- Snore



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By **Gorm Palmgren**



Snoring can be as loud as sleeping next to a lawnmower...

THE NEW BIOLOGY OF SNORING

Why do we snore? And why do some snore louder than others? Harvard researchers have mapped out the anatomy of snoring and found some crucial answers, while also rejecting an old assumption. Their results might save your life.

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Partners often joke about each other's snoring at night – how loud can it really be? Well the science is in, and the answer is 'pretty loud'. Loud snoring can reach 90+ decibels, roughly equivalent to sleeping next to a working lawnmower.

Living with a loud snorer can cause sleep deprivation, leading to other related health issues. But it may be even worse for the person snoring: loud grunts and noisy breathing could be symptoms of severe conditions in the snorer's body; these may be increasing the risk of stroke, diabetes, and other medical issues. And snoring itself can be inherently unhealthy. In sleep apnoea, the pharynx muscles block the airways completely, and breathing stops entirely for as long as it takes for the brain to register a lack of oxygen and undertake a forced restart. The snorer wakes, but often not enough to be properly aware of the problem. This interrupted sleep brings the same issues suffered by an adjacent suffering partner.

It is not surprising that snoring has a long history of study and treatment; the Ancient Egyptians may have used thyme as a treatment for snoring.

In recent years, researchers have turned closer attention to the biology of snoring, and a new study provides a surprising explanation for why some people snore louder than others.

The diaphragm plays a key role

Approximate one in four women snores; in men the proportion is closer to 50%. The volume can reach 93 decibels, according to the Guinness Book of World Records, but the average snore is closer to 50dB, around the level of normal conversation.

93

decibels is how loud snoring can get, according to the Guinness Book of World Records.

The cause of snoring is the same, regardless of volume. During sleep the muscles of the pharynx and oral cavity relax, making the soft tissue sink down to partially block the airways. This forces air through a narrower passage with each inhalation and exhalation, making the tongue and palate vibrate – which is the characteristic snoring sound.

For a long time, researchers have believed that the loudness of snoring was primarily determined by the extent to which the airways were blocked and how narrow a passage the breath was forced through: the more blocked, the louder the sound. But a 2024 study disproves that theory. Another factor is just as important, according to American researchers led by snoring specialist Daniel Vena from Harvard Medical School in Boston.

The Harvard researchers invited 40 test subjects, all snorers, to spend the night in a laboratory. During the night, the researchers measured the loudness of snoring sounds, while also monitoring the degree to which the subject's airways were blocked, and how hard muscles in the diaphragm were working to breathe.

Contrary to expectations, the loudest snoring was found to occur when airways were only partially blocked. If the passage through the pharynx became narrower and was almost completely blocked, the sound level dropped dramatically – even when the diaphragm was working hard to push air through.

The reason for the surprisingly quiet snoring sound is that eventually not enough air can be forced through the pharynx to make the soft tissues vibrate and produce the characteristic sound.

The results also showed that changes in diaphragm muscle activity during the sleep cycle had a significant impact on the loudness of snoring. During deep sleep, the diaphragm maintains calm and powerful breathing, and when coupled with narrowed airways, it was this which produced loud snoring.

During REM sleep, on the other hand, the diaphragm muscles do not contract as strongly, and breathing becomes more superficial. The speed of the airflow then decreases so much that it doesn't make the soft tissues oscillate, even when the pharynx is constricted.

Daniel Vena's studies show that the loudness of snoring depends as much on the diaphragm as on the pharynx. This new knowledge will be invaluable as researchers develop new tools to diagnose and treat the severe diseases that can be associated with snoring.

Night noises may reveal illness

Not all snoring indicates an underlying medical condition: snoring is not usually considered harmful in itself. But sometimes it may be a sign of something ▶



CID+X

Detailed sleep studies may use a portable cardiorespiratory polygraph, charting heart and breathing health through the night, while snoring is recorded using a small microphone attached to the larynx.

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Vibrating pharynx makes breathing non-silent

The soft tissue of the oral cavity can collapse when you sleep, turning your pharynx into a loud wind instrument.



