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出國報告（出國類別：國際研討會）

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## 第一屆腦刺激國際研討會

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## 壹、 摘要

這次會議是第一次以跨顱磁刺激儀為主題所辦的國際性研討會，來自世界各地從事相關研究的六百多位研究者，該會在新加坡舉行，為期三天(3/2-3/5)。本次赴大會於 3/3 報告與中央大學馬杰仁教授合作的研究，主題為 The parietal cortex, space and brain stimulation。報告內容有關是否手可及距離來探討後頂葉與空間視覺控制之關係，主要操弄伸手可及距離的與否，來探討動作同理心(motor empathy)之議題。報告中說明操弄是否伸手可及距離於地標作業，利用跨顱磁刺激(transcranial magnetic stimulation, TMS) 施打於刺激楔前葉 (Precuneus)(位在右側後頂葉位置)以及中央點，發現右側後頂葉會產生類似忽視現象。最後，討論 TMS 如何提供診斷及治療。此次會議的意外收穫，是認識英國 UCL 的 TMS 實驗室負責人 Prof. Vincent Walsh，一起討論目前感興趣的研究主題「TMS & Sport」，瞭解目前國內外的研究焦點。與 Dr. D. Pitcher 討論有關情緒相關的研究議題，他的研究利用 TMS 探討各種不同刺激，例如，人臉、物品或是身體軀幹在腦中的反應區域是否相同。以及同時遇到成功大學心理所所長蕭富仁老師，瞭解蕭老師目前結合 TMS 與 MRI 之研究，這都是此行相當大的收穫。此次會議行程，亦聆聽多場精彩的演講以及壁報報告，說明如下。

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## 參、 本文

### 一、 目的

這是第一次以腦刺激為主的研討會，有別於以往的認知神經科學相關的國際研討會，研究主題橫跨磁共振造影(MRI)、腦電波(ERP)、TMS 等，範圍相當廣泛，這一次的研討會聚焦於 TMS 及跨顱直流電刺激 (Transcranial direct current stimulation, tDCS)，除了安排相關的研究演講及壁報發表，更討論 TMS 及 tDCS 的實驗效果的有效性及其可信度。此外，藉由參加該研討會，進一步了解如何結合 ERP、MRI 與 TMS 等研究，了解各國學者的研究外，亦想將 TMS 應用至犯罪防治領域，做為將來防治之用。本人希冀以過去腦波研究結果為基石，結合新起且安全的 TMS 及 tDCS，做為未來研究方向。過去的研究顯示 tDCS 是安全的技術，透過微弱的電流的裝置通過大腦，誘導皮質區域活化的改變，改變受試者大腦表面膜電位神經性改變。tDCS 是良好且合適的技術影響大腦活動，瞭解其行為和認知的連結。希望藉由該研討會更深入瞭解腦刺激的神經生物機制，更希望在累積一定研究數量後，對於偵測及防範性犯罪提供一個最佳的建議，以及相關領域的合作和知識整合，同時對臺灣犯罪防治與矯正提供建議，進而共同形塑一個更好的社會環境。

## 二、 過程

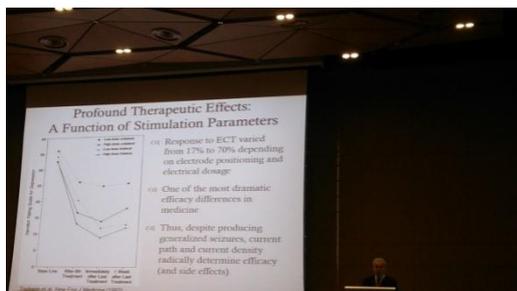
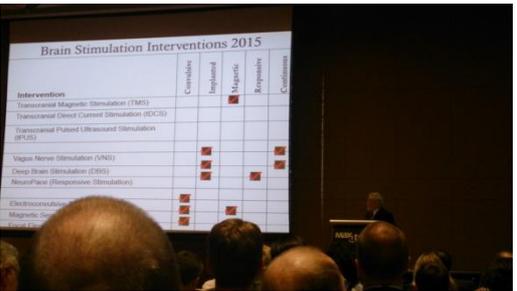
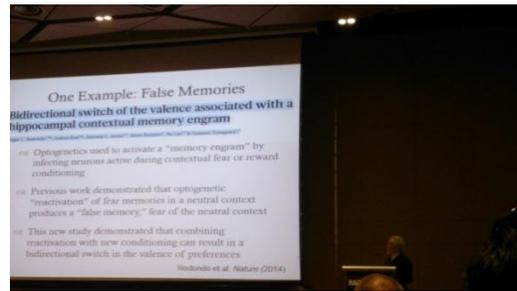
本次研討會的研究報告皆以摘要的形式投稿，經審稿者的詳細審閱後，刊登的研究論文包括口頭發表與海報式發表。透過該學術性研討會進行國際交流，深具學術價值及意涵。該會主題包含：

