Focus on the locus network with 7Tesla MRI: from normal to impaired memory

https://www.neurodegenerationresearch.eu/survey/focus-on-the-locus-network-with-7tesla-mri-from-normal-to-impaired-memory/

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Netherlands

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Focus on the locus network with 7Tesla MRI: from normal to impaired memory

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Research Abstract

The phrenological notion, that any mental process is located in one specific region of the cortex, has been replaced by the knowledge that large-scale networks underlie cognitive processing. However, clinical neuroscientific studies are now biased towards a cortico-centric perspective, disregarding important connections between cortex and brainstem. There is more to the brainstem than vital functions. Animal and pharmacological studies have taught us that the locus coeruleus (LC), a set of small noradrenergic nuclei, is crucial for memory formation. Ultra-high-field (UHF) imaging allows an accurate and detailed functional investigation of this tiny and difficult to visualize area.

I hypothesize that the LC is a crucial hub in episodic memory networks. Aging and Alzheimer?s disease (AD) affect the functional integrity of the LC network. I furthermore hypothesize that stimulating the LC alters the functional dynamics of this network.

Approach
In the first study, I will validate an associative memory task to ensure LC activation in young individuals. By using UHF susceptibility weighted and functional imaging with respiratory gating, I will be able to precisely localize the contribution of the LC to memory processes.
In the second study, I will investigate the functional dynamics of the LC with other memory networks during memory processes in healthy elderly and prodromal AD patients using effective connectivity analyses.
In the third study, I will test the neural mechanisms underlying transcutaneous vagus nerve stimulation, a technique stimulating the LC that has beneficial effects on memory, in the participants of study 2.

Potential importance
The proposed studies will provide fundamental knowledge on the functional role of specific brainstem areas to memory in healthy aging and AD. These findings can have diagnostic implications, by encouraging the use of connectivity-based biomarkers. Crucially, this project stimulates research investigating the potential of targeted neurostimulation for enhancing cognition or delaying AD onset.

Further information available at:

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