Tense muscles ensure free passage

1 During sleep, the muscles of the oral cavity are usually active enough to keep the soft tissues – primarily the tongue, soft palate, and uvula – tense. This allows a free passage for respiratory airflows, so breathing is relatively silent.

Relaxed muscles block airways

2 In some people, the muscles of the oral cavity are so relaxed during sleep that the soft tissues sink down to partially block the airways. Other factors, such as a blocked nose or swollen tonsils, can also contribute to the blockage.

Blockage makes the air oscillate

3 When air is inhaled, the narrowed passage increases the speed of the airflow, causing the pharynx to vibrate, and the vibration makes the air oscillate – as in a wind instrument – producing a loud snoring sound.

CLAUS LUNAU & AFRICA STUDIO/SHUTTERSTOCK

more serious, and particular sounds can indicate particular conditions. Obstructive sleep apnoea is closely linked to loud grunts and gasps as breathing is restarted after as long as 10 seconds where the airways are completely blocked. Episodes typically occur every few minutes, and the momentary losses of oxygen can damage cells and cause inflammatory conditions that increase the risks of elevated blood pressure, cardiovascular disease, type 2 diabetes, and stroke. It results not only in excessive snoring, but also in poor sleep which may cause mood, memory and concentration problems the next day. In the long term, poor sleep quality can result in depression and cognitive impairment. Yet some level of sleep apnoea affects around 10% of the adult population.

Studies have shown that the risk of type 2 diabetes in middle-aged men and women increases with the frequency and loudness of snoring. Very loud and daily snoring each double the risk of diabetes.

A large US study also found that middle-aged women who snored even 'now and then' were around 50% more likely to develop cardiovascular disease, while the risk was 100% higher in women who snored regularly.

165,000

breaths were measured by Daniel Vena and his colleagues in their latest study.

Inefficient internet remedies

So frustrating can snoring be for both the snorer and the 'snored' that many are tempted to seek out remedies. The internet is, of course, full of these, with ideas and products that promise to solve the problem. Few of the methods are supported by scientific proof. Notably there is no solid evidence that clips to hold the nose open or tape to close the mouth are useful against snoring.

But researchers do know of methods with a proven effect. One of the most effective is weight loss. Being overweight is a major contributor to snoring, because the extra fat presses on the respiratory organs and airways, making breathing more laboured. By reducing the volume of fatty tissue, air can pass through the pharynx more easily.

Another solution is to cut down on alcohol. Alcohol also relaxes the airway muscles, blocking airways and increasing the likelihood of snoring – especially if consumed shortly before bedtime.

Snoring could save your life

If none of these things work, or if after reading Daniel Vena's suggestions (overleaf) snoring remains a real problem for you or your partner, consider consulting your GP, and if necessary getting a referral

CLAUS LUNAU

Snoring could be a sign of severe illness

Snoring is often harmless, but loud or increasing snoring could be evidence of otherwise invisible diseases that are taking over your body.



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Home sleep tests can be as simple as a device on your finger monitored by an app on your phone. Pictured is ResMed's onesleeptest, also known as the Ectosense NightOwl.
RESMED