- (一) 概述腦刺激的基本機制(Overview of the Commonalities of the Methods, Focus on Basic Mechanisms)
- (二) 腦刺激的基本機制(Basic Mechanisms of Brain Stimulation)
- (三) 基礎神經生理學的進展(Advances in Basic Neurophysiology)
- (四) 如何使用計算模型來探討腦刺激的最佳化(How to use Computational Models to Optimize Brain Stimulation)
- (五) 使用腦刺激的方法來瞭解如何大腦工作(Using Brain Stimulation Methods to Unlock How the Brain Works)
- (六) 腦刺激在認知神經科學進展(Brain Stimulation Advances in Cognitive Neuroscience)
- (七) 以腦刺激來了解和測量腦的可塑性(Understanding and Measuring Brain Plasticity with Brain Stimulation Methods)
- (八) 腦刺激的臨床應用(State of the Art Clinical Applications of the Brain Stimulation Methods)

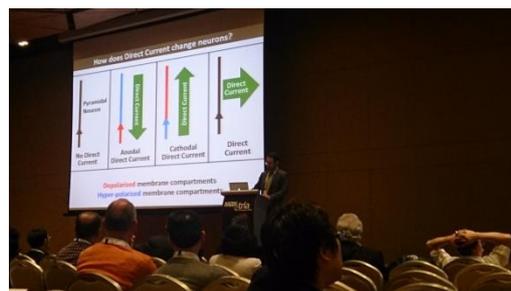
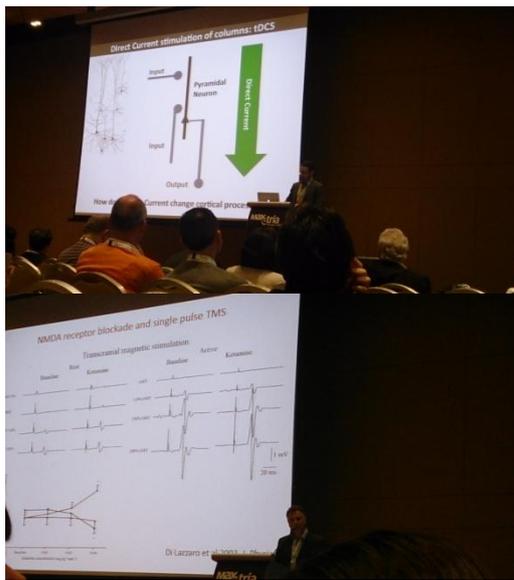
本人與中央大學認知神經科學研究所教授馬杰仁的口頭論文發表題目為「頂葉皮層，空間和腦刺激」 「The parietal cortex, space and brain stimulation」，論文發表時間為 3 月 3 日上午 9:00-9:30 腦刺激的基本機制 (Basic Mechanisms of Brain Stimulation)，該場次的主席為 Prof. Vincent Walsh，該場次共有四篇論文發表，我們被安排在第二順位報告，報告時間為 30 分鐘，與在場之學者交換研究心得，順利完成論文的發表，分享在研究過程中的心得，達到學術交流的目的，在此次的論文發表中，本人在學術上有著豐富的收穫。報告結束後，主持人 Prof. Vincent

