

New research findings pave the way to more accurate interpretation of brain imaging data

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Functional magnetic resonance imaging (fMRI) is a technique widely used in studying the human brain. However, it has long been unclear exactly how fMRI signals are generated at brain cell level. This information is crucially important to interpreting these imaging signals. Scientists from the Academy of Finland's Neuroscience Research Programme (NEURO) have discovered that astrocytes, support cells in brain tissue, play a key role in the generation of fMRI signals.

Functional magnetic imaging has become a highly popular method in basic neurobiological research, psychology, medicine as well as in areas of study that interface with the social sciences and economics, such as neuroeconomics. fMRI imaging does not directly measure the activity of nerve cells or neural networks, but local changes in cerebrovascular circulation during the execution of certain functions. Interpretation of the measurement data obtained with this method therefore requires a close knowledge of the cell-level mechanisms that are responsible for these local changes in cerebrovascular circulation.

Studies conducted by Canadian and Finnish scientists in the NEURO programme have shown that astrocytes in [brain tissue](#) play a key role in generating the fMRI signal. Astrocytes are not nerve cells, but neuronal support or glial cells that are present in the brain in greater abundance than nerve cells. Their signals change with changes in nerve cell activity in a manner that depends on the brain's metabolic state, and the astrocyte signals thus created regulate the diameter of blood vessels in the brain thereby affecting local circulation.

Professor Kai Kaila, who is in charge of the Finnish contribution to the research programme, says the results shed valuable light on the basic mechanisms behind fMRI signals. They also make it clear that interpretation of the fMRI results is not as straightforward as is assumed.

"For example, it is generally believed that changes in fMRI signals associated with different [brain](#) diseases reflect changes in the function of [nerve cells](#) and neural networks, even though the explanation might lie in a pathological change in the characteristics and function of astrocytes. Likewise, the distinctive characteristics seen in fMRI signals measured from premature newborns is probably in large part based on the immaturity of astrocyte and blood vessel function," Kaila explains.

Source: Academy of Finland

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