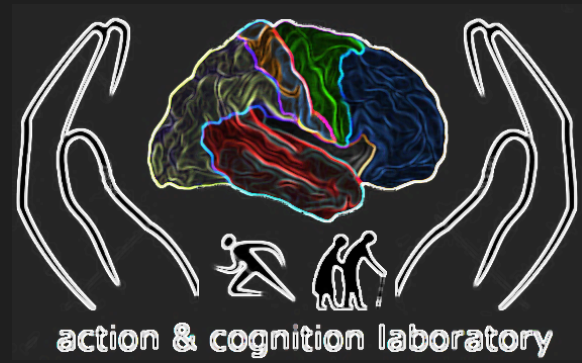
心腦同源：認知神經科學縱橫談

張智宏

中央大學認知神經科學研究所



台灣心智腦造影中心
Taiwan Mind & Brain Imaging Center

中華民國科技部 Ministry of Science and Technology, R.O.C.

執行長 / 副執行長

- 顏乃欣教授 (政治大學)
- 郭文瑞副教授 (陽明大學)

中心儀器

- 3T MRI (Skyra, SIEMENS) 搭配 12, 32, 64 頭部線圈陣列
- MR相容眼動儀、手寫板、反應鍵、搖桿等行為記錄設備

研究特色

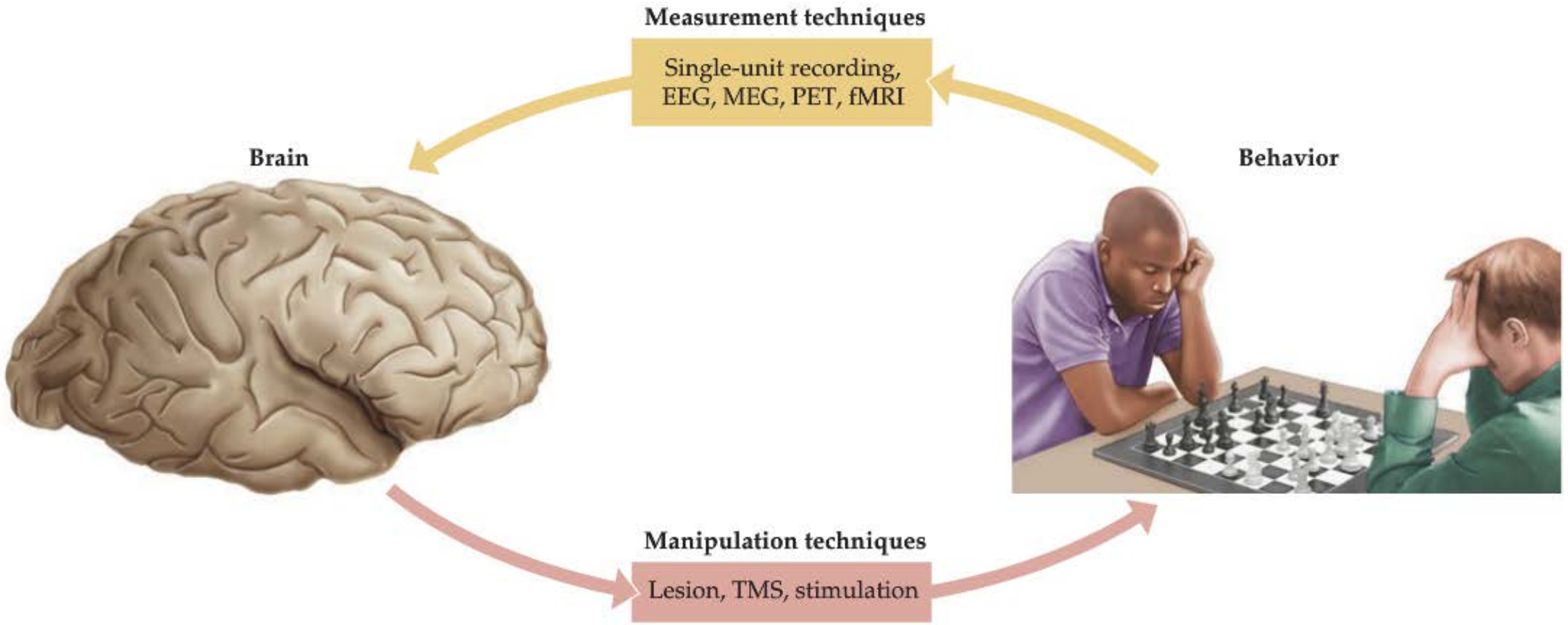
- 神經經濟學、自我意識之腦部機制、神經語言學、神經美學、運動與認知

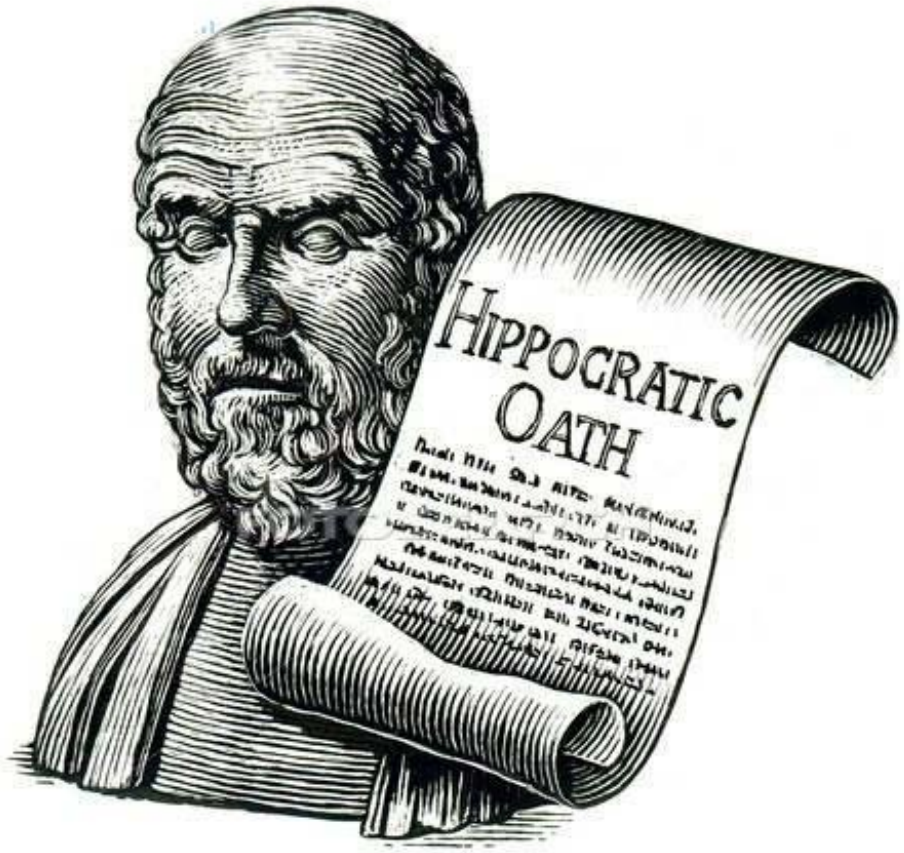
主要成就

- 申請案件已達100件
- 期刊論文22篇、研討會論文101篇 (2013-2016)

