Neural Plasticity

Hindawi

Special Issue on

Role of Spindle Oscillations across Lifespan in Health and Disease

CALL FOR PAPERS

Among the most exciting open questions in neuroscience is why and how sleep benefits our cognitive functions. Although the "why" remains a controversial topic, there is increasing evidence that a partial answer to the "how" may be found in spindle oscillations (~8-16Hz). Spindles are important electroencephalographic (EEG) oscillations of nonrapid eye movement (NREM) sleep and, together with slow waves (< 4Hz), form the ubiquitous hallmark of slow-wave sleep.

Spindle oscillations are central in a large variety of brain functions including somatosensory development, thalamocortical sensory gating, synaptic plasticity, and memory consolidation. "Spindle bursts," first detected around birth in rodents, participate in the activity-dependent development of the somatosensory brain maps "templates." And in adults, both rodent and human studies have provided strong evidences for a positive correlation of localized spindle power and coherence changes with memory performances and brain plasticity processes. Finally, it is noteworthy that conditions of impaired cognitive functions (e.g. aging, schizophrenia) are associated with decreased spindle activity.

Although compelling as a whole, most of those results are based on correlations and our knowledge on the underlying mechanisms at the basis of spindles' function in the brain remains elusive. What is the impact of spindles on cortical neuronal activity at the molecular, cellular, and network level? How do spindles interact with other brain oscillations and what do these couplings regulate? Are the different functions and physiological origin of spindles at different stages of development linked and how? Those are few of the many fundamental questions on spindles that remain to be addressed. Unraveling the significance and physiological substrate of these oscillations will undoubtedly further our understanding of pathologies in which spindle oscillations are impaired, thus opening avenues for potential translational research.

The purpose of this issue is to bring together original research articles and reviews on recent advances on the physiological origin and functions of spindle oscillations in cognition, health, and diseases. We especially encourage confrontation of current knowledge on spindle-like activity function(s) and regulation across lifespan in both humans and animals to promote a more integrated view on spindles functions.

Potential topics include, but are not limited to:

- Mechanisms of spindle generation
- Ontogenesis of spindle-like oscillations
- Role of spindle-like oscillations in early brain development
- Synchrony and cerebral networks associated with spindles
- Spindles and synaptic plasticity (in vivo, in vitro, and in silico)
- Role of spindles in the hippocampus-cortical dialog
- Roles of slow (<12Hz) and fast (>12Hz) spindles (humans and animals)
- Invasive (intracranial and electrophysiological) versus noninvasive (EEG and MEG) recordings of spindles in humans
- Spindles and the thalamic sensory gate (humans and animals)
- Spindle and memory (humans and animal)
- Spindles in cognition, aging, and diseases

Authors can submit their manuscripts via the Manuscript Tracking System at http://mts.hindawi.com/submit/journals/np/rso/.

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