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Special Issue
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The Sensory-Cognitive Interplay: Insights into the Neural Mechanisms and Circuits

Sensation and cognition are pillars of human experience and interact tightly in a bidirectional and multifaceted way. As senses represent our interface with the external world, sensory inputs provide the information that founds and drives our cognitive processes. Our interaction with the world is usually multimodal, involving multiple senses simultaneously (e.g. vision, audition, smell) as well as motor aspects. Therefore, multimodal (rather than unimodal) experiences play a fundamental role in shaping our perception and cognition. High-level perception and cognitive functions such as multisensory integration, attention, memory, language, perceptual awareness, self-awareness develop upon (multi)sensory inputs since our early life experiences and are continuously updated and modulated by them. Not only senses impact on cognition but the sensory processes themselves are strongly affected by our cognitive states. Emotions, context, expectations, motivations, mental images, attentional states influence our sensory systems, e.g. by increasing or decreasing sensitivity of specific sensory channels or by blocking out some sensory inputs, thus altering how the external information flows and is processed throughout the brain. Recalling items stored in memory may even re-activate the same sensory-motor features provided by the sensory inputs during learning.

Many empirical and theoretical studies have contributed to elucidate the complex interactions between sensory and cognitive functions. However, further contributions are needed to provide insight into the neural mechanisms and networks that underpin the close sensory-cognitive interplay, potentially outlining common mechanistic principles spanning throughout the manifold aspects of this interplay. These common mechanisms may include (but are not limited to): cortical hierarchical organization (from low-level sensory areas to high-level associative areas), synaptic arrangement (feedback/feedforward), anatomical/-functional connectivity, synaptic plasticity and learning, neural competition and cooperation, top-down/bottom-up mechanisms.

We welcome both theoretical and experimental contributions that using psychophysical, electrophysiological, neuroimaging, neurocomputational modelling approaches, attempt to advance our understanding of the neural mechanisms behind sensory-cognitive intertwining. Contributions may focus on one or more among the several aspects previously cited (multisensory integration, attention, emotion, semantic memory and language, working memory, awareness) addressing them as to healthy subjects or neurological/sensory-deprived patients (e.g. Alzheimer's disease, Parkinson's disease, Autism Spectrum Disorders, Attention-deficit/hyperactivity disorder, schizophrenia, blindness, deafness, etc.).

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