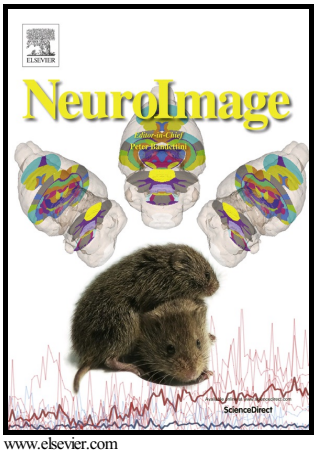

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The impact of ultra-high field MRI on Cognitive and Computational Neuroimaging

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Abstract

The ability to measure functional brain responses non-invasively with ultra high field MRI (7 Tesla and above) represents a unique opportunity in advancing our understanding of the human brain. Compared to lower fields (3 Tesla and below), ultra high field MRI has an increased sensitivity, which can be used to acquire functional images with greater spatial resolution, and greater specificity of the blood oxygen level dependent (BOLD) signal to the underlying neuronal responses.

Together, increased resolution and specificity enable investigating brain functions at a submillimeter scale, which so far could only be done with invasive techniques. At this *mesoscopic* spatial scale, perception, cognition and behavior can be probed at the level of fundamental units of neural computations, such as cortical columns, cortical layers, and subcortical nuclei. This represents a unique and distinctive advantage that differentiates ultra high from lower field imaging and that can foster a tighter link between fMRI and computational modeling of neural networks.

So far, functional brain mapping at submillimeter scale has focused on the processing of sensory information and on well-known systems for which extensive

[1] Equal contribution