網址 http://tmbic.nccu.edu.tw

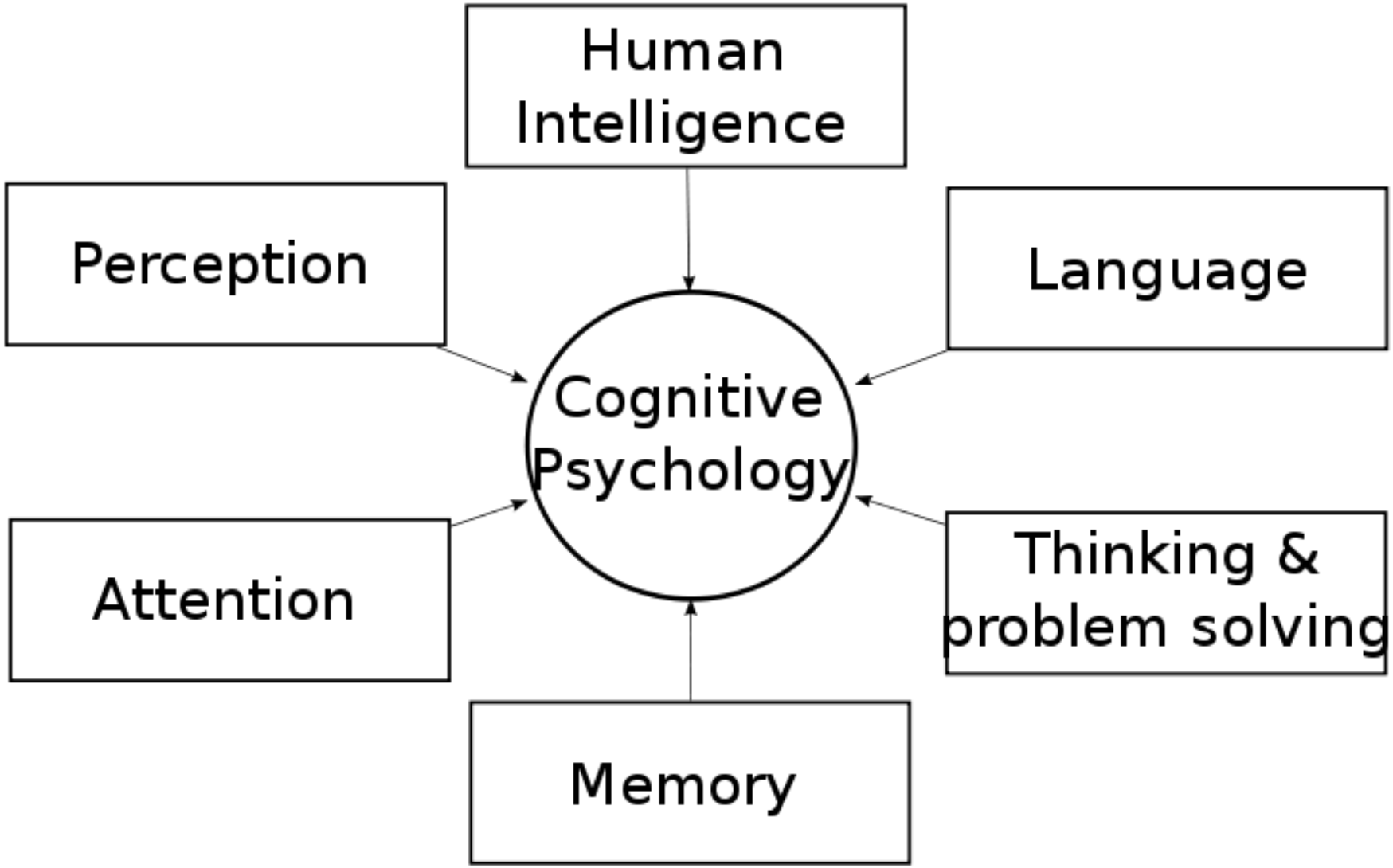
認知神經科學研究目標

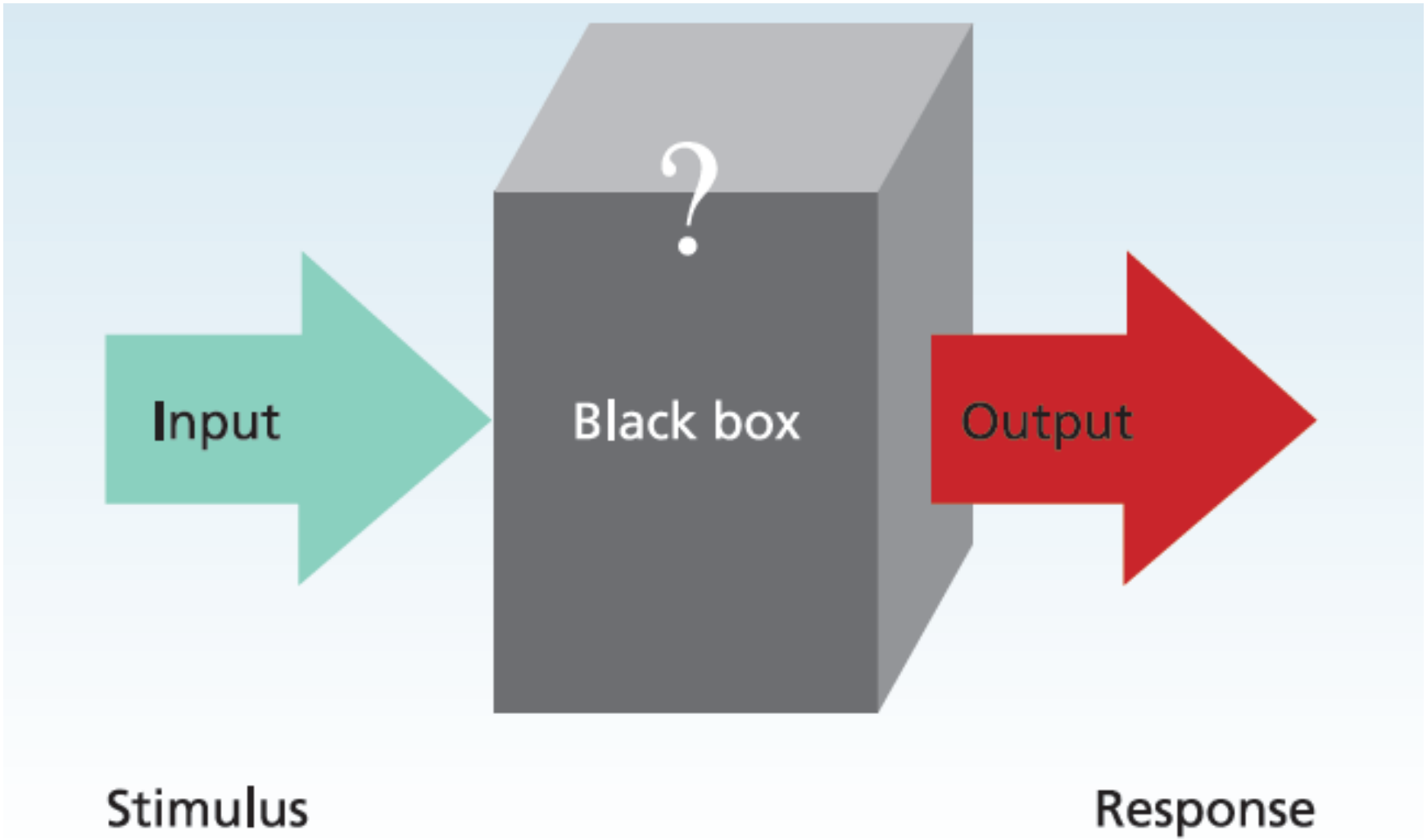

Measurement techniques
Single-unit recording,
EEG, MEG, PET, fMRI
Brain
Behavior
Manipulation techniques
Lesion, TMS, stimulation



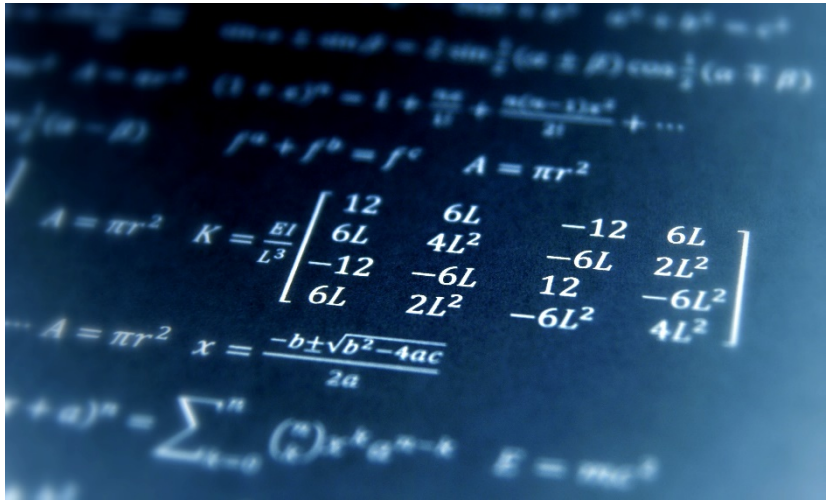
... from the **brain**, and from the brain **alone**, **arise our pleasures, joys, laughter and jokes, as well as our sorrows, pains, grief's and tears**. Through it, in particular, we think, see, hear, and distinguish the ugly from the beautiful, the bad from the good, the pleasant from the unpleasant...

Attributed to Hippocrates, 5th century BC


Human Intelligence
Perception
Language
Cognitive Psychology
Attention
Thinking & problem solving
Memory