Walsh 建議我們將研究結果投稿至國際期刊 Brain Stimulation，我已經投稿至該期刊且被接受刊登。此次大會提供最重要的資料內容包括會議議程，發表研討會的場次、時間、地點、主講人、講題內容，以及與會發表論文，在發表會場外所展示的壁報發表論文主題及時間。本研討會開會的會場在新加坡的靠近樟宜機場的會議中心內舉行。會場包括二個口頭發表場地及一個海報發表場地，壁報發表在口頭報告中間的休息時間，讓與會者有充足時間參與，口頭及壁報討論相當熱烈，本人從壁報發表中瞭解成功大學心理所所長蕭富仁老師的研究及成功大學所有的實驗設備。

Prof. H. Sackeim 在會議一開始給了一場幽默有趣的演講序曲，探討有關錯誤記憶(False memory)等有關運用磁刺激的研究趨勢。

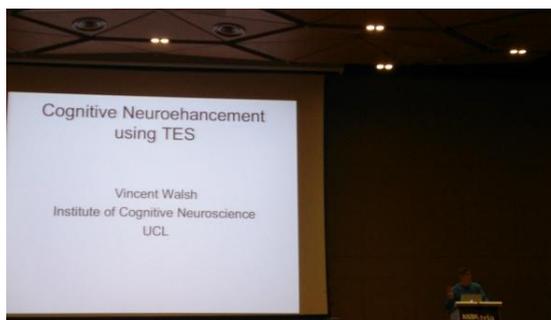


Prof. H. Sackeim 的演講主要說明磁刺激在近年的研究趨勢與數量，逐年增長。這說明該研究的重要性與未來發展。



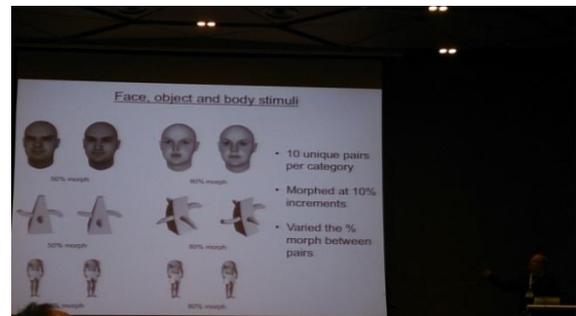
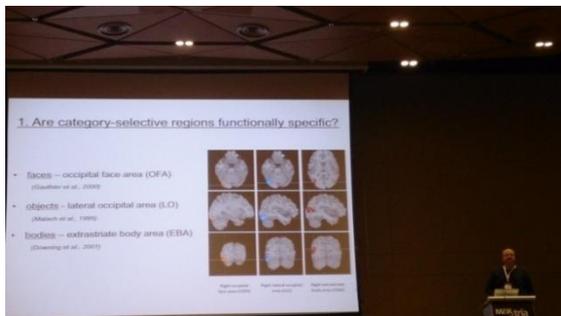
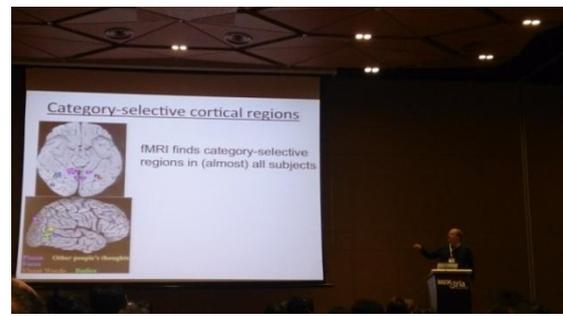
Prof. Randolph Nudo 說明磁刺激背後的神經生理機制，主要影響哪些型態的神經細胞。陽極 tDCS 導致增加皮質的興奮性，而陰極 tDCS 導致降低皮質興奮性。

在腦刺激在認知神經科學進展(Brain stimulation advances in cognitive Neuroscience)方面，Prof. V. Walsh 修改演講主題為 Cognitive Neuroenhancement transcranial electrical stimulation(TES)。主要探討 tDCS& TMS 的研究重要性及重點為何。大概因為時差的關係，Prof. V. Walsh 記錯時間而遲到，造成發表時間稍微的延誤。



