers may mistakenly be diagnosed with dyslexia if their reading ability is not assessed alongside their general intelligence. The sign of real dyslexia is a reading ability far below that for a child’s age and intelligence.

Research is gradually teasing out the developmental glitches that give rise to dyslexia. ‘From studies of twins in the UK and Colorado, we know that around 50–60% of the variance in reading ability is due to genetic influences,’ says Monaco. The condition is highly hereditary with around half of children born to people with dyslexia also developing the condition.

In a study of 300 families, his group identified a gene on chromosome 6 they suspect is strongly linked to dyslexia. The gene is thought to help neurons in the developing brains of babies move to their correct positions. ‘When you knock the gene out in rats, you get no movement of the neurons,’ says Monaco.

The finding was bolstered by researchers at Cardiff University who independently identified the same gene as a potential factor in dyslexia. ‘In the developing brain, neurons have to move to the right level and it appears that a variant of this gene impairs that movement,’ says Monaco.

Brain scans carried out by another Oxford University researcher, John Stein of the Dyslexia Research Trust, have shown that people with dyslexia have underactive brains in several key areas associated with reading and vocal word formation. ‘The evidence so far points strongly to dyslexics inheriting a genetic trait that means they have impaired neuronal migration,’ he says.

Experts believe that other genes will be discovered that also contribute to a person’s susceptibility to being dyslexic. Already, a Finnish group has found a gene on chromosome 15 that impairs neuronal movement in developing humans. And Monaco’s group believes that another contributing gene lies on chromosome 18.

Other research supports the notion that it is a real neurological condition: post-mortem examination of brains of people with dyslexia revealed many neurons were in the wrong place.

## *Why do suicide rates peak in the spring?*

Psychiatrists have been scratching their chins over this one for years. Counterintuitively, the arrival of spring, and the long sunny days it ushers in, mark a staggering rise in suicide rates.

Mental health experts at the Priory group say that May is the peak month for suicides in Britain. ‘The increase can be dramatic, with up to 50% more successful suicides in some cases,’ says Chris Thompson, director of health care at the Priory

group. In Britain, about 6,300 people take their own lives each year, 90% of whom are likely to have mental health problems.

The seasonal effect is seen all over the world, with the northern hemisphere witnessing a big rise in suicides in May and June and the southern hemisphere seeing a similar rise in November. While no one has a complete explanation as to why, the leading theory is that the increase is down to the effects of sunlight on our hormones.

According to Thompson, the seasonal changes that bring most of us out of winter apathy may work against those who are coming out of severe depression. 'It is a harsh irony that the partial remission which most depression sufferers experience in the spring often provides the boost of energy required for executing a suicide plan,' he says. 'Spring is a time for new beginnings and new life, yet the juxtaposition between a literally blooming world and the barren inner life of the clinically depressed is often too much for them to bear.'

Paradoxically, says Thompson, sunlight-driven changes in levels of the feel-good chemical serotonin may make people more aggressive and, if they are depressed, they could direct that aggression at themselves. The theory gains some support from research by Canadian scientists linking seasonal changes in bright sunlight with more violent suicides.

Other researchers believe that the influence of sunlight on another hormone, melatonin, is to blame. Sunlight inhibits production of melatonin, which is known to influence our behaviour.

### *Why do people sleepwalk?*

'The bottom line is the brain doesn't move from one sleep state to another properly,' says Carl Hunt, director of the National Centre on Sleep Disorders in Bethesda, Maryland.

'In most of us, when we go into REM sleep, the period when our brain is most active, our muscles are deactivated. It's why we don't act out our dreams. But with these people, their muscles aren't shut down.'

Sleepwalkers can not only walk around, but cook, eat, drive and commit acts of extreme violence. Hunt says sleepwalkers aren't conscious of what they are doing, but because their dreams are influenced by their surroundings, they can get around houses, or even mow lawns naked, as one Ian Armstrong's wife discovered to her horror.

Sleepwalking is common among children, but usually drops off as they reach adolescence. About 4% of adults continue to sleepwalk into older age and about 0.5% become violent in their sleep. The condition is hereditary and more common among men. Although no single neurochemical problem underlies all cases, Hunt says a substantial number go on to develop Parkinson's disease, suggesting that the disorder may be part of a progressive neural condition.