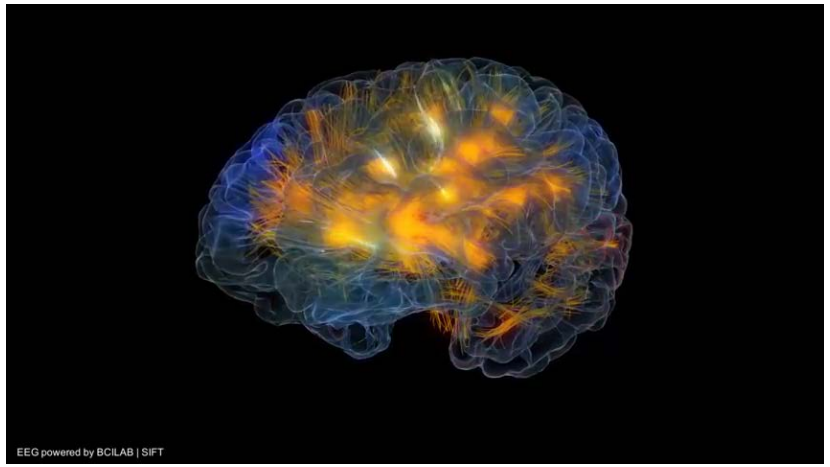

?
Input
Black box
Output
Stimulus
Response

Input



Output

Input



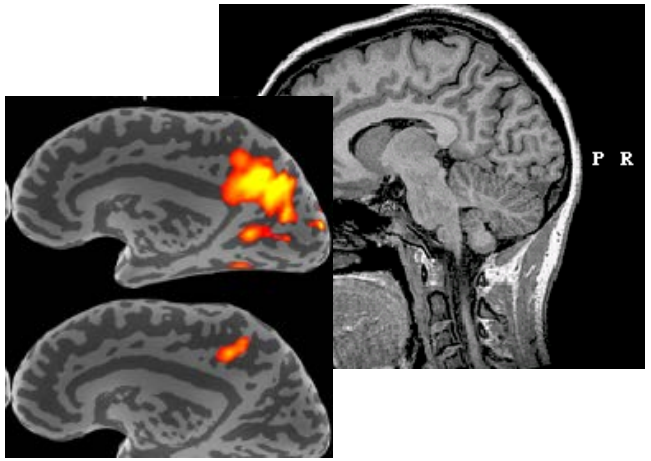
Output

Stimulus

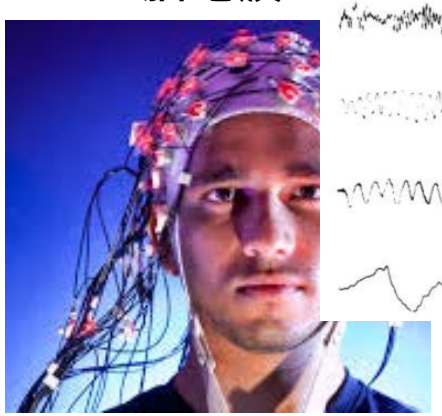
Response

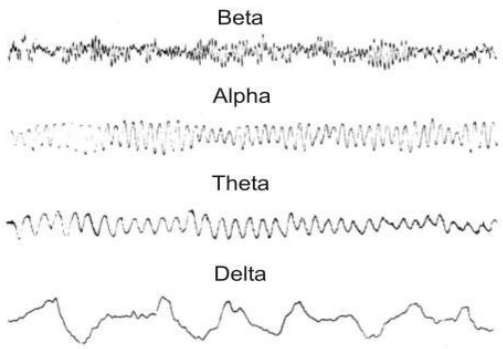
認知神經科學研究方法

腦造影

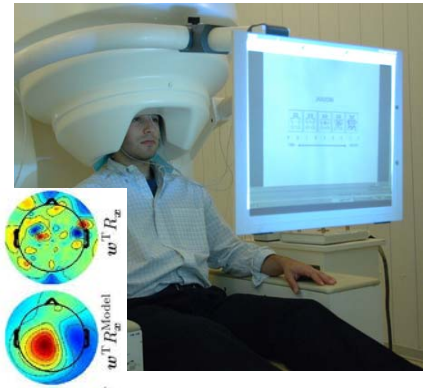


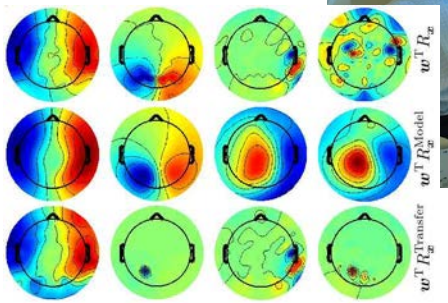
腦電波



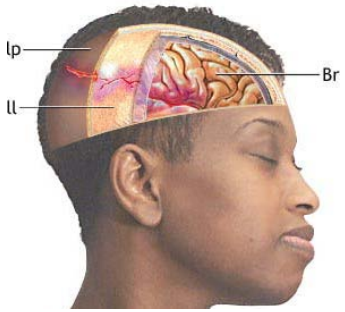


腦磁波

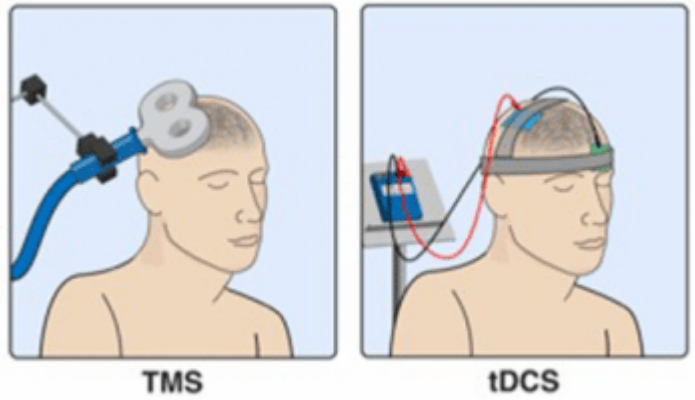




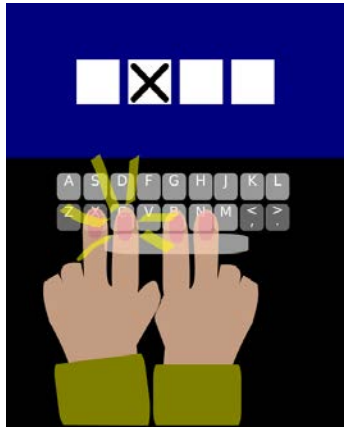
腦損傷



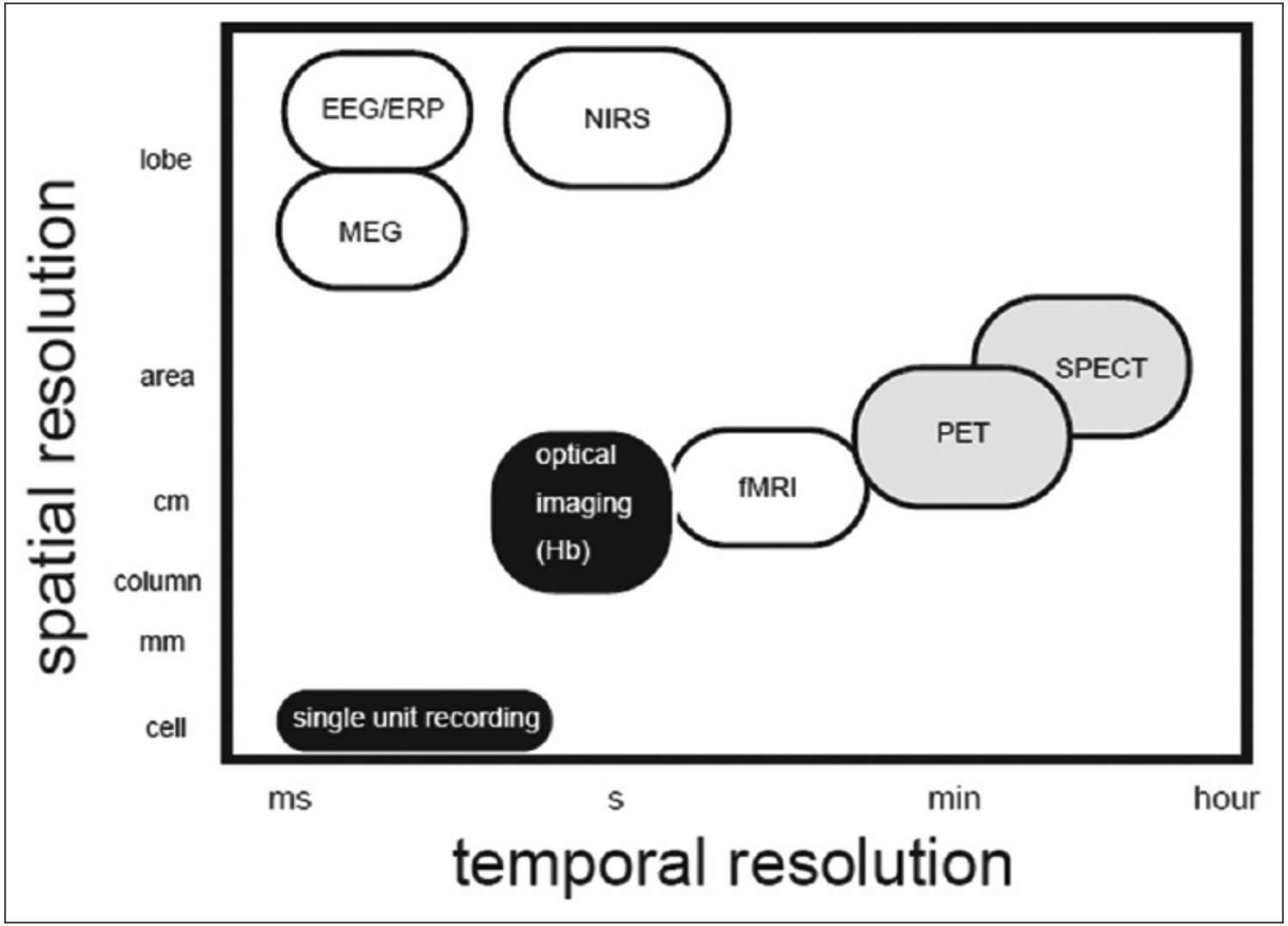
