



## 【校級神經醫學研究中心 109 年 11 月份月會】

### 會議紀錄

時間：109年11月18日(星期三) 12:10-13:30

地點：現場會議-醫綜後棟15樓第二會議室

同步視訊會議-Google Meet

主席：蔣永孝 主任 (藍亭副主任代理)

主持人：吳昌衛 副教授

## TMU Neuroscience Research Center Monthly Meeting Record for November, 2020

**Chair:** Director Y. C. Chiang

Recorded by: Professor J. Y. Wang,

**Host:** Dr. Chang-Wei Wu

Secretary C. N. Huang

**Time:** 2020/11/18 (Wednesday) 12:10-13:30

**Place:** 2nd Conference room at 15<sup>th</sup> Floor, United Medical Building (Back Building), Taipei Medical University (and net meeting via Google Meet held simultaneously).

### Meeting Agenda (議程):

1. Opening by Director Chiang
2. Forum hosted by Dr. Chang-Wei Wu

## 1. Opening

Prof. Tim Lane introduced the host, Dr. Chang-Wei Wu. Dr. Wu now is an Associate Professor at the Graduate Institute of Mind Brain and Consciousness in TMU. His expertise is sleep neuroimaging and fusion of EEG-fMRI. As before meeting, this meeting simultaneously is held with the in-person and the net meeting with Google Meet.

藍院長介紹今天的主持人-吳昌衛老師。吳老師目前為心智意識與腦科學研究所副教授，專長為睡眠神經影像、EEG 與 fMRI。本次月會除現場會議外，也同時舉辦視訊會議供不能到場的成員參加。

## 2. Forum

### 1) Introduction

Dr. Wu introduced his work about using functional magnetic resonance imaging (fMRI) to map brain functions during sleep. Sleep is a process of consciousness change. A normal human being experiences an alteration of consciousness between sleep and wakefulness every single night. But most research data about the gene, protein, cellular processes, and the systematic brain functional changes in sleep came from animal studies, not



The forum hosted by Dr. Chang-Wei Wu.

human studies. For understanding the deeper brain changes during human sleep, we used the technology that measures electroencephalography (EEG) and fMRI simultaneously. This technology can map multiple brain networks with specific cognitive functions. In this kind of strategy, they can differentiate the brain connectivity which is another popular topic in neuroimaging.

When we target the 2 brain networks inside our body, the sensory-motor network (SMN) and the default-mode network (DMN), we observed that through the progressive deepening of sleep stages, the gradual dissipation or the disruption of the brain connectivity. But in the deep sleep stages, especially in the N3, this kind of connectivity disrupted and which means that our brain seems to integrate together as the brain functions in our wakefulness. The interesting thing is that during the REM period, the EEG wave of the participant looked like awake again. Even though the observation is only from 3 participants because it's hard to sleep in an MRI machine, we can find this kind of connectivity even higher than wakefulness condition, this kind bilateral not only bilateral connectivity it's kind of the crossly brain network and kind of massive connection.



The forum hosted by Dr. Chang-Wei Wu. (11/18)

We also found another condition that people will feel dizziness, disorientation, lack of motor function, and other cognitive decline states after waking up. It lasts for about 30 minutes or longer, which depends on different people, after waking up to feel refreshed. This period is called "sleep inertia".

In 2002, Balkin used the PET to map the perfusion of the cerebral blood flow (CBF) and they found during the sleep inertia period, the human brain has dynamic changes. Most changes of CBF are filed in the prefrontal cortex, which means that in the posterior brain while this kind of perfusion changes is not that significant during the awakening period. In 2014, we also conducted this kind of observation during sleep inertia by comparing the pre-sleep and enter-sleep conditions. We found that the DMN was almost the same no matter before or after sleep. But it's different in the SMN, which was not really communicating with each hemisphere. The SMN can be still in its own function while there's no strong connectivity within the 5 minutes after awakening. And later on, we just did this kind of observation progressively because in this 2014 study we only just observed the five minutes after awakening. Since

we know the sleep inertia inference, we just continue this kind of observation to 1 hour after awakening. Fortunately, we found there be prominent sleep inertia changes in our brain activity. We saw the regional difference, for example, when the thalamus brain activity is gradually increasing during the sleep inertia period, but the insula didn't. So maybe this sleep inertia is a kind of reconnecting process and it probably took 30 minutes on average. In addition, these findings also provide a way to explain sleep disorders such as sleepwalking, narcolepsy, and chronic sleep deprivation from the cognitive domain.



The forum hosted by Dr. Chang-Wei Wu. (11/18)

## 2) Discussion

Prof. Lee also mentioned some technical problems of Dr. Wu's experiment. Because they need to do the EEG and MRI simultaneously and it takes more than 1 hour at the midnight to finish the experiment, it's hard to find the equipment which can be used for midnight. We need more support from the MOST or school for the equipment if we still need to do this kind of study. And Yang-Ming University and National Taiwan University has these kinds of equipment. Dr. Wu said the MRI machine is usually used for clinical patients, so it's hard for them to do the experiments with the MRI machine. But now they can do the EEG-MRI experiment in the Wanfang hospital because they have two MRI machines now. To solve this problem, Prof. Tim Lane announced that they have raised funds to 20 million NT dollars for a research MRI machine, but they still need more money to reach the goal.

李信謙主任補充說明因為吳老師所做的實驗需要同時使用 EEG 以及 MRI 機器，而且需要在午夜使用持續超過一小時，在目前環境下很難獲得這樣的設備跟條件進行實驗，因此若未來要能繼續進行這類的實驗，我們需要更多來自學校或科技部的支持，以取得更好的實驗環境。吳老師說明因為 MRI 機器通常會優先給臨床病人使用，因此較難用長時間提供給研究用，但目前萬芳醫院有兩台 MRI 機器，因此他們可以在萬芳醫院進行實驗。為了解決 MRI 缺乏的問題，藍亭教授表示他們目前正在為研究用的 MRI 機器進行募款，目前已募到兩千萬元。





Members discussed in the forum meeting. (11/18)

Prof. Chaur-Jong Hu shared his experience and recommend that Dr. Wu can collect RNA data from the blood of patients when they are doing the EEG recording. It's a precise way to analyze gene expression. Dr. Paola Magioncalda and Dr. Jian-Ying Chuang also discussed with Dr. Wu about his study.

胡朝榮教授分享自己的經驗並建議吳老師可以在蒐集 EEG 資料的同時，蒐集受試者的血液進行 RNA 及基因表現分析。Dr. Paola 跟莊健盈老師也有與吳老師討論研究內容。



Members discussed in the forum meeting. (11/18)

This time, some online participants said that when people asked questions, they could hardly hear anything. Therefore, please use the microphone when asking questions in a face-to-face meeting.

本次有參與線上會議的成員反映聽不清楚提問者的問題，因此希望未來各位成員在發言時記得使用麥克風。

會議結束時間為 13:30。