A weak heart also damages the brain

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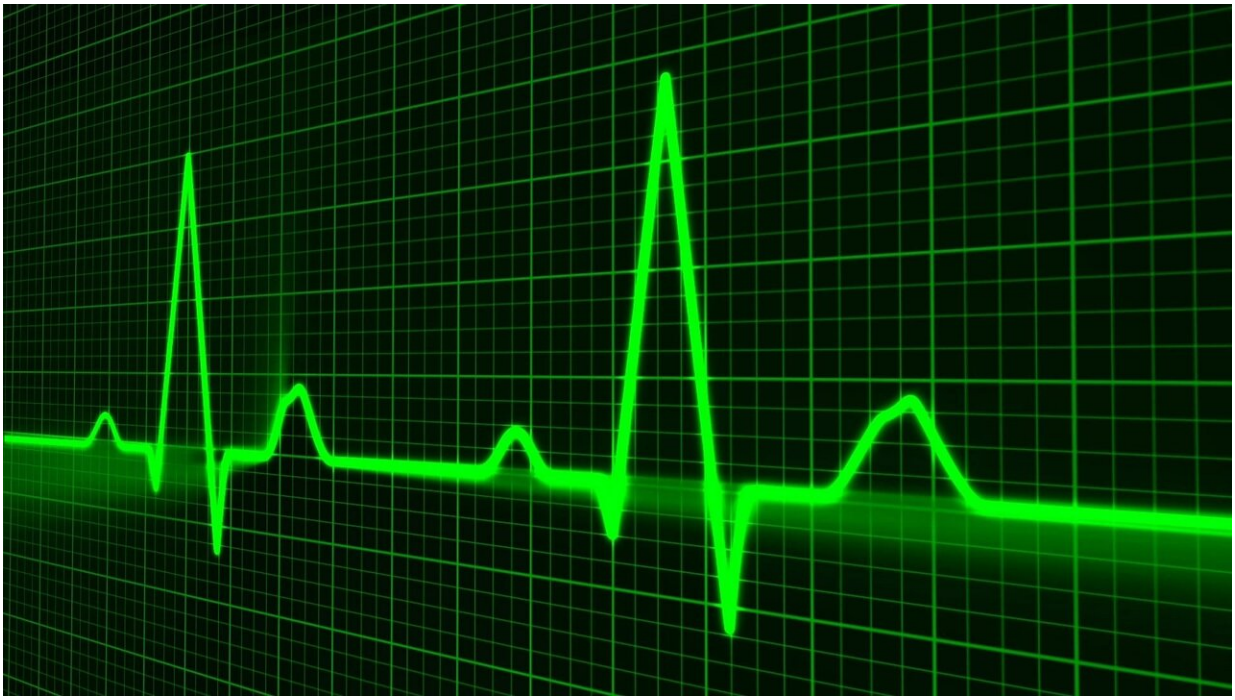

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If the heart pumps too little blood into the body, the brain is usually not adequately supplied with oxygen. Until now, however, it was unclear how this affects brain structure. Researchers at the Max Planck Institute for Human Cognitive and Brain Sciences together with colleagues from the Leipzig Heart Clinic, have now figured out that the grey matter also suffers from a weak heart.

About 1,8 billion people in Germany suffer from heart insufficiency. This does not just influence the patient's performance—they are exhausted more quickly and complain about breathlessness when under stress. It also has an impact on their brain. Scientists at the Max Planck Institute for Human Cognitive and Brain Sciences have now shown that the density of grey matter decreases. After a heart attack the damage is particularly extensive.

"The weaker the heart, the lower the density of the grey matter," says Matthias Schroeter, leader of the research group Cognitive Neuropsychiatry at the Max Planck Institute in Leipzig, about the central result of the current study. The whole frontal and parietal medial cortex and the so-called precuneus within the cortex as well as the hippocampus are particularly affected. These regions are involved in attention and memory. "A decline of grey matter in these areas could make it more likely that someone would develop Alzheimer's disease," Schroeter says.

The scientists investigated the relation between the grey matter and heart function of 80 patients at the Leipzig Heart Clinic with the help of Magnetic Resonance Imaging (MRI) scans. They examined the amount of blood that is ejected by each heart beat and the concentration of a certain hormone in the blood vessels that is known as a marker for heart insufficiency. Thereby they found a significant correlation between the level of this insufficiency and reduction in grey matter.

Grey matter processes higher mental capabilities

The grey matter of the brain is mainly composed of the neurons' cell bodies. The neurons' long ends, in contrast, form the white matter. The majority of the grey matter forms the cerebral cortex, the highly convoluted, three to five millimetre layer that sheathes the brain. Here, the higher mental capabilities of humans are processed, ranging from language to creativity.

"In the case of heart failure it's important to also take into account that the brain structure can be damaged," Schroeter explains. Previous studies had shown what best counteracts the breakdown, for example sports and social activities. "Of course, it's also crucial to treat the heart insufficiency." That means addressing the causes such as smoking, diabetes, or obesity.

More information: Karsten Mueller et al. Brain Damage with Heart Failure: Cardiac Biomarker Alterations and Gray Matter Decline, *Circulation Research* (2020). DOI: 10.1161/CIRCRESAHA.119.315813

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