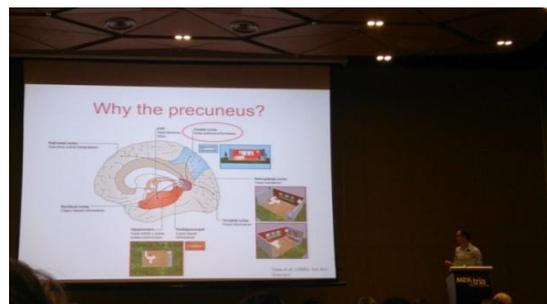
英國 UCL 的 TMS 實驗室 Prof. Vincent Walsh 演講說明磁刺激在各領域的應用性。

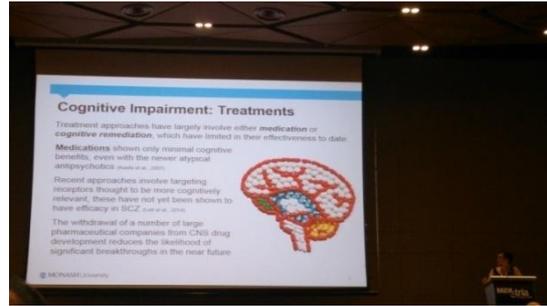
Dr. D. Pitcher 的主題是在短暫中斷認知網路：結合跨顱磁刺激和功能性磁振造影(Transient disruption in cognitive networks: combining TMS and fMRI), 探討人臉、物品或是身體軀幹是不同類別或是在腦中的反應區域也不相同?



Dr. D. Pitcher 討論有關情緒相關的研究議題，他的研究利用 TMS 探討各種不同刺激，例如，人臉、物品或是身體軀幹在腦中的反應區域是否相同。

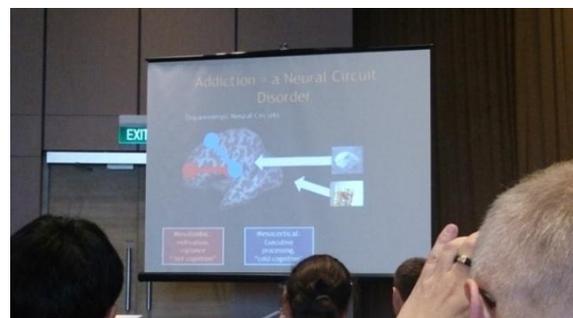
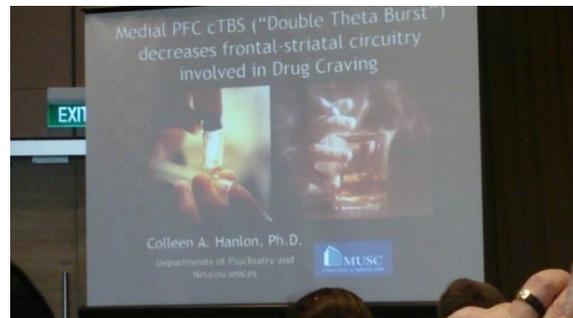
本人與中央大學馬杰仁教授合作的研究，主題為「頂葉皮層，空間和腦刺激」(The parietal cortex, space and brain stimulation)。

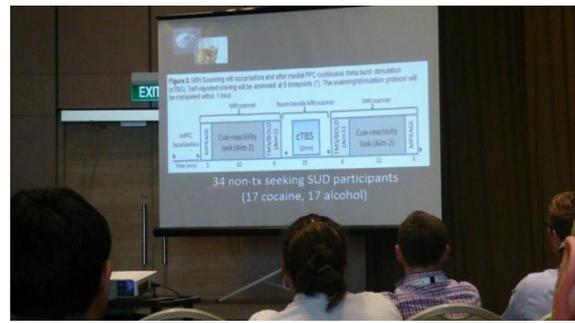
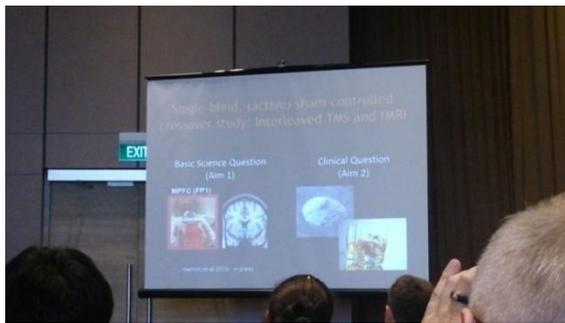
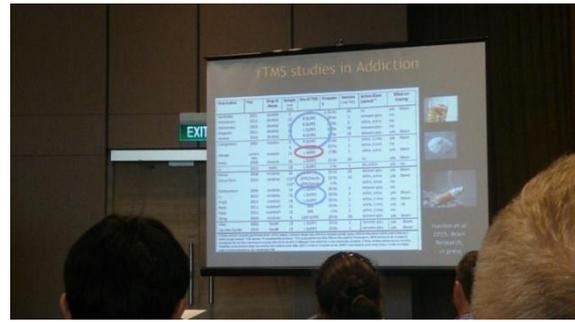




