Here's what happens to your body during plane turbulence: How to reduce the discomfort it causes

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Credit: Pixabay/CC0 Public Domain

This week has seen another barrage of unsettled weather sweep across the UK, with many flights delayed or cancelled. Some of those who were

fortunate enough to take off found themselves arriving at destinations that weren't on their boarding passes—such as passengers traveling from Stansted to Newquay who eventually diverted to Malaga.

One thing that was consistently described by passengers was that parts of the flights and the attempted landings were some of the most unnerving they'd ever experienced, due to turbulence.

Turbulence results from uneven air movement, which is increasing in frequency. If you turn your hair dryer on at home and hold it still, the air moves at a constant rate, but once you begin drying your hair and moving the hairdryer around, the air movement becomes uneven, that is to say, turbulent.

Although turbulence may be unnerving and make you feel unwell, it is important to recognize that it is very common and typically nothing to worry about if you're in your seat with your seatbelt fastened.

How the body detects and responds to turbulence

The body recognizes itself within any environment. Its relationship with objects in terms of distance and direction is called spatial orientation.

When flying, this is typically moving forwards, ascending, some turns and a descent. However, turbulence disrupts this relationship and confuses the sensory information being received by the brain—it makes the body want to respond or recalibrate.

Our inner ears play a pivotal role in all this. It consists of complex apparatuses that undertake more than hearing. These include the cochlea, three semi-circular canals, the utricle and the saccule.

The cochlea is responsible for hearing. It converts sound energy into

electrical energy that is then "heard" by the brain. The remaining structures are responsible for the balance and position of the head and body. The semi-circular canals are positioned in a vertical (side to side), horizontal and front-to-back plane, detecting movement in a nodding, shaking and touching ear-to-shoulder direction.

Attached to these canals are the utricle and saccule, which can detect movement and acceleration.

All of these apparatuses use microscopic hair cells in a specialized fluid called endolymph that flows with the head to create a sense of movement. When the plane encounters turbulence, this fluid moves around, but unpredictably. It takes about 10 to 20 seconds for the fluid to recalibrate its position, while the brain struggles to understand what is going on.

When the aircraft hits turbulence, the balance apparatus cannot distinguish the movement of the plane from that of the head, so the brain interprets the aircraft movement as that of the head or body. But this doesn't match the visual information being received, which causes sensory confusion.

The reason the inner ear causes so much confusion is because during flights you are devoid of your primary sensory tool relative to the external environment—your sight and the horizon.

Eighty percent of spatial information comes from your eyes during flight. However, you only have the seat in front of you or the cabin as a reference point, which means your inner ear becomes the dominant sensory message to the brain during turbulence and disrupts the "vestibulo-ocular reflex". This reflex keeps your vision aligned with your balance or expected position.

Vision is the most valued of the senses and one-third of the brain is attributed to its function, reinforcing its importance in spatial orientation.

This sensory mixed messaging often results in things like dizziness and sweating as well as gastrointestinal symptoms, such as nausea and vomiting.

Motion sickness can be triggered by turbulence and although research into specific airsickness is limited, other modes that induce motion sickness suggest that women are more susceptible than men, particularly in the early stages of the menstrual cycle.

The turbulence also causes an increase in your heart rate, which is already higher than normal when flying because of a decrease in oxygen saturation.

What about the pilots?

Commercial pilots accrue thousands of hours at the controls, they are subject to the same forces as the passengers.

Over time, they can adapt to these forces and experiences, but they also have a couple of additional resources that most passengers don't.

They have the view out of the cockpit windows, so have a horizon to use as a reference point and can see what lies immediately ahead.

If it is cloudy or visibility is low, their instruments provide additional visual reference to the position of the aircraft. This doesn't mean they are immune to the effects of turbulence, with some studies reporting up to 71% of trainee pilots reporting episodes of airsickness.

How to reduce the discomfort

A window seat can help, or even looking out the window. This gives the brain some sensory information through visual pathways, helping calm the brain in response to the vestibular information it is receiving.

If you can get one, a seat towards the front or over the wing reduces the effects of turbulence.

Deep or rhythmical breathing can help reduce motion sickness induced by turbulence. Focusing on your breathing calms the nervous system.

Don't reach for the alcohol. While you may feel it calms your nerves, if you hit turbulence it's going to interfere with your visual and auditory processing and increase the likelihood of vomiting.

If you suffer from motion sickness and are worried about turbulence while flying, then there are also drugs that can help, including certain antihistamines.

Finally, it's important to remember that although turbulence can be unpleasant, aircraft are designed to withstand the forces it generates and many passengers, even frequent fliers, will rarely encounter the most severe categories of turbulence because pilots actively plan routes to avoid it.

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