經顱電/磁刺激



行為測量

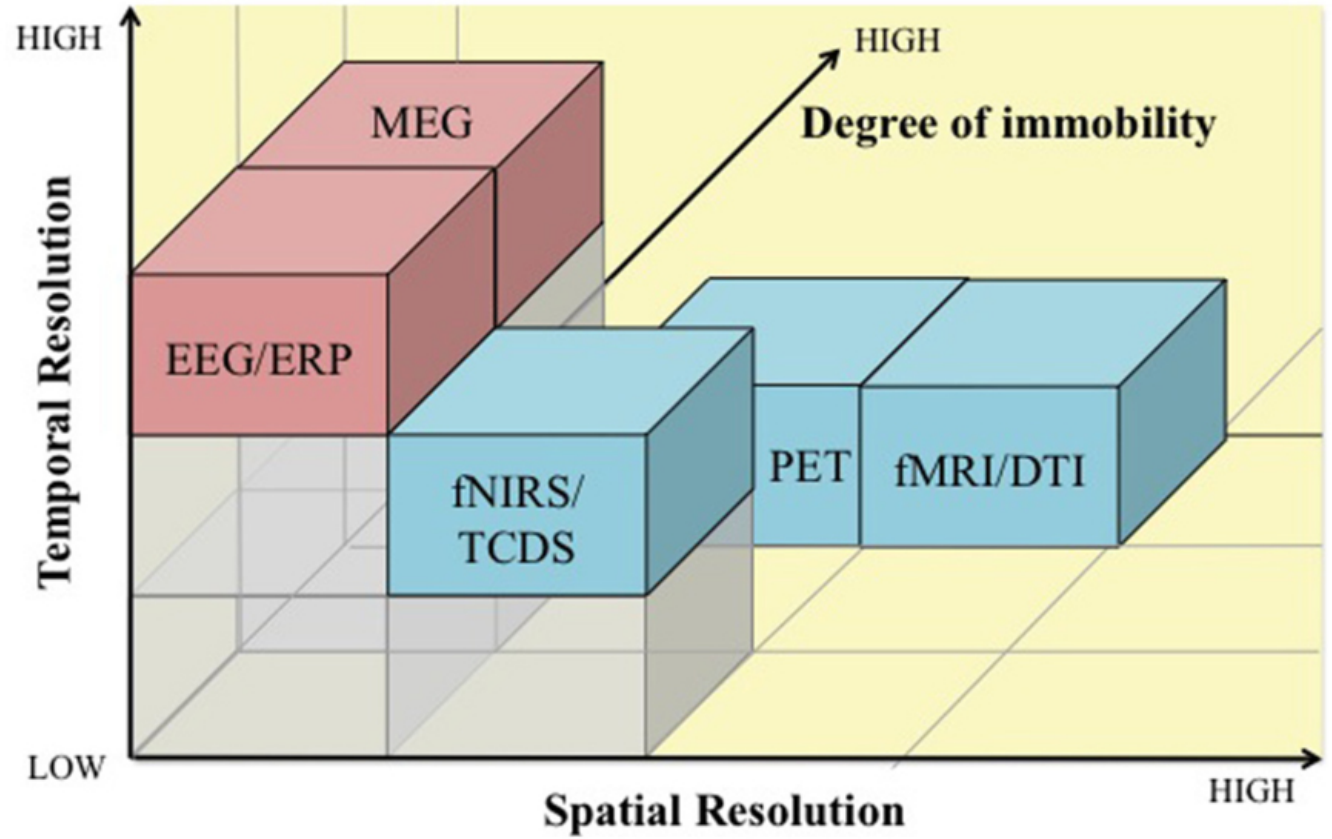


時間與空間解析度



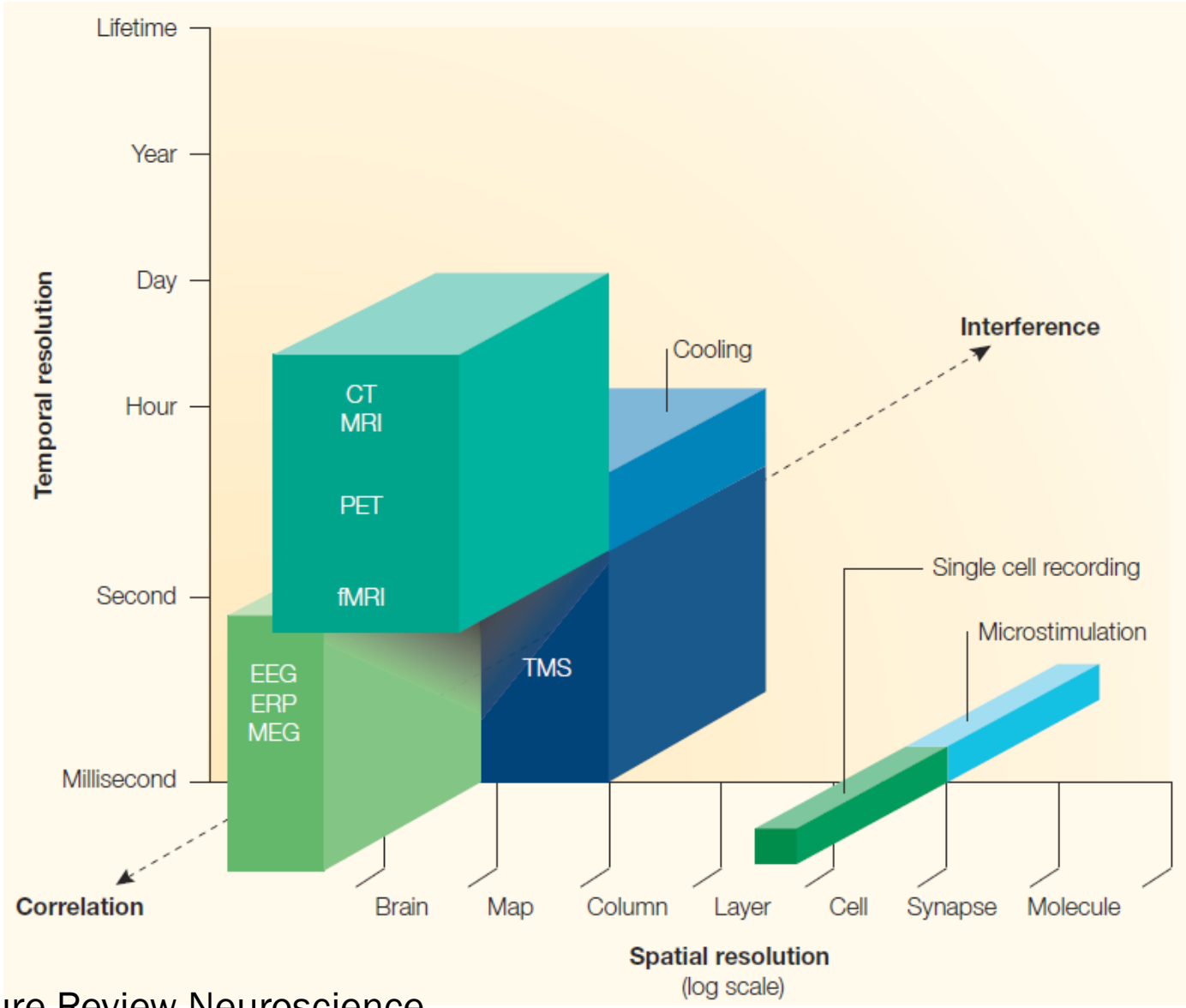
Kameyama & Jinzaki (2016). World Journal of Nuclear Medicine.

可移動性



Mehta & Parasuraman (2013). Frontiers in Human Neuroscience.

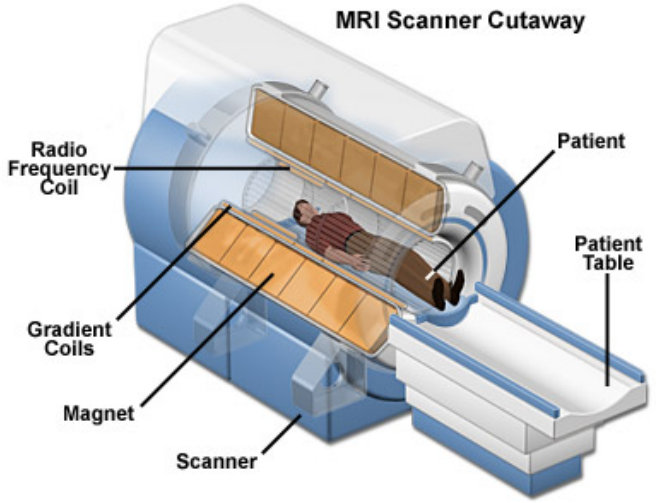
相關與因果推論



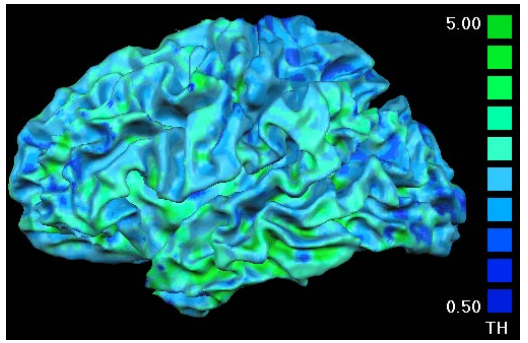
Walsh & Cowey (2000). Nature Review Neuroscience

磁振造影
Magnetic Resonance Imaging (MRI)

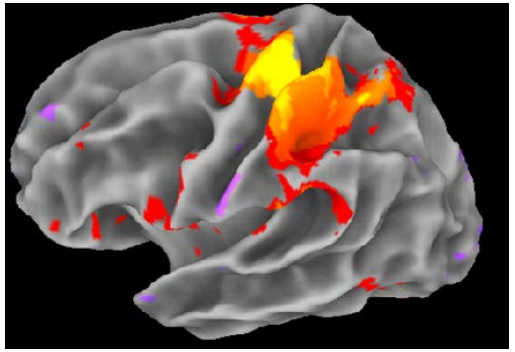
Siemens MAGNETOM Skyra
3T Scanner at NCCU