報告內容有關是否手可及距離來探討後頂葉與空間視覺控制之關係，主要操弄伸手可及距離的與否，來探討動作同理心(motor empathy)之議題。報告中說明操弄是否伸手可及距離於地標作業，利用跨顱磁刺激(transcranial magnetic stimulation, TMS) 施打於刺激 Precuneus(位在右側後頂葉位置)以及中央點，發現右側後頂葉會產生類似忽視現象。最後，討論 TMS 如何提供診斷及治療。

本人最感興趣的一場演講是 Dr. Hanlon 的研究，主題為在毒品渴求期間連續 theta 磁刺激於內側前額葉皮質額葉減低額葉-紋狀體迴路(Continuous theta burst stimulation to the medial prefrontal cortex decrease frontal-striatal circuitry involved in drug craving)。





該研究將 TMS 施打於前額葉位置 (FP1)，減低額葉-紋狀體迴路的激發，是相當不容易做的研究，容易引起受試者的疼痛。

本人聆聽部分與本人研究相關的壁報發表，由於大會禁止拍攝，因此盡量在不干擾他人情況下來記錄重要的研究。

有興趣的壁報主題包括:

- (一) 背側前額葉及認知控制的雙系統：tDCS 研究(Dorsolateral prefrontal cortex and dual mechanisms of cognitive control: A tDCS study)。
- (二) 迷走神經刺激對情緒與注意力的影響(Effect of vagus nerve stimulation on emotion-attention interaction)。
- (三) 高頻率的反覆磁刺激和巧克力零食消耗量(High-frequency rTMS and modulation of chocolate snack consumption)。
- (四) 以事件相關電位的 P300 評估電痙攣療法精神疾病患者(ECT and information processing in patients with treatment-resistant psychiatric disorders assessed by event-related potential P300)。

(五) 以 tDCS 區別下額葉和背外側前額葉在反應抑制上的功能(Dissociating the role of inferior frontal gyrus and dorsolateral prefrontal cortex in response inhibitory by TDCS)。

### Dorsolateral prefrontal cortex and dual mechanisms of cognitive control: A tDCS study

Maria Cruz Martin and Carlos J. Gomez-Ariza  
University of León (Spain)

**Introduction**

Various models try to explain the role of the DLPFC in cognitive control. The dual mechanisms model (DMM) proposes that the DLPFC is involved in two distinct processes: the inhibition of irrelevant information and the selection of relevant information. The DMM is supported by evidence from animal models and human studies. However, the role of the DLPFC in cognitive control is still unclear. This study aims to investigate the role of the DLPFC in cognitive control using tDCS.

**Experimental procedure**

Two groups of participants: sham tDCS (sham) and active tDCS (active). The active group received tDCS over the DLPFC. The sham group received tDCS over the forehead. The active group performed a working memory task. The sham group performed a working memory task. The active group performed a working memory task.

**Results**

The active group showed significantly better performance than the sham group. The active group showed significantly better performance than the sham group. The active group showed significantly better performance than the sham group.

**Conclusions**

The results suggest that the DLPFC is involved in cognitive control. The results suggest that the DLPFC is involved in cognitive control. The results suggest that the DLPFC is involved in cognitive control.

**References**

Miller, E. K., & Cohen, J. D. (2001). An integrative theory of prefrontal cortex function. *Annual Review of Psychology*, 52, 429-452.