### *What is persistent sexual arousal syndrome?*

There is nothing remotely amusing about this unusual condition. Here's an extract from the internet diary of one anonymous sufferer: 'It continues to rule my life and I schedule my work and personal life around my physical pain and discomfort . . . I

have begun to contemplate suicide again because I cannot imagine living like this for the rest of my life.'

This woman is one of several dozen who have come forward in the past couple of years complaining of near-constant sexual arousal. The sensation is apparently unrelenting, not associated with feelings of desire, and can lead to spontaneous, repetitive orgasms. 'I can cause an orgasm by the simple act of gently moving my leg up and down,' another sufferer says.

Sandra Leiblum, a psychiatrist at the Robert Wood Johnson medical centre in New Jersey and one of the first scientists to study the condition, says no one has any idea what causes it. 'It's hard to find a single determinant that unites the women in terms of background,' she says. 'People have looked at everything from hormonal or neurological contributions or excessive vascular flow or congestion in the genitals.'

Finding a treatment has proved equally difficult, though Leiblum says some success has been achieved using counselling with one sufferer, and applying a local anaesthetic called lidocaine with another.

'We would like to do some brainwave studies to see if there's a kind of arousal in the brain centrally that doesn't shut off in the way it would in women without the problem,' she says.

*Why is it so easy to read words even when the letters are muddled up?*

The ease might be illusory. Or even illogical. Never mind what the web loggers tell you, scrambled words can be hard to read.

One email doing the rounds claims that 'Accidentally to research at an English university, it doesn't matter in what order the letters in a word are, the only important thing is that the first and last letter is in the right place. The rest can be a total mess and you can still read it without great problem. This is because we do not read every letter by itself but the word as a whole.'

Not so, says Martin Turner of the Dyslexia Institute. 'There is a spectrum of truth here, and that is towards the lower end, because actually sequence is about the only thing that is important.'

Experiments with so-called format distortion can change the appearance of a word drastically – alternating letters in capitals, lower case, superscript and subscript, for instance, or in a huge Gothic typeface to disguise the lettering – but in experiments young children can still read such disguised words, says Turner. What throws them is a change in the sequence of letters, hardly surprising because letters represent a flow of speech sound. The first letter is an important clue to a scrambled word, the last much less so.

In fact, the exact way in which the letters are scrambled can be extremely significant. For example, with plurals, leaving the 's' at the end, but not the letter that should have preceded it, can make the word hard to decipher.

'All you need to do is try and read that email,' says Turner. 'Immediately, you discover it is quite difficult to read. And secondly, you get very fed up with it after two or three sentences. What you have done is put yourself in the position of a dyslexic or poor reader, who loses interest jolly quickly.'

‘Motivation slumps and it is quite an aversive experience. I got that email, from a fellow psychologist, needless to say, and immediately wrote back commenting that it was hard work, and aversive. After a while, I thought: do I really want to do this? Why don’t I look out the window and see what is going on?’

### *Can you drill a hole through your head and survive?*

Yes, though it’s not painless. And it depends which bit of your brain you drill through. It was reported, for example, that Ron Hunt of Truckee, California, fell off a ladder and on to a drill, whose 18-inch bit was driven into his skull by his right eye socket and out again by his right ear. Nevertheless, he was laughing and joking with hospital staff shortly afterwards.

‘This type of incident is by no means infrequent,’ says Steven Rose, director of the brain and behaviour research group at the Open University. He cites the famous case of Phineas Gage, a US railway worker who in 1848 was involved in an accident that resulted in a spike being shot through his head. Gage lived for years but there was a marked change in his behaviour and personality. The case improved our knowledge of where brain functions are localised.

We learned more in the First World War, says neuroanatomist David Edgart at Liverpool University. ‘Bullet wounds produced clean lesions, due to their speed. Doctors could correlate which part of the brain was damaged with the areas of the patient’s system that no longer worked properly.’

‘To put it in its simplest form, different bits do different things,’ says Edgart. ‘Physical damage to one part may be fatal, but in another it may have very little effect.’

Rose adds: ‘If the lower regions of the brain or spinal cord are damaged – regions that control heart rate, breathing etc. – the consequences are likely to be fatal. The function of the great frontal lobes is more interesting . . . if these parts are damaged the victim is not fatally impaired.’