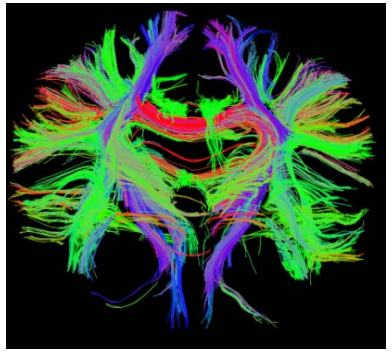
Anatomical



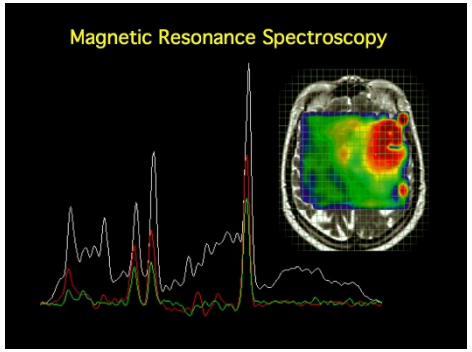
Functional



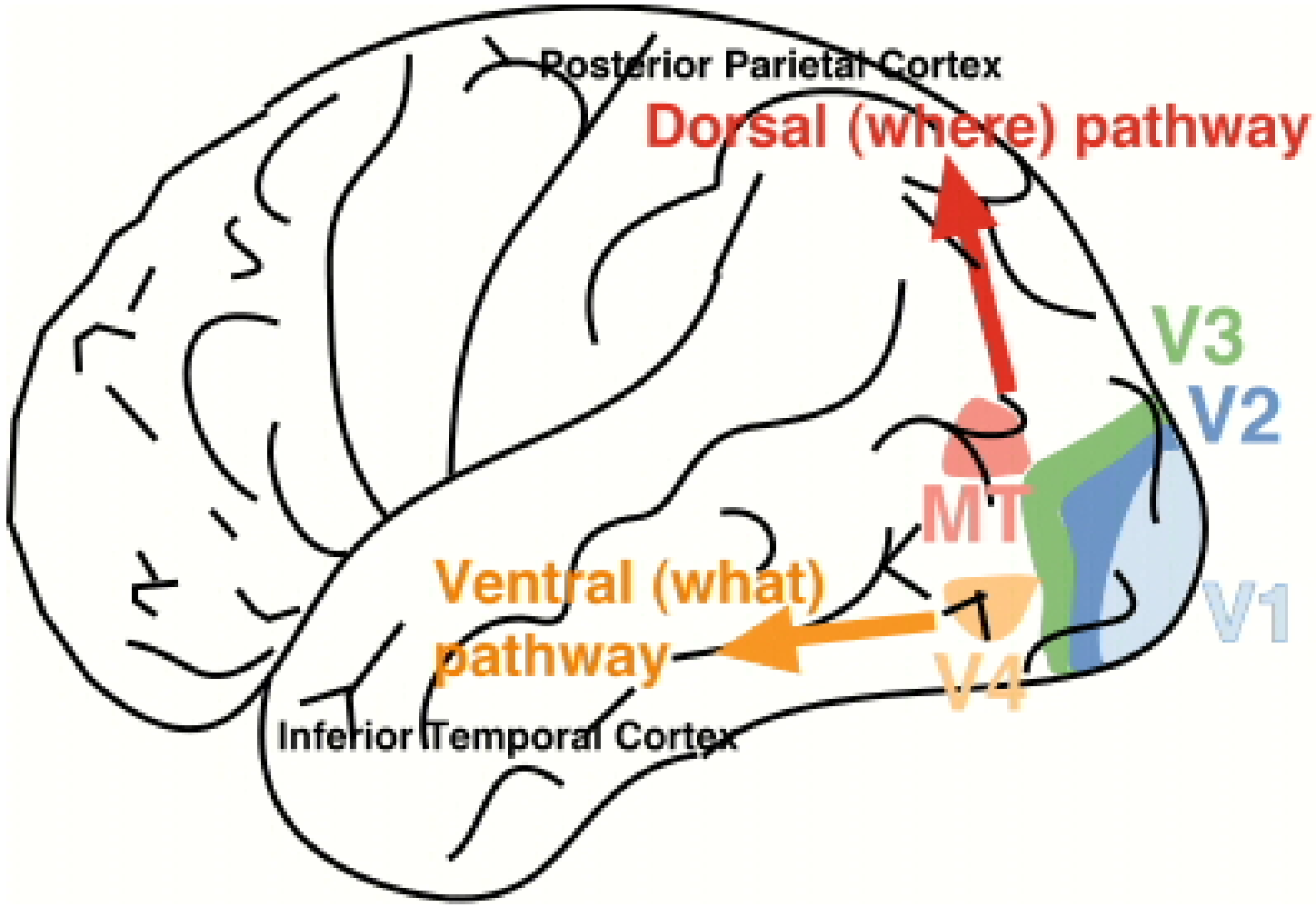
DTI



MRS

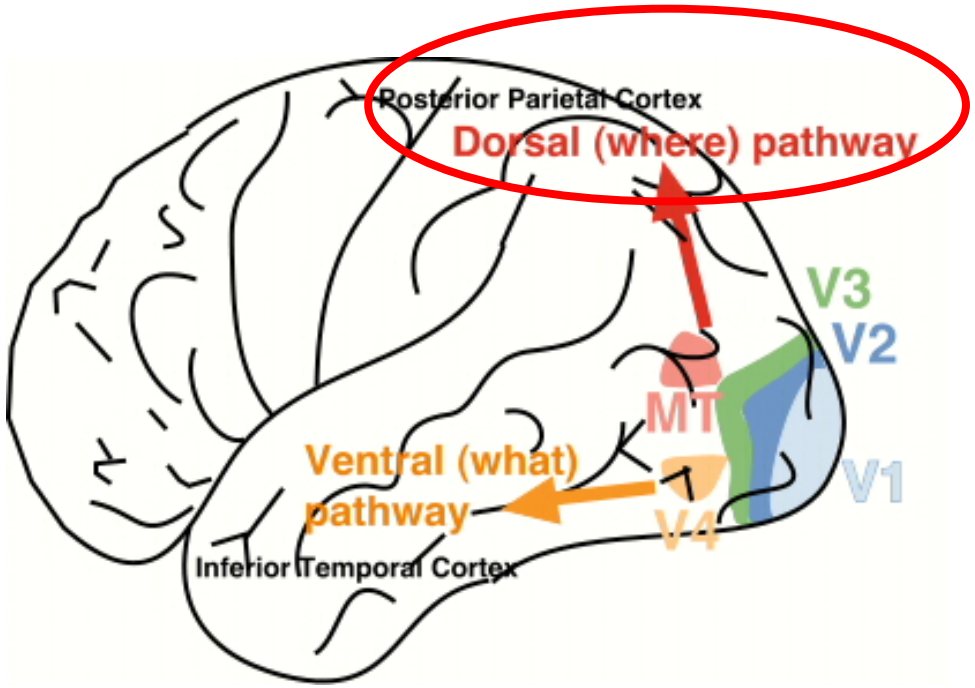


人類視覺神經系統


Posterior Parietal Cortex
Dorsal (where) pathway
V3
V2
MT
V1
V4
Ventral (what) pathway
Inferior Temporal Cortex

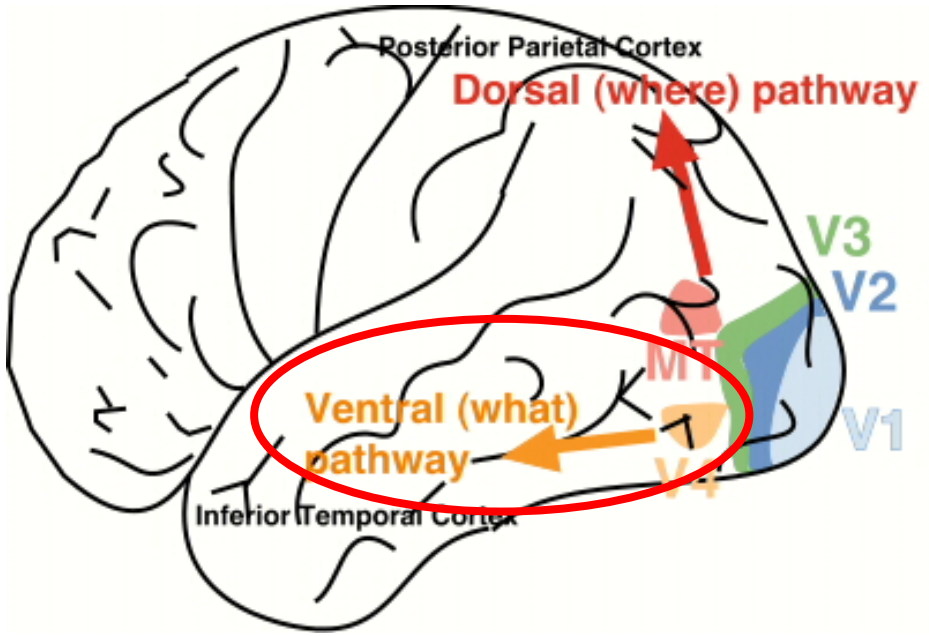
背側通路受損

- Optic Ataxia
  - 視覺性共濟失調
  - Caused by damage to posterior parietal cortex
  - Incapable of reach-for-grasp objects, but can name them and describe their functions

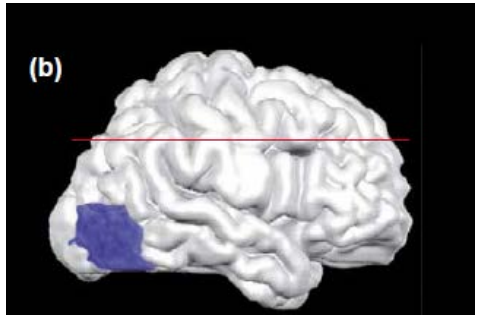


腹側通路受損

- Visual form agnosia
  - 視覺失認
  - Failure to identify familiar objects
    - But can recognize them by touching
  - Normal in verbal memory and intelligence



病人DF

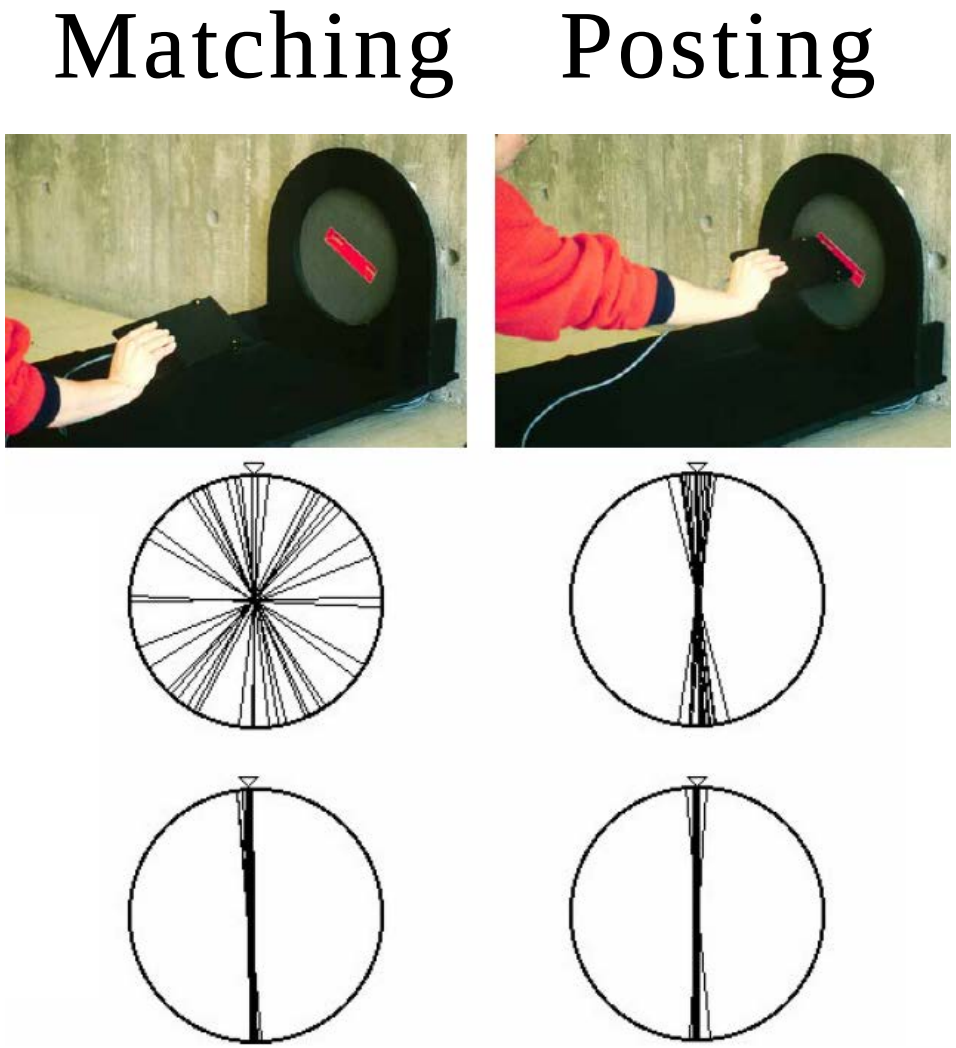


“It’s made out of metal –is it aluminium? It’s got red plastic on it.

