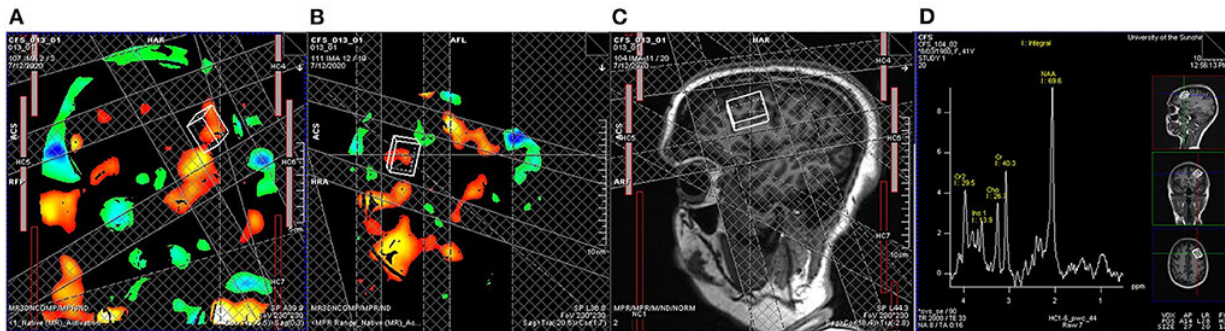


Novel brain imaging study seeks answers to chronic fatigue mystery

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Real-time task fMRI guided functional magnetic resonance spectroscopy (fMRS). A general linear model determined BOLD signal changes associated with the symbol digit modalities test implemented on the MRI scanner with a threshold of uncorrected $P < 0.001$ in Neurology (2022). DOI: 10.3389/fneur.2022.954142

Vibrant, bubbly and full of energy, 24-year-old occupational rehabilitation consultant Nadia was living her best life. Then the fatigue took hold.

Now, five years since her first symptoms of chronic [fatigue](#) appeared, she is taking part in a novel brain imaging study by the University of the Sunshine Coast seeking better, faster ways to diagnose and treat the debilitating syndrome that affects more than 24 million people worldwide.

"I find people do not understand how a twenty-something can be constantly fatigued," says Nadia, who believes an unknown virus was the trigger for her illness.

"After I recovered from that virus, I was never quite the same. I never regained my energy."

With no known cause, objective diagnostic test or cure, the study by UniSC's Thompson Institute could be the key to finally pinpointing the neurobiological origin of [chronic fatigue](#) syndrome (CFS), also known as myalgic encephalomyelitis (ME).

Lead researcher Dr. Zack Shan says the world-first research is using MRIs to track brain activity in around 300 study participants to determine how the brain controls its [blood flow](#) to match its energy needs, to better understand the disease process of fatigue-related illnesses.

Healthy volunteers may hold the key

As well as ME/CFS, the study is seeking participants with long-COVID and fibromyalgia, a [chronic condition](#) causing muscle and bone pain, as well as fatigue, sleep, memory and mood issues.

Healthy volunteers who lead mostly sedentary lives are also vital to the study, to allow researchers to compare [brain activity](#) in people with ME/CFS and fibromyalgia from non-sufferers.

"This allows us to analyze and gain insights from the vast amount of information brain imaging provides about how specific areas of the brain differ between people with and without fatigue conditions," Dr. Shan said.

"If we can determine the factors that cause [chronic fatigue syndrome](#), including a neuromarker or biological indicator—for both ME/CFS and fibromyalgia, we can help diagnose them faster," he said.

"This could benefit the design of biologically based therapeutic interventions and reduce patients' frustration by providing an accepted definite cause for their symptoms."

Identifying abnormal patterns in brain power

Dr. Shan said that although the causes of ME/CFS and fibromyalgia remain unresolved, the well-documented impacts, including profound fatigue, sleep disturbance and cognitive impairments suggest that abnormal brain function plays a crucial role in the underlying disease process.

The brain accounts for 20% of total body energy consumption but has limited or no energy reservoir. Normal function relies critically on the timely matching of local blood flow to neural energy demand.

The researchers believe abnormalities in this process, known as neurovascular coupling, is responsible.

To test this hypothesis, participants are given cognitive tasks during their scans to measure how their brains regulate blood flow in response, and its relationship to fatigue severity. The scans also measure changes to chemical messages in their brains as they complete mental exercises.

Dr. Shan said the results would be used to generate a [brain](#) pattern of distributed clusters that predict disease severity, potentially providing a neuromarker for predicting ME/CFS fatigue conditions.

'It takes pieces of you away'

After a long, frustrating road to her diagnosis, Nadia says the opportunity to help researchers better understand her condition is appealing and she is encouraging others to volunteer.

"This study is so important, it is leading the way for CFS research," she said.

"Overall, chronic fatigue takes so many pieces of you away. I no longer have that [energy](#) to be my normal bubbly self. I feel I'm just trying to get through each day," she said,

More participants are needed, including those with fibromyalgia, and volunteers in good health. Taking part involves questionnaires, health checks such as blood pressure and wearing an activity monitor.

Research related to the study is published in *Frontiers in Neurology*.

Those interested in participating in the ongoing study can find information [here](#).

More information: Zack Y. Shan et al, Multimodal MRI of myalgic encephalomyelitis/chronic fatigue syndrome: A cross-sectional neuroimaging study toward its neuropathophysiology and diagnosis, *Frontiers in Neurology* (2022). [DOI: 10.3389/fneur.2022.954142](https://doi.org/10.3389/fneur.2022.954142)

Provided by University of the Sunshine Coast

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