Changes in brain function persist for months in those with long COVID, study finds

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Months after COVID-19, previously infected people with persistent neuropsychiatric symptoms had abnormal brain activity during memory tests, with less activity in brain regions normally used for memory tasks,

but more activity in other areas of the brain, according to new research published in the April 26, 2023, online issue of *Neurology*.

Despite these changes and the ongoing complaints of problems with memory, concentration and fatigue, people who had COVID-19 had cognitive test scores similar to those who never had a history of COVID-19. However, people who had long COVID had greater brain activation on a working memory task compared to people without prior COVID-19 infections.

The study does not prove that COVID-19 caused the brain changes. It only shows an association.

"The greater activity occurred outside of the normal working memory brain network, where such changes are often seen in patients with brain injury," said study author Linda Chang, MD, MS, of the University of Maryland School of Medicine in Baltimore.

"These people who had COVID-19 had symptoms of fatigue and pain, and developed mental health symptoms, such as anxiety and depression, with deficits in the default mode network of the brain, and changes in brain activities in alternate brain regions to maintain function."

The study involved 29 people who had COVID-19 an average of seven months earlier and had at least one ongoing neuropsychiatric symptom. Nine of these people were hospitalized for COVID-19. The post-COVID group was compared to 21 people with no history of COVID-19 who were of similar age, health status and vaccination status.

All participants completed tests that evaluated thinking and memory skills, emotional health, movement, as well as measures for symptoms of depression, anxiety, fatigue, and pain. They also had functional MRI brain scans while they performed three tasks to evaluate their working

memory. The scans showed which areas of the brain were active during the tests.

"Even though the majority of people who had COVID-19 in our study reported ongoing problems with concentration and memory, they had scores on various tests for thinking skills that were similar to those who had no history of COVID-19," Chang said. "However, their brain activity differed from those without prior COVID-19, indicating that their brains compensated for their deficits by reorganizing the networks to maintain their performance."

However, the post-COVID group did have poorer scores on tests of dexterity and motor endurance than the non-COVID group. They also reported more negative feelings, such as anger and sadness, and more stress and lower scores for life satisfaction, as well as meaning and purpose. In addition, they had higher scores for depression, anxiety, fatigue and pain. People in the post-COVID group who had greater changes in their brain activity were more likely to have poorer scores in many of these symptom domains.

A limitation of the study was that it was conducted mainly during the delta variant phase of the pandemic in the United States, so the results do not necessarily show whether newer coronavirus variants may affect the brain similarly. In addition, since antibody testing was not performed on those who reported no prior COVID-19, it is possible that they had prior infections with no symptoms.

More information: Linda Chang et al, Changes in Brain Activation Pattern During Working Memory Tasks in People With Post-COVID Condition and Persistent Neuropsychiatric Symptoms, *Neurology* (2023). DOI: 10.1212/WNL.0000000000207309

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