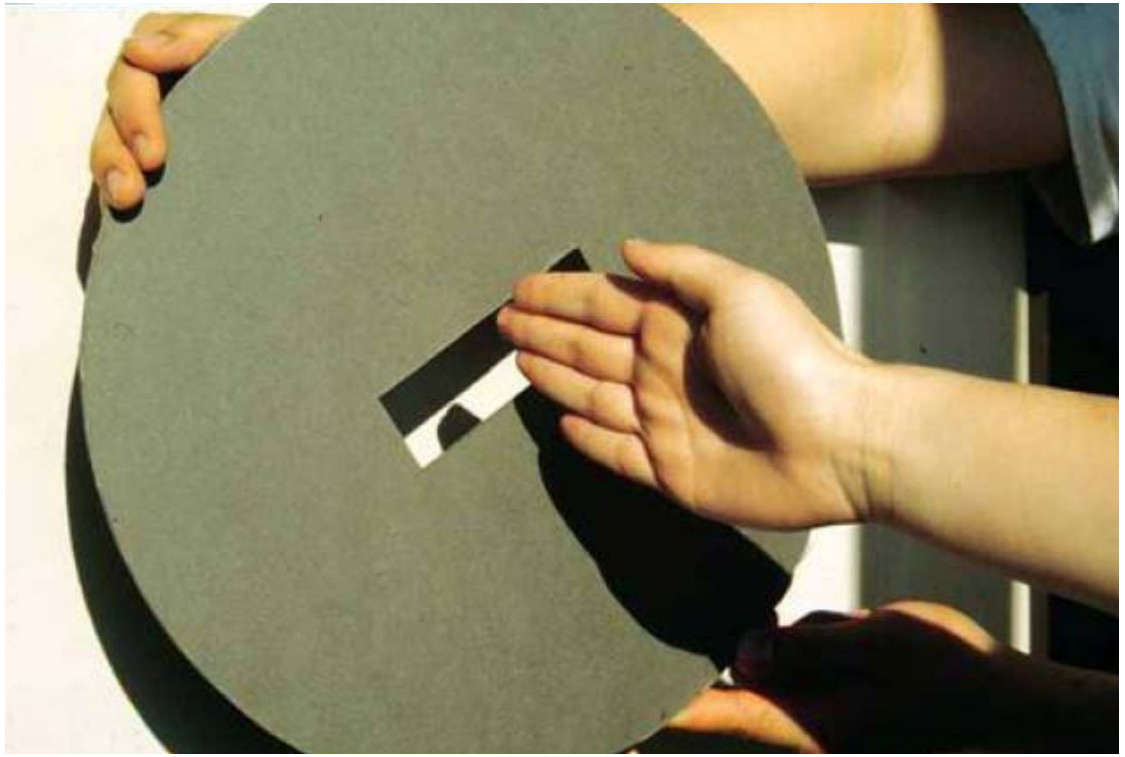
“Is it some sort of kitchen utensil?”

Humphrey, Goodale, Jakobson, & Servos (1994). *Perception*

插縫作業

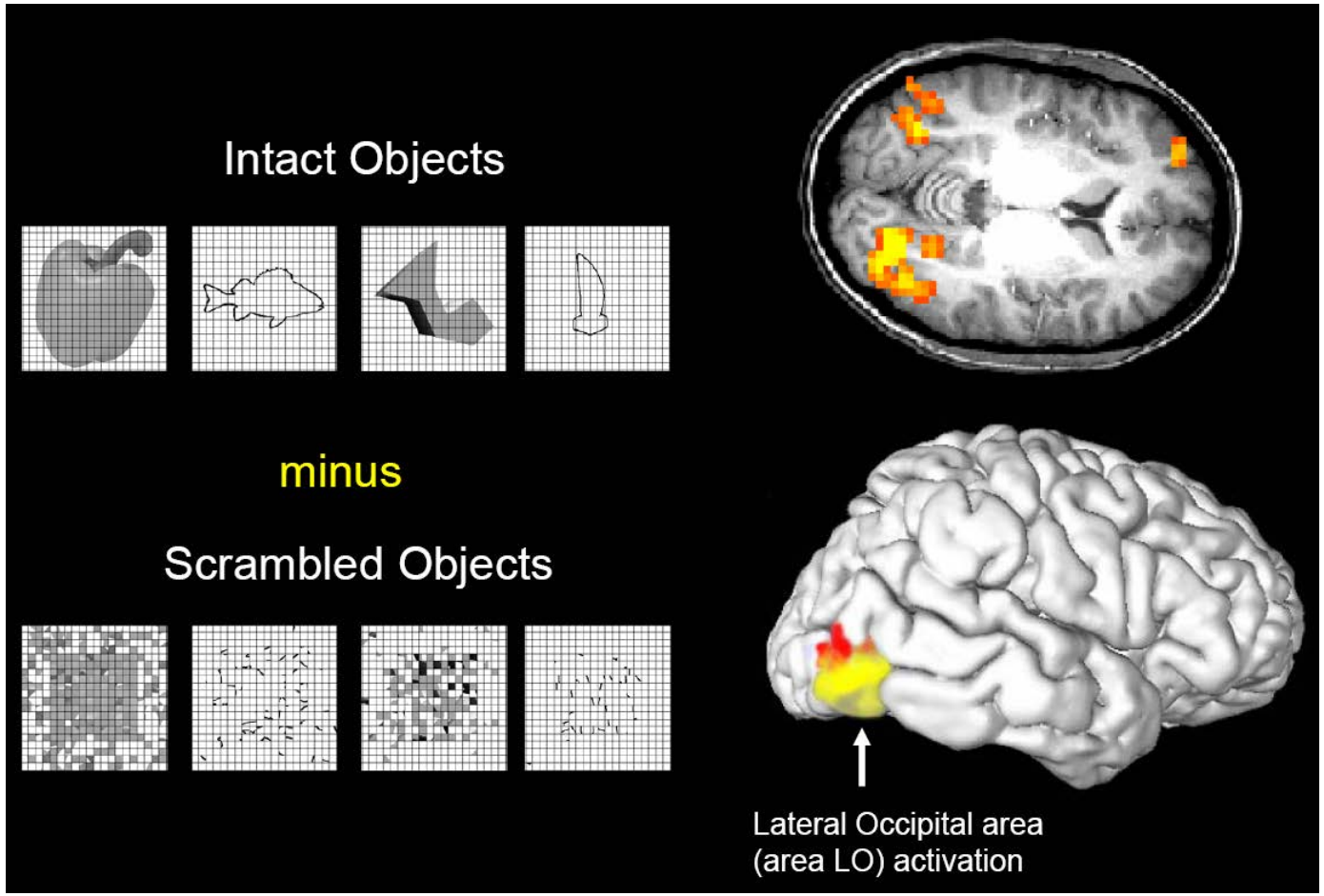


視覺性共濟失調 (Optic Ataxia)

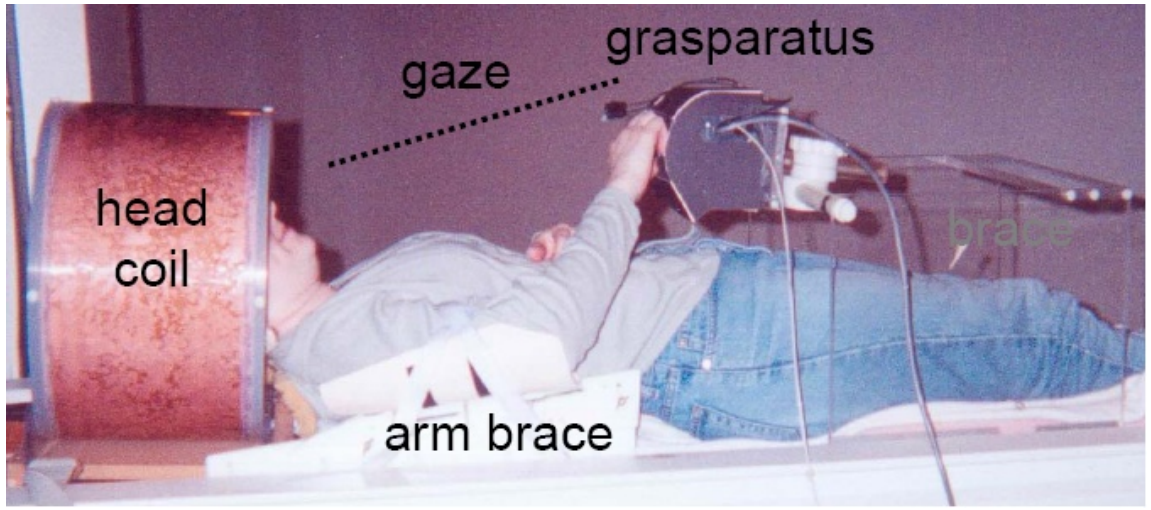


Perenin & Vighetto (1988) Brain

物體辨識腦造影研究


Intact Objects
minus
Scrambled Objects
Lateral Occipital area
(area LO) activation

