

## Theta-based cortico-hippocampal interplay model of cognition

**Sirel Karaka**

*Dogus University, Turkey*

Cognition includes numerous mental processes representing exogenous and endogenous information processing at increasingly complex levels (Table 1). The interaction between the cortex and the hippocampus, which utilizes theta oscillation, is crucial for creating these processes. Theta is an extensively studied oscillation of the nervous system; however, a current update of specifically the cognitive-affective correlates of the theta oscillation is unavailable. The present study focuses on the theta oscillation of the hippocampal-cortical system and indicates some of the cognitive correlates of this functional architecture.

Exogenous and endogenous information that arrives from multiple cortical areas and the limbic system is exposed to a process of theta-based hippocampal binding (Table 1). Binding associates different aspects of external and internal input, leading to object perception. It also integrates perception with motor responses. Theta-based supramodal associational processing of disparate sources of information, such as in cross-modality studies, is observed in a loop between the hippocampus and multimodal tertiary association areas. The complex architecture of the hippocampus and its interrelation with cortical areas also contribute to visuospatial cognition and navigation. The association of the theta oscillation with the oscillations in the other frequency bands represents, for example, multistable visual perception. The densely interconnected and highly synchronized hippocampal-cortical interplay produces the theta-enhanced, selectively distributed parallel processing system that contributes to synchrony and hypersynchrony in the human brain. Among some of the other cognito-affective processes that this system provides are learning, consolidation, and retrieval of particularly the scripts, and scenarios that form episodic memory. A detailed investigation of the theta-based cortico-hippocampal interplay has the potential to demonstrate the impact of a holistically functioning brain on the cognito-affective processes of the human mind.

### Biography

Sirel Karaka is an Emeritus Professor of the Psychology Department at Doğuş University. She has served as an executive officer, owner, and co-founder at Neurometrika Medical Medicine Technologies Ltd. She received a Master's in Experimental Psychology and a PhD in Biophysics from Hacettepe University. Her research area is cognitive neuroscience. She owns many academic awards (e.g., SCOPUS 2007, Hacettepe University Science Award). She has standardized the first neuropsychological test battery (BİLNÖT) in Turkey. She has prepared the first internet dictionary of Psychology Terms. Prof. Sirel Karakaş plays a pivotal role as the Doğuş University Coordinator of the TÜBİTAK-KAMAG Project, a significant initiative aimed at developing a national intelligence test. Her leadership and expertise in this project have been instrumental in its success, making a profound impact on the field of cognitive neuroscience.