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REDUCING MIND-WANDERING WITH TRANSCRANIAL DIRECT CURRENT STIMULATION AND MINDFULNESS MEDITATION

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Transcranial direct current stimulation (tDCS) can modulate mind wandering, which is a shift in the contents of thought away from an ongoing task and/or from events in the external environment to self-generated thoughts and feelings. Using functional magnetic resonance imaging (fMRI), we investigated the causal relationships among tDCS, stimulation-induced directed connection alterations within the DMN, and is part of the default mode network (DMN) that enables modulation of the internal mind wandering, perhaps facilitating rumination about drug use in addicted participants. The anodal tDCS on the right inferior parietal lobule (IPL) decreased the afferent connections of the posterior cingulate cortex (PCC) from the right IPL and the medial prefrontal cortex (mPFC). Furthermore, mediation analysis revealed that the changes in the connections from the right IPL and mPFC correlated with the facilitation and inhibition of mind wandering, respectively. These effects are the result of the heterogeneous function of effective connectivity: the connection from the right IPL to the PCC inhibits mind wandering, whereas the connection from the mPFC to the PCC facilitates mind-wandering. Then the author will present the function of different styles of meditation, focused attention meditation (FA) and open monitoring meditation (OM). We found that FA and OM are associated with different functional connectivity between the striatum and DMN regions. Finally, the author will summarize the emerging body of knowledge that suggests the benefits of mindfulness meditation on treating addiction, and different types of meditation exercises.

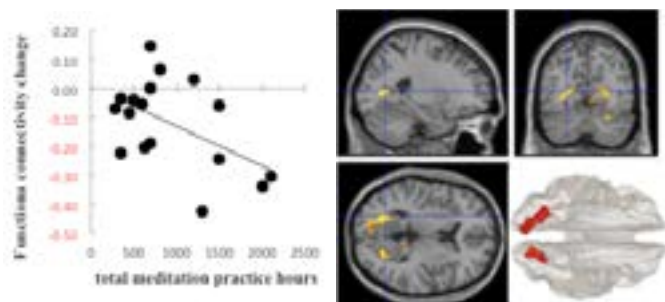


Figure 1: Relative to beginners, experienced meditators may be more free from their autobiographical memory.

Recent Publications

1. Fujino M, Ueda Y, Mizuhara H, Saiki J and Nomura M (2018) Open monitoring meditation reduces the involvement of brain regions related to memory function. *Scientific Reports* 8.
2. Takano R and Nomura M (2018) Anodal transcranial direct current stimulation of the right temporoparietal junction enhances the self-effacing bias in Japanese individuals. *Culture and Brain* DOI: 10.1007/s40167-018-0064-4.
3. Kajimura S, Kochiyama T, Abe N and Nomura M (2018) Challenge to unity: Relationship between hemispheric asymmetry of the default mode network and mind wandering. *Cerebral Cortex* DOI: 10.1093/cercor/bhy086.
4. Yanagisawa K, Kashima E S, Moriya H, Masui K, Furutani K, Yoshida H, Ura M and Nomura M (2017) Tolerating dissimilar other when primed with death: Neural evidence of self-control engaged by interdependent people in Japan. *Social Cognitive and Affective Neuroscience* 12:910–917.
5. Kajimura S, Kochiyama T, Nakai R, Abe N and Nomura M (2016) Causal relationship between effective connectivity within the default mode network and mind-wandering regulation and facilitation. *Neuroimage* 133:21-30.

Biography

Michio Nomura, PhD is an Associate Professor at the Kyoto University. He graduated from the Faculty of Technology at the Nagoya University. He contributed to the identified neural mechanisms of processing subliminally presented emotional stimuli with fMRI (functional magnetic resonance imaging) when he was a graduate student at Nagoya University. He began research on the molecular mechanisms of the brain reward system, including serotonergic systems, at Nagoya University in 2002 and continued this research at Hiroshima University (2008-2010) and the Kyoto University (2010-present). He has served as an Executive Member of the Japanese Society of Neuropsychopharmacology (JSNP) since 2009. He was awarded the Japanese Brain Science Society Young Investigator Award in 2007, the CINP Presentation Award from the JSNP in 2010, and 2011. He serves as Academic Editor of several journals, *Frontiers in Psychology* and *Interdisciplinary Education and Psychology*.

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