林宜美 教授

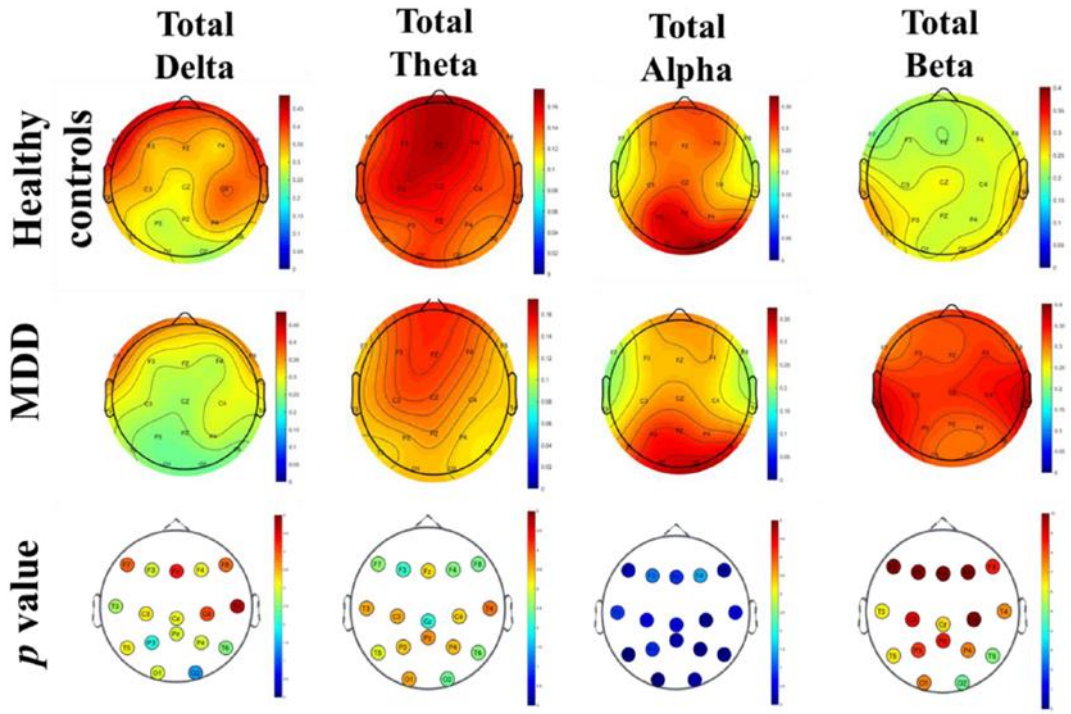
人文社會科學院/心理學系

- 榮獲高雄醫學大學研究績優教師：研究計畫績優獎、研究成果績優教師獎。

Richard Davidson 是美國著名的認知神經科學家與心理學家，他在 1998 提出前額葉 alpha 不對稱(frontal alpha asymmetry, FAA)理論，認為左前額葉為掌管正向情緒的大腦，調控正向情緒與趨近行為；右前額葉為掌管負向情緒的大腦，調控負向情緒與逃避行為。當左前額葉的活性太低(左前額的 alpha 波高於右前額 alpha 波)，或右前額的活性太高(左前額 alpha 波低於右前額 alpha 波)，可能無法活化正向情緒，進而出現憂鬱情緒與逃避行為，因此，FAA 被認為是憂鬱症的生物標誌，有些研究亦探討頂葉 alpha 波不對稱(parietal alpha asymmetry, PAA)。

本研究團隊與高雄醫學大學附設醫院與小港醫院精神科合作，測量 135 名重度憂鬱症(major depressive disorder, MDD；簡稱鬱症)合併焦慮症狀的患者與 135 名健康對照組，在休息狀態、憂鬱回憶、快樂回憶下的腦波，結果發現僅有部份患者符合 FAA 或 PAA，多數鬱症患者在表層有較低的 delta 與 theta，較高的 beta 與 high beta，呈現大腦過度活化現象。研究團隊後續亦發現鬱症患者在深層情緒相關腦區(包括前額葉、扣帶迴、杏仁核等)，以及大腦網絡亦呈現過度活化現象，包括預設模式網絡(default mode network)、顯著網絡(salience network)、額葉邊緣迴路(fronto-limbic circuit)等，未來可根據大腦過度活化理論來開發神經回饋訓練模組。

研究論文：**Lin, I. M.***, Chen, T. C., Lin, H. Y., Wang, S. Y., Sung, J. L., & Yen, C. W.* (2021). Electroencephalogram patterns in patients comorbid with major depressive disorder and anxiety symptoms: Proposing a hypothesis based on hypercortical arousal and not frontal or parietal alpha asymmetry. *Journal of Affective Disorders, 282,* 945-952. https://doi.org/10.1016/j.jad.2021.01.001



鬱症患者在表層腦波呈現全腦過度活化

【具體成果】

榮獲高雄醫學大學研究績優教師：研究計畫績優獎、研究成果績優教師獎

【研究團隊】

團隊成員：林宜美、林欣儀、陳亭君、王三瑜、顏正芳、葉怡君、簡千芮、林千雯、柯志鴻、柯巧俐、林貝芸、高雄醫學大學心理學系、高雄醫學大學附設醫院精神科、高雄小港醫院精神科