### Effect of vagus nerve stimulation on emotion-attention interaction

Behavioral Research Unit, Department of Psychology, University of York, UK

**Introduction**

Vagus nerve stimulation (VNS) is an emerging treatment method for various neurological and psychiatric disorders. VNS is thought to modulate attention and emotion. This study aims to investigate the effect of VNS on emotion-attention interaction.

**Methods**

Participants were divided into two groups: VNS and sham VNS. They performed a task that required attention and emotion. The VNS group received VNS over the vagus nerve. The sham VNS group received sham VNS over the vagus nerve.

**Results**

The VNS group showed significantly better performance than the sham VNS group. The VNS group showed significantly better performance than the sham VNS group. The VNS group showed significantly better performance than the sham VNS group.

**Conclusions**

The results suggest that VNS modulates emotion-attention interaction. The results suggest that VNS modulates emotion-attention interaction. The results suggest that VNS modulates emotion-attention interaction.

**References**

Wang, J., & Li, X. (2018). The effect of vagus nerve stimulation on emotion-attention interaction. *Journal of Neuroscience*, 38, 1234-1245.

### High-Frequency rTMS and Modulation of Chocolate Snack Consumption

Hyeon Min Ahn, Shan Ah Kim, Eun Jung Lee, Sang Hee Kim  
Department of Brain and Cognitive Engineering, Korea University, Seoul, Korea

**Introduction**

Previous studies have demonstrated that the application of repetitive transcranial magnetic stimulation (rTMS) to the dorsolateral prefrontal cortex (DLPFC) can reduce craving for appetitive foods among those with frequent experiences of craving for food. However, whether actual consumption of appetitive foods was reduced by rTMS treatment is less clear. In this study, we investigated whether a single session of high-frequency rTMS stimulation to the left DLPFC before training to inhibit responses to chocolate stimuli would reduce subjective craving for chocolate food and also decrease the amount of chocolate snack consumption during a binge-eat test.

**Method**

**Participants**

42 healthy women (Mean age: 22.0 ± 0.82)

**rTMS Stimulation**

Intensity: 40% of rest power (0.87 ± 0.40% of M1)

Frequency: 10 Hz, Total 1200 pulses

**Binge-Eat Test**

Participants were asked to consume as much as they wished to judge the taste of the products.

**Result**

**Participants' Demography**

Age	Weight	Height	Body Mass Index
22.0 ± 0.82	52.5 ± 5.5	165.0 ± 5.0	19.5 ± 1.5

**No mood change by rTMS**

Positive Mood: 2.5 ± 0.5

Negative Mood: 2.5 ± 0.5

**Chocolate Snack Consumption**

Group	Chocolate Snack Consumption (g)
Sham	100.0
rTMS	50.0

**Summary & Discussion**

Our results indicate that chocolate snack consumption was reduced in the rTMS group as compared with the sham-control or real-control.

These results indicate that high-frequency rTMS over the left DLPFC may help attenuating impulsively restrained inhibitory control over tempting chocolate snacks and can be used as an effective tool to modulate food consumption behaviour in young women.

### ECT and information processing in patients with treatment-resistant psychiatric disorders assessed by event-related potential P300

K. Dapkin, A. Sturkate, J. Lengenauer, V. Malinina  
Department of Psychiatry, University of Vienna, Austria

**Introduction**

Electroconvulsive therapy (ECT) is an effective treatment for various psychiatric disorders. However, the underlying mechanisms of ECT are still unclear. This study aims to investigate the effect of ECT on information processing in patients with treatment-resistant psychiatric disorders.

**Methods**

Participants were divided into two groups: ECT and sham ECT. They performed a task that required information processing. The ECT group received ECT. The sham ECT group received sham ECT.

**Results**

The ECT group showed significantly better performance than the sham ECT group. The ECT group showed significantly better performance than the sham ECT group. The ECT group showed significantly better performance than the sham ECT group.

**Conclusions**

The results suggest that ECT modulates information processing. The results suggest that ECT modulates information processing. The results suggest that ECT modulates information processing.

