Neuroplasticity: From bench to practice

Tuesday, Jun 19: 8:00 AM - 9:15 AM
2590
Symposium
Tuesday - Symposia AM

Neuroplasticity, the ability of the brain to change throughout life, contributes a dynamic and exciting avenue to the science of brain mapping. Neuroscientists are still unraveling how neuroplasticity occurs with one of the most recent findings showing how newborn neurons from neurogenesis in the adult brain weave themselves into a “new and improved” tapestry (Adlaf et al, 2017). Unlocking the secrets of constructive neuroplasticity would have great implications to ameliorate cognitive decline as well as compromised brains. The current proposed symposium hopes to provide understanding of neuroplasticity in the adult brain first from invasive brain mapping to understand connectomics and the effect of physiological defect (e.g. blindness) on the reorganization of brain networks, to non-invasive methods of cognitive and exercise training to stimulate neuroplasticity (e.g. in psychopathology and neurorehabilitation). We hope the symposium will provide a platform for discussion of the importance of neuroplasticity in brain mapping and increase interest to further research in stimulating neuroplasticity using non-invasive methods.

Reference

Elena W Adlaf, Ryan J Vaden, Anastasia J Niver, Allison F Manuel, Vincent C Onyilo, Matheus T Araujo, Cristina V Dieni, Hai T Vo, Gwendalyn D King, Jacques I Wadiche, Linda Overstreet-Wadiche. Adult-born neurons modify excitatory synaptic transmission to existing neurons. eLife, 2017; 6 DOI: 10.7554/eLife.19886

Objective

1. Attendees will learn brain connectomics based on direct electric stimulation in the awake brain that permits real-time anatomo-functional correlations
2. Attendees will learn how congenital blindness reorganize brain regions sensitive to visually-perceived body parts and their actions
3. Attendees will learn of the potential effectiveness of non-invasive paradigms that can stimulate neuroplasticity in psychopathology and neurorehabilitation

Target Audience

The symposium is suitable for students, junior to senior researchers interested in connectomics, cognitive neuroscience, social neuroscience and neurorehabilitation.

Co Organizer

Tatia Lee, Laboratory of Neuropsychology, and Laboratory of Cognitive Affective Neuroscience

Organizer

SH Annabel Chen, PhD, Nanyang Technological University

Presentations

The functional anatomy of the brain revisited: towards Connectomics and neuroplasticity (index.cfm?do=ev.viewEv&ev=1680)

Direct electrical stimulation (DES) mapping of the subcortical fibres offers a unique opportunity to investigate the functional connectivity of the brain. This original method permits real-time anatomo-functional correlations, especially with regard to neural pathways, in awake patients undergoing brain surgery. Insights on the functional connectivity underlying the sensorimotor, visuospatial, language and sociocognitive systems will be reviewed. Interactions between these neural networks and multimodal systems can also be investigated by axonal stimulation. In this

networking model of conation and cognition, brain processing is not conceived as the sum of several subfunctions, but results from the integration and potentiation of parallel—though partially overlapping—subnetworks. This hodotopical account, supported by axonal DES, improves our understanding of neuroplasticity and its limitations. The clinical implications of this paradigmatic shift from localizationism to hodotopy, in the context of brain surgery, neurology, neurorehabilitation and psychiatry, will be discussed.

Presenter

Hugues Duffau, MD, PhD, University Hospital of Montpellier

The effect of congenital blindness on body-sensitivity in the lateral occipito-temporal cortex (index.cfm?do=ev.viewEv&ev=1681)

It is well known that congenital vision loss causes massive plastic change in the early visual cortex, whereas its effect on the high-order visual cortex is not fully understood. The lateral occipito-temporal cortex (LOTC) contains regions that are sensitive to visually-perceived body parts and their actions. As the LOTC also shows body sensitivity in the tactile domain (Kitada et al., 2009), we have been investigating the effect of congenital blindness on body-sensitivity these regions. In this talk, I would like to show recent findings that congenital vision loss affects LOTC in a topographical manner (Kitada et al., 2014) and patterns of functional connectivity in the region. References Kitada R*, Yoshihara K, Sasaki AT, Hashiguchi M, Kochiyama T and Sadato N (2014) The brain network underlying the recognition of hand gestures in the blind: the supramodal role of the extrastriate body area. The Journal of Neuroscience, 34, pp. 10096-10108 Kitada R*, Johnsrude IS, Kochiyama T and Lederman SJ (2009) Functional specialization and convergence in the occipito-temporal cortex supporting haptic and visual identification of human faces and body parts: an fMRI study. Journal of Cognitive Neuroscience, 21, pp. 2027-2045

Presenter

Ryo Kitada, PhD, Nanyang Technological University

Are individuals with higher psychopathic traits better learners at lying? Behavioural and neural evidence (index.cfm?do=ev.viewEv&ev=1682)

High psychopathy is characterized by untruthfulness and manipulativeness. However, existing evidence on higher propensity or capacity to lie among non-incarcerated high-psychopathic individuals is equivocal. By employing a longitudinal design involving university students with varying degrees of psychopathic traits, we successfully demonstrate that the performance speed of lying about face familiarity significantly improved following 2 sessions of practice, which occurred only among those with higher, but not lower, levels of psychopathic traits. Furthermore, this behavioral improvement associated with higher psychopathic tendency was predicted by a reduction in lying-related neural signals and by functional connectivity changes in the frontoparietal and cerebellum networks. Our findings provide novel and pivotal evidence suggesting that psychopathic traits are the key modulating factors of the plasticity of both behavioural and neural processes underpinning lying. These findings broadly support conceptualization of high-functioning individuals with higher psychopathic traits as having preserved, or arguably superior, functioning in neural networks implicated in cognitive executive processing, but deficiencies in affective neural processes, from a neuroplasticity perspective.

Presenter

Robin Shao, PhD, University of Hong Kong

Self-Regulatory Learning for Activity Performance among Post-stroke Patients (index.cfm?do=ev.viewEv&ev=1683)

Self-regulatory training for post-stroke patients performing daily activity tasks involved chunking, appraisal and mental rehearsal. Efficacy of the training was reported in previous studies (such as Liu et al., 2009). This brain imaging study was aimed to understanding the neural mechanisms behind the effect of the self-regulatory training. Post-stroke received a two-week training according to the established clinical protocol. The experimental task involved patient subject to visualize a step of a daily task (called sub-task). The subject was to appraise and respond with “yes” or “no” to indicate whether the sub-task can be performed with available assistance during which BOLD signals were captured. There were two types of tasks: trained (as control) versus non-trained. The results revealed increased activations among patients who received training in the anterior cingulate gyrus and precuneus than those who did not receive training. When compared with normal older control, patient subjects showed increased BOLD responses in the inferior frontal gyrus. These results suggested that self-regulatory strategy adopted by the post-stroke patients involved executive control and self-referent appraisal. Reference Liu KPY, Chan CCH, Wong RSM, Kwan IWL, Yau CSF, Li LSW, Lee TMC. A randomized controlled trial of mental imagery augment generalization of learning in acute poststroke patients. Stroke. 2009; 40(6):2222-5. doi:10.1161/strokeaha.108.540997

Presenter

Chetwyn Chan, PhD, The Hong Kong Polytechnic University