

Science Focus

All you want to know about
THE SEARCH FOR ALIEN LIFE

How gravitational waves change
THE WAY WE SEE THE UNIVERSE

Behind the scenes of
CHRIS PACKHAM'S EPIC SERIES

THE SECRET LIFE OF DOGS

THE NEW SCIENCE REVEALING WHAT OUR BEST FRIENDS THINK AND FEEL

PLUS
How to make your dog happier, according to science

SF
SCIENCEFOCUS.COM

40

ISSUE #394 SUMMER 2023
UK £5.99 US \$12.99 CAN \$14.99
AUS \$14.50 NZ \$19.99

IN THIS ISSUE — Artificial Intelligence	Psychology	Health
What happens when AI art eats itself?	Why we trust confidence over competence	The risks and rewards of becoming an older father



MEDICINE

SCIENTISTS DISCOVER WHY SPACE TRAVEL WEAKENS ASTRONAUTS' IMMUNE SYSTEMS

Astronauts routinely break out in rashes or get ill while aboard the International Space Station. Now we know why

A new study shows that space travel changes how the genes in our white blood cells work, preventing them from recognising and combating infections.

“These results are important considerations of the risks to health during spaceflight and space exploration,” Myles Harris, coordinator of the Space Health Risks Research Group at University College London, who was not involved in the study, told *BBC Science Focus*.

The study, published in *Frontiers in Immunology*, describes how the rapidly decreasing strength of our immune systems in space is likely caused by a phenomenon

“It’s thought that this fluid shift alters the expression of over 15,000 genes within our white blood cells”

known as ‘fluid shift’. Fluid shift involves blood plasma, which transports white blood cells around the body, moving from the lower body to the upper body due to the microgravity of being in space. It’s thought that this fluid shift alters the expression of over 15,000 genes within our white blood cells as well as the volume of both the blood plasma and the white blood cells.

But it’s not all bad news – as long as you return to Earth. Within one year of returning from a six-month stint on the International Space Station (ISS), astronauts’ volumes of white blood cells return to normal. This is why astronauts are more vulnerable to infection during their

NEUROSCIENCE

AI USES BRAINWAVES TO PERFECT YOUR PERSONALISED PLAYLIST

Your mood and energy levels may reveal your preferred musical genres to streaming services

Lady Gaga's *Bad Romance*. Beyoncé's *Crazy in Love*. Adele's *Rolling in the Deep*. They're all massive global hit songs, but what makes them so successful?

A team of researchers in the US might be on the way to finding out after they used a machine learning artificial intelligence to predict hit songs with 97 per cent accuracy.

They did it by fitting sensors to volunteers to monitor their brainwaves as they listened to 24 pop songs. The approach is known as 'neuroforecasting' and aims to record the neural activity of the participants as they experience a sound, act or feeling in parts of the brain associated with mood and energy.

Once they had the data, the team used machine learning techniques and computational models to line up the participants' neurophysiological responses to how they rated the songs. The researchers then used a machine learning algorithm to figure out what was going on.

"That the neural activity of 33 people can predict if millions of others listened to new songs is quite amazing. Nothing close to this accuracy has ever been shown before," said research lead Prof Paul Zak of California's Claremont Graduate University.

The researchers suggest that the technique may help streaming services to predict the genres and styles that listeners are more interested in.

"This means that streaming services can readily identify new songs that are likely to be hits for people's playlists more efficiently, making the streaming services' jobs easier and delighting listeners," Zak said.

The study was not without limitations. It only included a small number of songs and styles, and the sample size, ethnic diversity and age span of the participants was relatively small.

However, the team believes that the same technique could be applied in the study of other art forms.



ABOVE A blood sample is taken from Canadian astronaut David Saint-Jacques aboard the ISS

first month back on Earth. Individuals' specific recovery times are likely to depend on personal factors, but research on this has yet to take place.

The research team, from the University of Ottawa, Canada, studied white blood cell genes from 14 astronauts who had spent 4.5-6.5 months aboard the ISS. Before, during and after the flight, the astronauts had 4ml (less than a teaspoon) of blood drawn 10 times.

"A weaker immunity increases the risk of infectious diseases, limiting astronauts' ability to perform their demanding missions in space," said Dr Guy Trudel, one of the study's authors.

"If an infection or an immune-related condition was to evolve to a severe state requiring medical care, astronauts, while in space, would have limited access to care, medication or evacuation."

The next step will be designing ways to prevent immune system suppression during long-duration space flights. According to Harris, this "would also make valuable contributions to the design of personalised medicine on Earth."



Lady Gaga performs in Germany during her summer stadium tour in 2022