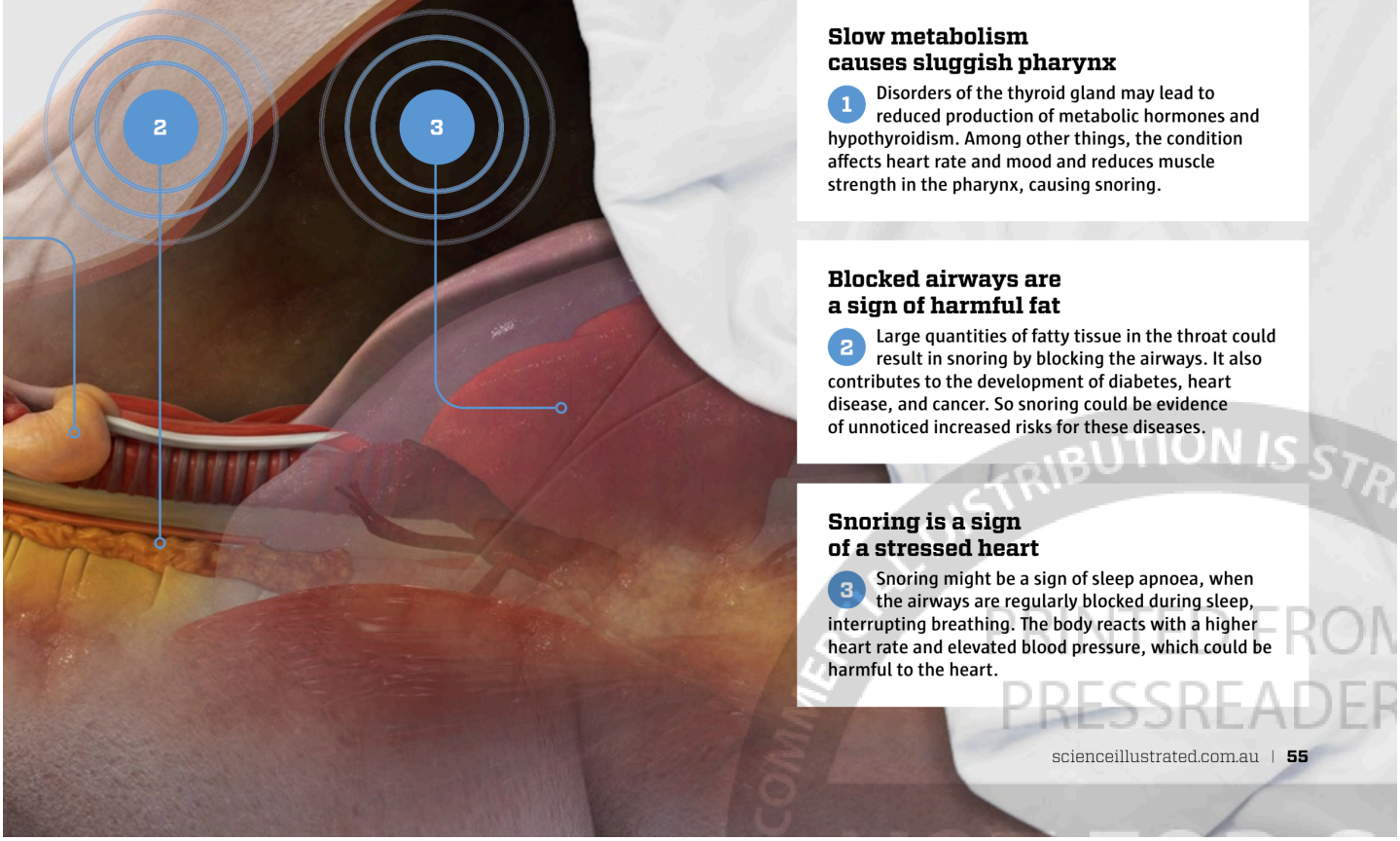
to a sleep study specialist. You can be tested for a number of possible causes of your snoring, with sleep studies often involving using a sleep apnoea testing machine you can wear at home to monitor breathing, oxygen levels and other vital signs as you sleep. These can be simple but sophisticated finger devices.

This level of investigation is required because so far our knowledge of snoring has been too limited to make accurate conclusions simply based on the sounds of our snoring. But Vena's study may be a first step towards a more complete understanding of how conditions inside the body influence the audible patterns and volume of snoring.

In the future, it may be possible to use an app simply to listen to your snoring and make early recommendations for seeking treatment. By listening their way to the exact cause of your snoring, doctors might be able to determine whether you have hypothyroidism, which makes the soft tissues in your pharynx collapse, or whether you suffer an increased risk of cardiovascular disease and diabetes.

And they will be able to find the best possible treatment for you, not only for snoring but to combat the implications of other diseases. The sound of your snoring may help avoid potentially life-threatening consequences of invisible diseases.

So the next time your partner pokes you to stop your loud snoring, or you are woken up by lawnmower levels of noise from the adjacent pillow, remember that the snoring is not merely annoying but also very interesting: it could be offering information that could save a life. SI



Slow metabolism causes sluggish pharynx

1 Disorders of the thyroid gland may lead to reduced production of metabolic hormones and hypothyroidism. Among other things, the condition affects heart rate and mood and reduces muscle strength in the pharynx, causing snoring.