### *Why are we happier when the sun is out?*

A host of reasons. But, to be fair, none has been proven beyond doubt. The hormone melatonin is believed to play a major role.

When it gets dark, a region of the brain called the pineal gland starts producing melatonin. This is thought to make our bodies cool down and feel drowsy, helping us fall asleep. But flick on the lights and melatonin production is cut off. The ‘hormone of darkness’, as it is known, does not just make us sleepy. It has also been linked to depression. People who live in regions with very little sunlight tend to have higher levels of melatonin and are more likely to suffer from depression.

In 1997, in an attempt to bring joy to the miserably light-starved people of Helsinki, psychiatrist Timo Partonen of the National Public Health Institute gave people special lamps producing light that closely matched sunlight. After leaving the lamps on their desks throughout the winter people felt happier, less hostile and more alert.

Light also triggers changes in the brain that make us feel more cheery. Evidence is emerging that light pushes up levels of serotonin and noradrenaline, two key feel-good

chemicals.

People suffering from seasonal affective disorder (SAD), a mild depression during winter, often crave foods like chocolate and strawberries, says Anne Farmer of the Institute of Psychiatry in London, which are high in tryptophan, a natural precursor to serotonin.

According to Partonen, physiological changes are just part of the story. 'Light has been associated with good, and dark with bad. So, there is clearly a psychological influence,' he says.

### *What can psychometric tests tell you about someone?*

According to its fans at least, psychometrics can go a long way to telling you about (among other things) someone's numeracy, language skills and aptitude for leadership. The tests have become increasingly popular as a method for companies to assess candidates for top jobs.

'You can find out to what degree somebody is likely to be an authoritative rather than a participative manager. You can tell to what degree they believe in learning and development for their team. You can tell a lot about their ability to think strategically,' says Heather Salway, director of the human resources consultancy at Eden Brown Recruitment.

She says psychometrics – a set of tests developed by psychologists and linguists over the past few decades – can help employers learn about their prospective employees very quickly. In under an hour, perhaps, you may learn what would have taken six months to emerge under normal circumstances.

Anyone thinking of cheating would, proponents say, be wasting their time. 'Built into the tests are safeguards so if somebody is trying to fool the tests, that is thrown out when you do the analysis,' says Salway.

Not everyone is enamoured with the tests, however. Their use in hiring staff has been criticised by some trade unions, for example, who argue that they are a blunt instrument likely to encourage laziness among employers.

### *Can loud music cause physical damage?*

Undoubtedly. Turn up the bass, and the high-pressure sound waves can literally knock the wind out of you, causing your lungs to collapse. The condition, known as pneumothorax, was experienced by one man while driving. Doctors blamed the injury on a 1 kW bass box he had installed to boost his in-car stereo. Another man described a sudden sharp pain in his lung while standing next to a loudspeaker at a club.

Doctors believe that tiny pockets of air become trapped in the outer tissues of the lungs, and when hit by intense pulses of sound these air pockets resonate so much they can rupture the tissue, allowing air to leak from the lung. John Harvey, a lung specialist at Southmead hospital, Bristol, teamed up with colleagues in Belgium to highlight the danger. 'In the worst case scenario, the leak is big and continues, so the lung can collapse,' he says. Only certain frequencies, the bass tones between 30 and 150 Hz, are thought to be problematic.

Collapsed lungs are three times as common in men than women, partly because men tend to be taller, so the strain on their lungs due to gravity is greater. Smokers are also more likely to suffer the condition.

No one knows how many collapsed lungs are down to loud music. 'It's never been described before so we don't know how common it is,' says Harvey. 'But whenever we mention it at meetings, people say, "I had a case like that". Now that it's a described association, hopefully doctors will ask patients and we'll probably find it's not uncommon.'

### *Is urban cycling bad for your heart?*

Shedloads of lycra-clad peddlers nearly careered off the road after being told their daily exertion on two wheels could be doing more harm than good. Tiny specks of air pollution belched from diesel-fuelled taxis and buses can damage blood vessels, and, according to reports, could outweigh the obvious health benefits of cycling. The warning came after research in the laboratory of David Newby, a British Heart Foundation senior lecturer in cardiology at Edinburgh University. In his tests, 15 healthy men cycled on exercise bikes in a chamber while being exposed to levels of diesel pollution similar to those found on a congested city street. After an hour of cycling, the scientists found their blood vessels became less flexible and produced less of a protein that breaks down blood clots in the heart – damage associated with the early stages of heart disease.

