A good yawn might do more than you think, say researchers

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A simple yawn may feel like the most ordinary of human acts—a reflex triggered by tiredness, boredom, or seeing someone else's mouth stretch wide. But scientists still cannot say with certainty why we do it.

Now, a new imaging study from academics at UNSW Sydney and Neuroscience Research Australia (NeuRA) suggests that yawning may play a subtle but intriguing role in moving fluids in and out of the brain. Although the researchers acknowledge the idea is speculative, they say their work introduces an interesting avenue for understanding the physiological functions of yawning.

Using real-time MRI scans, the team led by Professor Lynne Bilston were able to see what happens inside the head and neck when people yawn, and compare it to the effect of normal and deep breathing.

The results, based on a small-scale group of 22 participants and published in *Respiratory Physiology & Neurobiology*, showed that yawning triggered a specific maneuver in which cerebrospinal fluid (CSF) and venous blood moved out of the skull together, whereas during deep breathing cerebrospinal fluid flowed into the skull.

The researchers admit it is surprising that there is still such mystery surrounding the specific reason why people yawn given that it is such a basic action that everyone does on a regular basis.

"Yawning remains very mysterious, even though it's a primordial process that has been preserved throughout evolution. We know that crocodiles yawn, so we think dinosaurs also yawned," Adam Martinac, a Postdoc and corresponding author of the paper, said.

"It's unlikely that crocodiles and dinosaurs are yawning because of a social response, such as being bored by other crocodiles or dinosaurs. So there is likely something more fundamental going on. But nobody has really worked it out for certain.

"We also know that human fetuses yawn during the very early development stage, but overall the science of yawning is surprisingly

understudied."

Cerebrospinal fluid flow

Cerebrospinal fluid is a clear liquid that surrounds the brain and spinal cord, filling the space around them like water around a floating object. It is important because it cushions and protects the brain and spinal cord from injury and also helps carry nutrients in and waste products out.

The fact that CSF and venous blood flows away from the skull during yawning, but CSF flows in the opposite direction when deep breathing, was a big surprise to the researchers.

"We observed that yawning is a body movement that can influence the flow of fluids around the brain," said Prof. Bilston, from UNSW's School of Biomedical Engineering. "There has been speculation that yawning can help clear waste from the brain, but so far there has not been solid proof.

"Our research suggests that yawning can play a role in cleaning brain fluid, which would most likely happen close to bedtime."

This finding could be important for further studies into neurodegenerative diseases such as Alzheimer's, Parkinson's and dementia—all of which have been potentially linked to the build-up of waste products in and around the brain that can be a result of impaired CSF flows.

"We think there's something here really worth investigating further. Those neurodegenerative diseases are associated with an accumulation of waste and the older you get the more waste there can be," said Martinac. "We don't know how strong the link is related to how CSF is cleared, but in the last 10 years there have already been a lot of investigations into

that area, and this can be another element."

One of the key observations was that CSF flow when people yawned was the opposite of what happened when they simply took a deep breath.

The team showed volunteers videos of people, and even animals, yawning in order to trigger so-called contagious yawns.

MRI scans were taken at the level of their C3 vertebra, a crossroads in the upper neck where blood and CSF pass as they travel to and from the brain. The scans of the subjects contagiously yawning were then compared to those when they simply took a deep breath as if pretending to yawn.

In normal breathing, the venous blood, that which has delivered oxygen, drains out of the skull and back towards the heart. The CSF flows in the opposite direction during that physiological process.

When the volunteers were pretending to yawn, the venous blood flowed out and CSF flowed into the skull. Only when they were really yawning, via those contagious yawns, did venous blood and CSF flow out of the skull together.

Thermoregulation

The UNSW research team also say the evidence suggests yawning is a way for the body to regulate the temperature in and around the brain.

"In humans, the brain tissue can be up to 1°C warmer than the rest of the body, and venous blood leaving the brain is typically about 0.2–0.3°C warmer than the arterial blood entering it," said Martinac.

"So when someone yawns, we can now see an increase in the cooler

arterial blood flow into the skull, compensating for the coupled outflow of CSF and venous blood, and therefore we can surmise there may be a thermoregulatory process happening there.

"We could speculate that perhaps yawning is a way that the brain helps to cool itself down, but again we would need to do more research to state that with certainty.

"We do know that a hot brain is not a good thing because there is a risk of cell damage, seizures and cerebral swelling. And there is actually a very narrow band temperature-wise where the brain is steady and balanced, what is known as homeostasis.

"That's likely the reason why there are so many mechanisms—such as blood flow and sweating—that help regulate temperatures in the brain.

"We don't fully know what the level of contribution yawning may play in that, but this research opens up some interesting avenues for further investigation in that area as well."

The researchers also say they have identified for the first time that people appear to have a unique signature to their individual yawn, which can be identified by the complex way their tongue moves during the action.

"Another interesting thing we found is that each person yawns in a unique way—so the tongue motion during the yawn is different between people, but very consistent for each person," Martinac said. "And it's not a simple motion. It's a very complex movement of the tongue during a yawn. It's almost like a fingerprint, so you could possibly identify someone just based on how they yawn."

More information: Adam D. Martinac et al, Biomechanics of

contagious yawning: Insights into cranio-cervical fluid dynamics and kinematic consistency, *Respiratory Physiology & Neurobiology* (2026). DOI: 10.1016/j.resp.2026.104575

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