**References**

Malinina, V., & Dapkin, K. (2018). The effect of ECT on information processing in patients with treatment-resistant psychiatric disorders. *Journal of Neuroscience*, 38, 1234-1245.

# Dissociating the role of inferior frontal gyrus and dorsolateral prefrontal cortex in response inhibition by tDCS

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### INTRODUCTION

Response inhibition is a key component of executive functions and is associated with the inferior frontal gyrus (IFG) and dorsolateral prefrontal cortex (DLPFC). The IFG is involved in the inhibition of prepotent responses, while the DLPFC is involved in the inhibition of goal-directed responses. The present study aimed to dissociate the role of these two regions in response inhibition by using transcranial direct current stimulation (tDCS).

### OBJECTIVES

The present study aimed to investigate the role of the IFG and DLPFC in response inhibition by using tDCS. The study was designed to test the following hypotheses: (1) tDCS over the IFG would improve response inhibition performance, (2) tDCS over the DLPFC would improve response inhibition performance, and (3) tDCS over the IFG would have a greater effect on response inhibition performance than tDCS over the DLPFC.

### STOP-SIGNAL TASK

Participants performed a stop-signal task. In this task, participants were presented with a sequence of stimuli (words or numbers) and were required to respond to each stimulus. However, on some trials, a stop signal (a red 'X') was presented, and participants were required to withhold their response. The stop-signal task is a well-established paradigm for measuring response inhibition.

### IDCS PARAMETERS

The tDCS protocol consisted of a 20-minute session at 2 mA. The anode was placed over the IFG (or DLPFC) and the cathode was placed over the contralateral forehead. The tDCS protocol was applied to the IFG (or DLPFC) for 20 minutes. The tDCS protocol was applied to the IFG (or DLPFC) for 20 minutes. The tDCS protocol was applied to the IFG (or DLPFC) for 20 minutes.

### IDCS MONTAGES & RESULTS

Group	IFG	DLPFC	Control
Response Inhibition (ms)	201.18	204.10	210.07
Response Inhibition (ms)	201.18	201.18	201.18
Response Inhibition (ms)	201.18	201.18	201.18
Response Inhibition (ms)	201.18	201.18	201.18
Response Inhibition (ms)	201.18	201.18	201.18

### CONCLUSIONS

The present study found that tDCS over the IFG improved response inhibition performance, while tDCS over the DLPFC did not. These findings suggest that the IFG plays a more prominent role in response inhibition than the DLPFC. The present findings suggest that tDCS over the IFG could be a useful tool for improving response inhibition performance in individuals with response inhibition deficits.

### 三、 心得及建議

此次參與在新加坡舉辦的 Brain Stimulation 研討會，最主要的收穫是參加美國南加大 Dr. Hanlon 的演講，這是在國內比較少見的研究，與來自該研究領域的研究者齊聚一堂，不但在發表會場內有交流，還會延續場內的討論到場外，難能可貴的是，除了談相關研究外，亦有交流文化的衝擊，學習不同思維、激盪出更多的研究想法，吸取別人的長處。值得一提的是，這是第一屆腦刺激(Brain Stimulation)研討會，兼備理論與實務，雖然有許多場次是以理論為主，但是部分場次，還是有許多具有應用性的論文發表以及一些與犯罪防治相關的研究。此次國際級會議，讓我了解最熱門的研究議題。聆聽大師級的演講，且有機會面對面互動請益。參與國際研討會，最大的價值之一就在於能夠得到聽者對論文的回饋，從來自現場的各種問題與看法，能夠多思考自己的研究方向與價值。目前臺灣在此領域仍屬少數，未來如何超越其他國家將是重要課題。

主辦單位舉行國際會議之經驗與整體組織能力值得臺灣學習，心中更覺得參加本次研討會的非常有意義。此次大會提供最重要的資料內容包括會議議程摘要，發表研討會的場次、時間、地點、主講人、講題內容，以及與會發表論文摘要等等，十分具有參考價值，其對於從事相關研究上亦有極大的助益。

在個人建議方面，希望多補助國內人士出國經費以鼓勵參與，同時邀請專業人士參與國內舉辦的國際級研討會。