伸手抓物腦造影研究

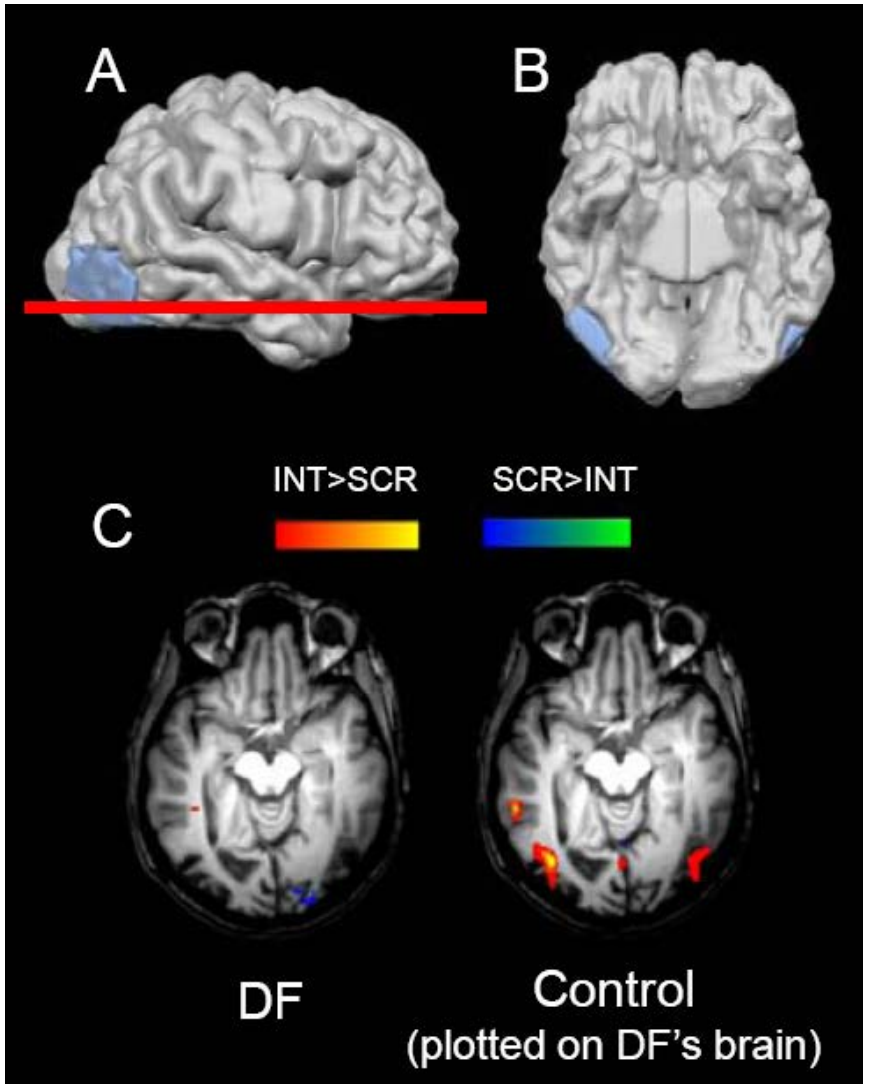


Grasping

Reaching

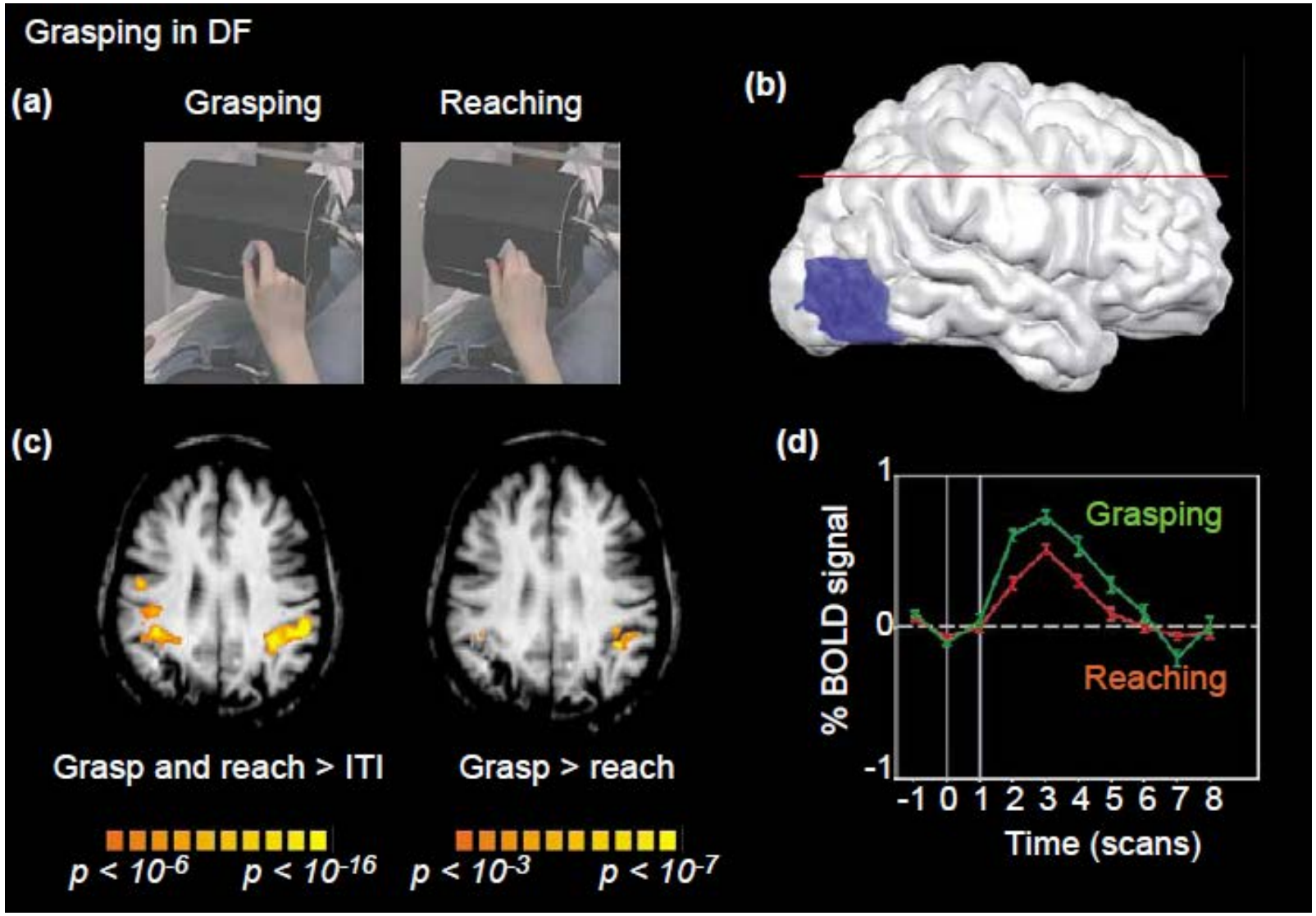
Culham, Danckert, DeSouza, Gati, Menon & Goodale (2003).Experimental Brain Research

病人DF與正常人的物體辨識腦活動



Culham et al. (2003). Experimental Brain Research

病人DF的伸手抓物時的腦部活動

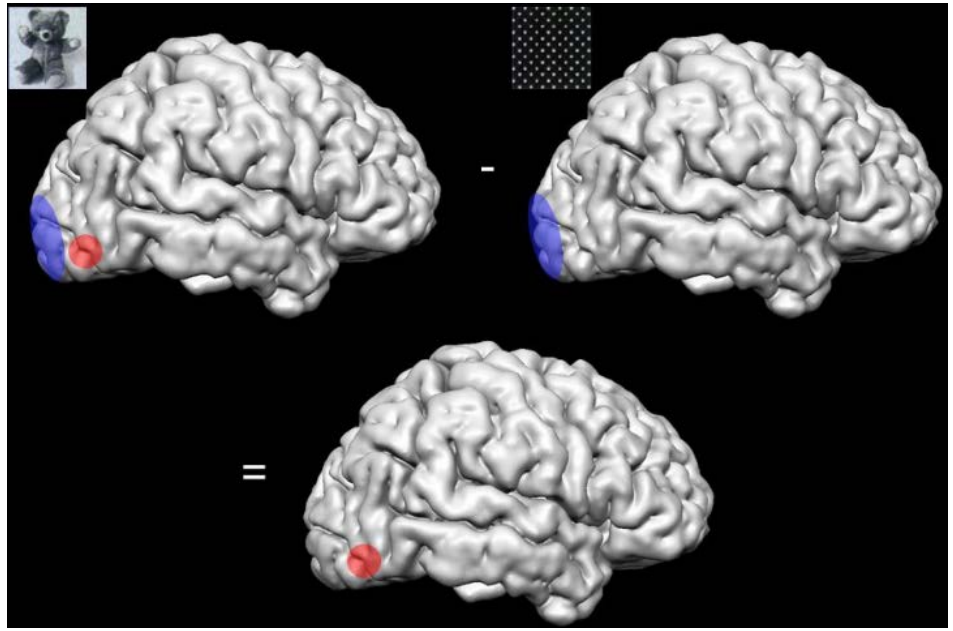


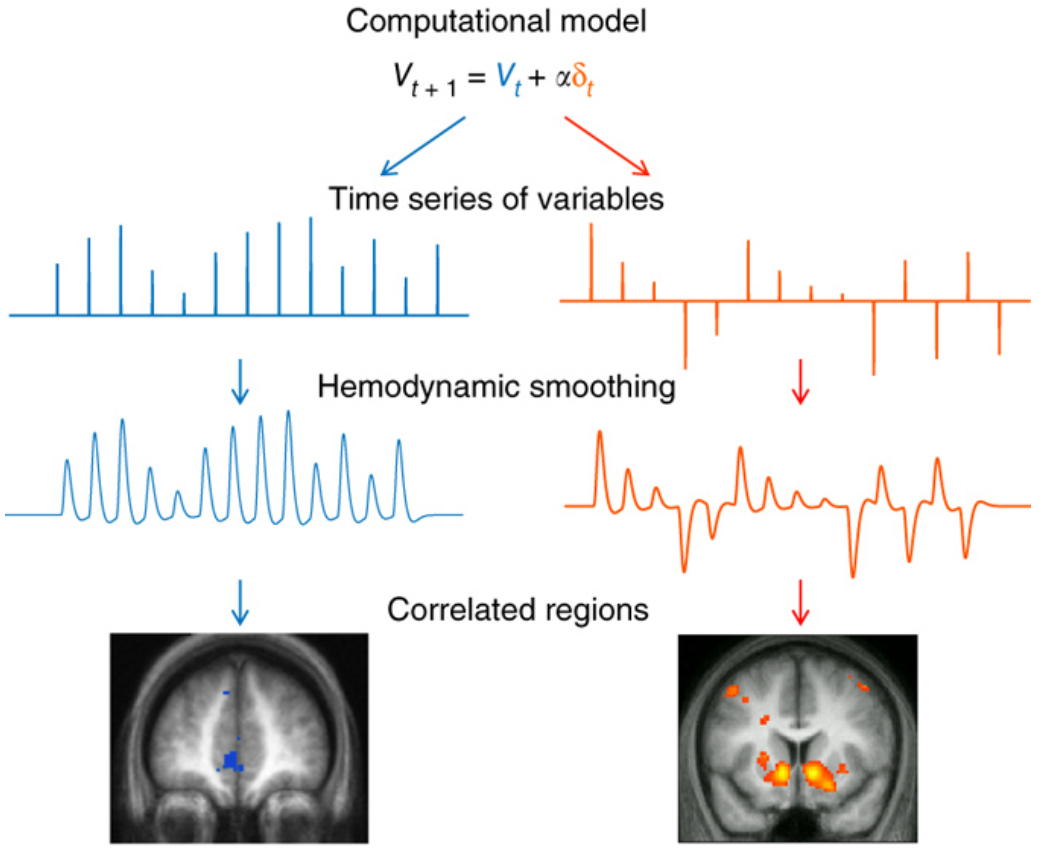
雙重解離(Double Dissociation)