Blocked airways are a sign of harmful fat

2 Large quantities of fatty tissue in the throat could result in snoring by blocking the airways. It also contributes to the development of diabetes, heart disease, and cancer. So snoring could be evidence of unnoticed increased risks for these diseases.

Snoring is a sign of a stressed heart

3 Snoring might be a sign of sleep apnoea, when the airways are regularly blocked during sleep, interrupting breathing. The body reacts with a higher heart rate and elevated blood pressure, which could be harmful to the heart.

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RESEARCHER INTERVIEW:

Can we easily stop snoring?

Harvard's Daniel Vena is one of the world's leading experts on snoring. His research reveals the dangers of snoring, and he has a few concrete tips on how to avoid the nightly nuisance.

RANGIZZZ/SHUTTERSTOCK



DANIEL VENA



DANIEL VENA

WHO'S WHO

TITLE

Assistant Professor in the Division of Sleep Medicine at Harvard Medical School, USA.

RESEARCH

He has spent the past 12 years researching sleep disorders, particularly sleep apnoea, which causes snoring and could also give rise to a number of severe problems in the body and brain. The aim of his research is to understand the physiological processes behind snoring and contribute to the development of new efficient treatments.

Simple measures can reduce snoring

What is snoring, and why does it occur?

Snoring occurs when air flows from breathing cause the tissues of the oral cavity and pharynx – primarily the soft palate, tongue, and uvula – to vibrate, producing a sound. During sleep, the muscles in the area become less active, making the tissue collapse and narrowing the airways. This forces inhaled and exhaled air through a narrower passage, making the speed of the airflow increase. This vibrates the tissue and causes the snoring sounds.

Who is particularly prone to snoring?

As you get older, the muscles become less active, and therefore the likelihood of snoring increases with age. Men tend to snore more than women, and this is partly related to the shape and structure of the face and skull and the location of body fat deposits. When men become overweight, they tend to accumulate fat deposits around the abdomen and neck, which reduces airflow and may lead to snoring. After menopause, women's physiology changes so that their risk of snoring also increases.

Do I need to worry if I snore?

First and foremost it will be your partner who has reason to worry, because your snoring can disturb their sleep! However, several studies show an increased risk of cardiovascular disease with snoring, especially in women. Other studies demonstrate that pregnant women who snore suffer a higher risk of complications such as elevated blood pressure and pregnancy toxaemia. So there are indications that snoring itself may have a negative effect on health, especially on the blood circulation system, but the exact mechanism remains unclear.



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Are there particular factors or habits that lead to snoring?

High BMI, being overweight, increases the risk of snoring, as does taking tranquilizers or drinking alcohol, because they have a muscle relaxing effect. If you have had a lot of alcohol one evening, you are likely to snore more that night. Interesting data sets show that snoring peaks on Friday and Saturday nights and decreases during the week. And you generally snore more if you sleep on your back

Do the products that promise to prevent snoring work?

The most well-documented product is a mandibular advancement splint, which moves the lower jaw forwards and reduces the risk of the tissue in the throat vibrating. It is a kind of brace that the dentist makes specifically for you. There are also devices that vibrate or give a mild electric shock if you lie on your back, but although they can make you turn on your side and snore less, people generally find them uncomfortable to use. On social media, taping your mouth shut at night to breathe through your nose is often recommended, but there is little evidence that this reduces snoring.



A mandibular advancement splint pushes the lower jaw and tongue forward to open up the pharynx more.
THORNTON ADJUSTABLE POSITIONER

What is your best advice for those wanting to snore less?

Do not be a man and get younger. No, I am joking. The best advice is to lose weight, so if snoring is a problem in your relationship, it's a really good idea to do something about your weight. Some say that physical activity also helps, but that is probably just because you will lose weight. And then you need to think about your alcohol consumption. A drink before bed to help you fall asleep will definitely increase the risk of snoring, and in general, you can keep snoring at bay by drinking less. If you lie on your side to fall asleep, you probably will not snore at first, but if you later turn over on your back, it no longer makes a difference.

Do you snore yourself?

No, I do not think so. I have never had any complaints about it.

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