RGC Reference	HKU703-HSS-13
please insert ref. above	

The Research Grants Council of Hong Kong
Prestigious Fellowship Scheme under the Humanities and Social Sciences Panel
Completion Report
(for completed projects only)

Part A: Project and Award Holder

1. Project Title

The Neuroplastic Effect of Meditation on Attention and Emotion

2. Award Holder and Academic Department/Unit Involved

Name/Post	Unit/Department/Institution	Contact Information
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Part B: The Report

5. Workplan

5.2 Revised workplan

Date of approval from the RGC: October 11, 2013

Reasons for the change: Change of the date of commencement of the Fellowship programme

Time	Plan of work
Jan 2014 – Mar 2014	- Project setup and preparation - Subject recruitment - Preparation of the special issue
Mar 2014 – Jul 2014	- Data collection for this study - Data analysis - Submissions to the special issue invited - Planning for the international symposium
May 2014 – Dec 2014	- Preparation of manuscripts for journal publication - Dissemination of research findings in international conferences - Production of the special issue - Launching of the international symposium - Visits to other universities and mindfulness centres

5.3 Realisation of the workplan
(maximum 2 pages; please state how and to what extent the work as stated in the workplan has been achieved; give reasons for under-achievements and outline attempts to overcome problems, if any)

Approval from the University of Hong Kong's Ethics Committee was obtained for this longitudinal study that examined the direct effect of meditation on the brain. We recruited the proposed sample of Chinese meditation novices between the ages 25 and 49 years who were randomly assigned to either the experimental (meditation condition) or control (active relaxation) group. At each time point, all participants underwent structural and functional imaging scanning to determine changes occurred in their brain morphology and functions.

"Meditation" in this study is a combined form of focused attention meditation (FAM) and loving kindness meditation (LKM) practice, each bearing an equal weighting.

Objectives proposed were:

1. To examine whether combining experiences causes aggregated neuroplastic effects. We observed changes in both neural systems for attention and emotion processing.
2. To directly verify the cause-and-effect relationship between meditation changes in brain functions and structures.
3. To identify the long-term neuroplastic effects of meditation.

The three proposed objectives have been accomplished. We observed neural changes in systems of attention and emotion processing (Objective #1). The meditation training was effective in regulating trait anxiety symptoms. Both the right amygdala activity and left amygdala-ventral insula coupling dropped significantly during negative emotion processing. Affective dysregulation is at the root of many psychopathologies, including stress induced disorders, anxiety disorders, and depression. The root of these disorders appears to be an attenuated, top-down cognitive control from the prefrontal cortices over the maladaptive subcortical emotional processing. Meditation practice can trigger meditation-specific neuroplastic changes in the brain regions underlying cognitive control and emotion regulation, suggesting that meditation can act as a kind of mental exercise to foster emotion regulation and possibly a cost-effective intervention in mood disorders.

Findings of this longitudinal study confirm the direct cause-and-effect relationship between meditation changes in both brain structures, activity and connectivity (Objective #2). Comparing the neural data acquired during baseline, immediately post-training, and 8-week post-training, we observed a reduced synchronization in the primary somatosensory system and increased the functional coupling between the right inferior parietal lobule and right hippocampus during a resting state (Objective #3). Furthermore, there was a moderation effect of meditation on the neural–cortisol association in cortisol-sensitive brain regions.

Taken together, the findings of this study confirmed the neuroplastic effect of medication. The data carry important implications for the design of intervention programs that incorporate the cultivation of attention-based compassion for alleviating affective dysregulation.

6. Dissemination plan

6.3 Realisation of the dissemination plan
(maximum 2 pages; please state how and to what extent the output as stated in the dissemination plan has been achieved; give reasons for under-achievements and outline attempts to overcome problems, if any)

Site Visits and Conference Attendance

I have visited laboratories and mindfulness centers in Toronto, London, China. Findings of the Findings were disseminated in international meetings (e.g. Human Brain Mapping Annual Conference and Mind and Life Institute).

Publications

The following manuscripts were published during the duration of the fellowship. The support by the fellowship was duly acknowledged.

1. Lam BY, Raine A, Lee TM (2014): The relationship between neurocognition and symptomatology in people with schizophrenia: social cognition as the mediator. BMC Psychiatry. 14:138.
2. Leung NT, Lo MM, Lee TM (2014): Potential therapeutic effects of meditation for treating affective dysregulation. Evid Based Complement Alternat Med. 2014:402718.
3. Lin K, Xu G, Lu W, Ouyang H, Dang Y, Guo Y, et al. (2015): Neuropsychological performance of patients with soft bipolar spectrum disorders. Bipolar Disord. 17:194-204.
4. Shao R, Lee T (2014): Aging and risk taking: toward an integration of cognitive, emotional, and neurobiological perspectives. Neuroscience and Neuroeconomics. 3:47-62.
5. Shao R, Zhang HJ, Lee TM (2015): The neural basis of social risky decision making in females with major depressive disorder. Neuropsychologia. 67:100-110.
6. Sun D, Chan CC, Hu Y, Wang Z, Lee TM (2015): Neural correlates of outcome processing post dishonest choice: an fMRI and ERP study. Neuropsychologia. 68:148-157.
7. Wong NM, Cheung SH, Chan CC, Zeng H, Liu YP, So KF, et al. (2015): Diffusivity of the uncinate fasciculus in heroin users relates to their levels of anxiety. Transl Psychiatry. 5:e554.
8. Yesudas EH, Lee TM (2015): The role of cingulate cortex in vicarious pain. Biomed Res Int. 2015:719615.

Organization of International Symposium

The International Symposium on Applied Neuroscience and Neuropsychology (ISANN) is organized by the Laboratory of Neuropsychology, Faculty of Social Sciences of The University of Hong Kong and Caritas Hong Kong - Services for the Elderly. ISANN has provided a valuable platform for scientists and health professionals to gather and exchange knowledge on neuroscience and the neural underpinnings of our brain functions.

Other impact *(e.g. award of patents or prizes, collaboration with other research institutions, knowledge transfer, etc.)*

NA