- 腦損傷
  - A腦區受損呈現X症狀而無Y症狀
  - B腦區受損呈現Y症狀而無X症狀

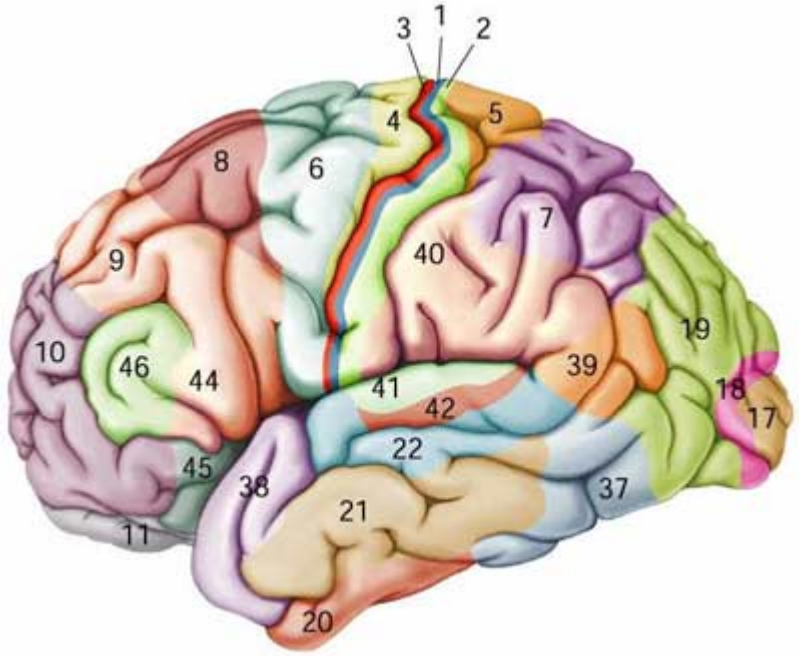
- 腦造影
  - 在A腦區對X作業比對Y作業活化程度高
  - 在B腦區對Y作業比對X作業活化程度高

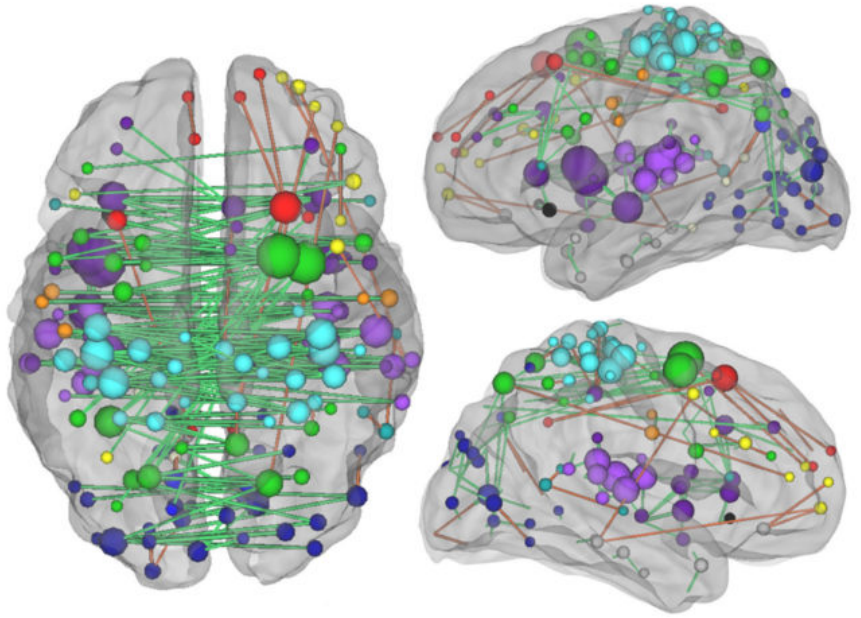
趨勢一：從簡單相減到複雜函數



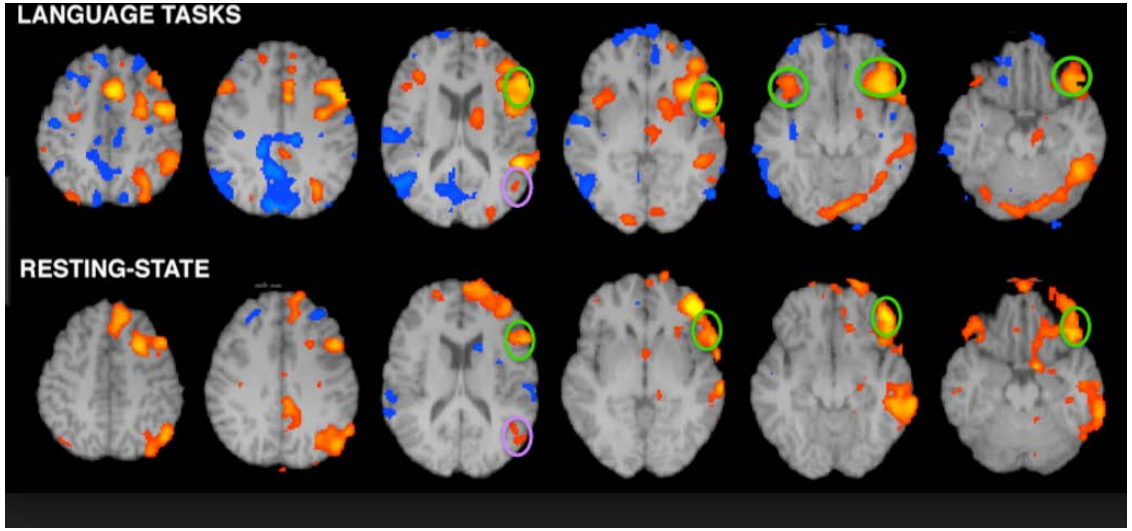


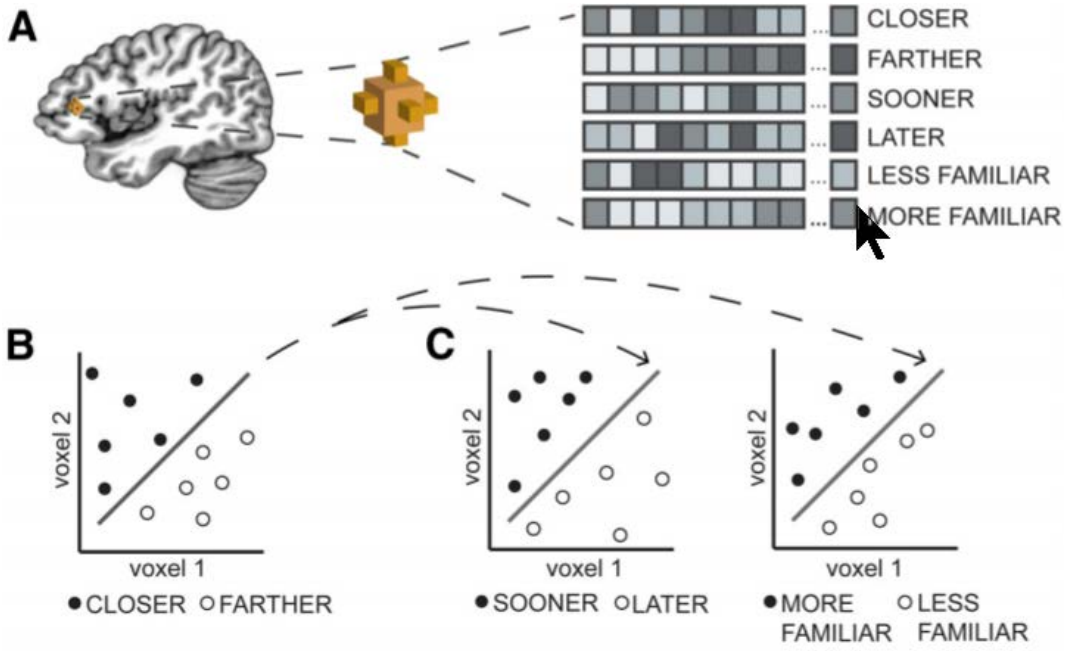
趨勢二：從找位置到找網路





趨勢三：從辨識強度到辨識型態





09:10 心腦同源：認知神經科學縱橫談
10:00 中央 張智宏教授

10:10 安全第一：磁振造影安全大小事
11:00 中山 莊子肇教授

11:10 不只這樣：連神經走向也看得出
12:00 高醫 周銘鐘教授

13:10 見微知著：數學居然算得出大腦
14:00 政大 張蓼蓼教授

14:10 臨床應用：科學化與醫療的舞曲
15:00 中國醫 陳君明 博士後研究員

15:10 最終賽局：讓決策思考變得科學
16:00 政大 陳尹華 博士後研究員

國立政治大學 台灣心智科學腦造影中心
國立政治大學 心理系

共同主辦

高雄醫學大學 非線性分析及優化研究中心
高雄醫學大學 心理學系／醫放系