研究團隊以心理學系「生理與神經回饋實驗室」成員為主，並與高雄醫學大學附設醫

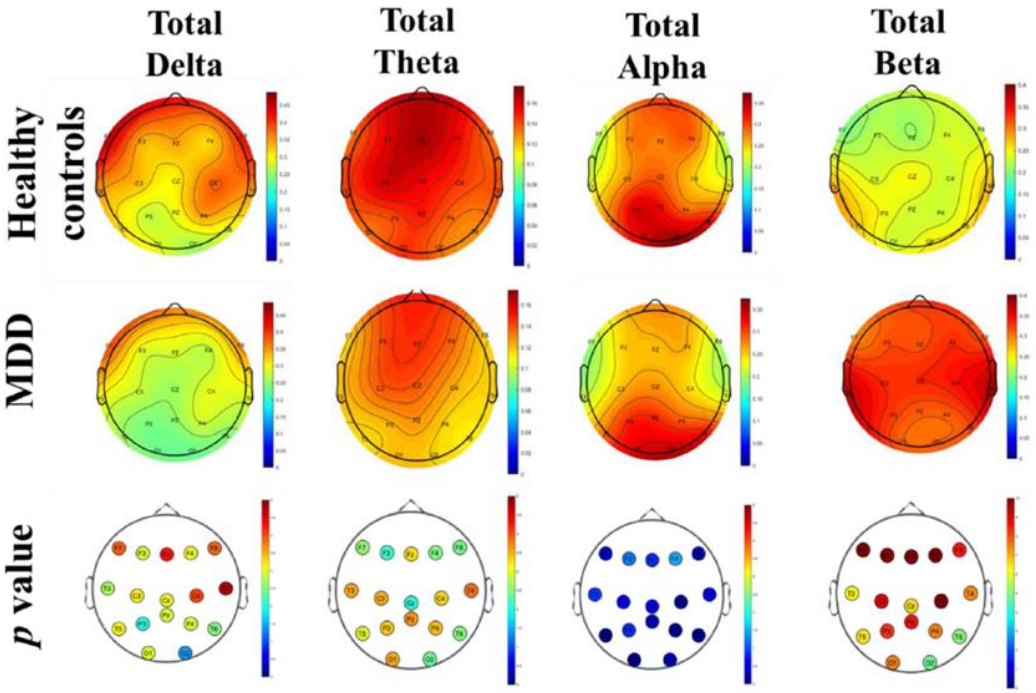
院與小港醫院精神科醫師合作，針對憂鬱症患者進行心理生理測量與心理介入，包括自主神經系統反應、心跳變異生理回饋、腦波，以及神經回饋。

研究聯繫 Email：psyiml@gap.kmu.edu.tw

Richard Davidson, a renowned cognitive neuroscientist and psychologist in the United States, proposed the theory of frontal alpha asymmetry (FAA) in 1998. He posited that the left prefrontal cortex (PFC) regulates positive emotions and facilitates approach behavior, while the right PFC regulates negative emotions and promotes avoidance behavior. When the activity of the left PFC is insufficient (reflected by higher alpha activity in the left PFC compared to the right), or the activity of the right PFC is excessive (reflected by lower alpha activity in the left PFC relative to the right), the brain's ability to activate positive emotions may be impaired. This imbalance can result in depressive mood and increased avoidance behavior. Consequently, FAA is regarded as a potential biomarker of depression. Additionally, some studies have investigated parietal alpha asymmetry (PAA) as another biomarker.

Our research team collaborated with the Department of Psychiatry at Kaohsiung Medical University Hospital and Kaohsiung Xiaogang Hospital to conduct a study involving 135 patients with major depressive disorder (MDD) combined with anxiety symptoms and 135 healthy controls. Electroencephalography (EEG) measurements were taken during the resting state, depressive recall, and happiness recall stages. The results revealed that only a subset of patients met FAA or PAA. Most patients with depression exhibited lower delta and theta activity, and elevated beta and high beta activity on surface EEG, indicating brain hyperactivation. Further investigation by the research team demonstrated that patients with depression also displayed excessive activation in deep emotion-related brain regions (including the prefrontal lobe, cingulate gyrus, and amygdala) and brain networks, such as the default mode network, salience network, and fronto-limbic circuit. These findings suggest that future neurofeedback training modules could be developed based on the theory of hyperactivation.

Publication: Lin, I. M.*, Chen, T. C., Lin, H. Y., Wang, S. Y., Sung, J. L., & Yen, C. W.* (2021). Electroencephalogram patterns in patients comorbid with major depressive disorder and anxiety symptoms: Proposing a hypothesis based on hypercortical arousal and not frontal or parietal alpha asymmetry. *Journal of Affective Disorders, 282,* 945-952. https://doi.org/10.1016/j.jad.2021.01.001



Brain hyperactivity in surface EEG for patients with major depressive disorder

Concrete Results: Research Outstanding Teacher and Research Project Excellence Award, Kaohsiung Medical University

【Research Team】

Team Members: I-Mei Lin、Hsin-Yi Lin、Ting-Chun Chen、San-Yu Wang、Cheng-Fang Yen、Yi-Chun Yeh、Chia-Ruei Jian、Chien-Wen Lin、Chih Hung Ko、Chiao-Li Khale Ke 、Pei-Yun Lin、Department of Psychology, Kaohsiung Medical University、Department of Psychiatry, Kaohsiung Medical University Hospital, Kaohsiung Medical University、Department of Psychiatry, Kaohsiung Municipal SiaoGang Hospital

Research Team Introduction: The core research team is based in the "Bio-Neurofeedback Laboratory" of the Department of Psychology and collaborates with psychiatrists from Kaohsiung Medical University Hospital and Kaohsiung Municipal Siaogang Hospital. Our research focuses on psychophysiological assessments and psychological interventions for patients with depression, including autonomic nervous system responses, heart rate variability biofeedback, electroencephalogram, and neurofeedback.

Research Contacts Email: psyiml@gap.kmu.edu.tw