All very worrying, particularly that, as the faster a cyclist pedals the more air they breathe in, those who believe they are improving their fitness the most are storing up the biggest trouble for themselves.

'Cycling is a good thing to do,' Dr Newby insists. 'We don't want to give the message that it isn't.' His team has made no direct comparison of the risks versus the benefits, and what the original story failed to mention, he says, is that the situation for car drivers is even worse. Drivers face a bigger risk as car ventilation systems Hoover up pollution at ground level, which cannot then disperse, leading to concentrations inside some three times higher than on the street.

For cyclists there is both good news and bad news. The latter is that no type of expensive mask and filter can block the tiny carbon particles that do the damage. 'They're just so small they behave almost like a gas,' Dr Newby says.

The positive spin is that the levels of pollution drop off considerably just a few metres from the congested source – so cyclists who stick to less busy roads should have nothing to worry about.

### *Are sunbeds worse for you than sunbathing?*

Given the different types of sunbed available and variations in the intensity of natural sunlight, it's almost impossible to make a direct comparison. But what is clear is that both tanning methods expose the skin to potentially harmful levels of ultraviolet (UV) radiation. 'The simple answer is that sunbeds are about the same as being in the sun,' says Mark Birch-Machin, a skin cancer expert at Newcastle University.

Birch-Machin says results from his laboratory show that exposing cultured skin cells to tanning lamps can induce the same sort of DNA damage that is seen in skin cancer patients. Such DNA damage can lead to potentially fatal skin.

At the heart of the matter is the proportion of UVA to UVB radiation that the sunbeds use. Natural sunlight can contain as much as 8% UVB, which is more intense than the UVA that makes up the rest. Older sunbeds used about 98% UVA, until a succession of orange faces convinced manufacturers they needed to boost the UVB level to mimic sunlight and give a more natural-looking tan. Modern tanning lamps now use around 5% UVB, so they can both tan and burn the skin more quickly, but on the plus side it means that people generally stay underneath them for a much shorter time. Put simply, the new tanning lamps are about as strong as the Mediterranean sun, while older sunbeds are more similar to a day out in Blackpool.

‘It’s a very unpopular message but a tan is a sign of skin damage because it means your skin has been exposed to UV,’ says Sara Hiom of the charity Cancer Research UK. Returning to the original question, Hiom says that it is difficult to judge exactly whether sunbathing or sunbeds carry greater risks. ‘To do comparative studies between sole sunbed use and sole solar UV is next to impossible,’ she says. ‘What people are there that use sunbeds and don’t go out in the sun as well?’

### *Can video games trigger violent behaviour?*

Scientists are divided. After decades of arguments over possible copycat aggression sparked by violent films and television programmes, the debate has moved on to the PlayStation generation. The games are certainly violent. Doom 3, for example, features decapitations, exploding heads and stomachs, and an array of terrible weapons including axes, chainsaws and rocket launchers. The British Board of Film Classification said, however, that there was no evidence directly linking the playing of games with violent behaviour.

But some disagree, most notably Craig Anderson, a psychologist at Iowa State University who has published a succession of studies making that link. ‘Violent video games are significantly associated with increased aggressive behaviour,’ he says. ‘High levels of violent video game exposure have been linked to delinquency, fighting at school and violent criminal behaviour.’

Anderson reached his conclusions partly after carrying out his own experiments, during one of which students played violent games and then competed for the right to blast an opponent with a loud noise. He found that aggressive behaviour almost invariably followed aggressive games. He also assessed the evidence of a number of published studies that suggested a link.

The problem is that other psychologists have examined the same studies and reached an entirely different conclusion. ‘The research evidence is not supportive of a major public concern that violent video games lead to real-life violence,’ one group decided.

How can this be? Partly because it is difficult to compare the studies – the basic assumptions they make are often so different. One, for example, classed Pacman as containing violent events, and counted 0.59 deaths per minute in a Smurfs game.