

論文 / 著書情報
Article / Book Information

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論文要旨

THESIS SUMMARY

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要旨 (英文 800 語程度)

Thesis Summary (approx.800 English Words)

Depression is a pervasive mental health disorder, affecting over 322 million people worldwide. Previous studies have suggested that only quantitative differences in the degree of severity exist between subthreshold depressive (sD) states and major depressive disorder (MDD). sD is showing a progressively increasing prevalence and has a lifelong impact, and the social and clinical impacts of sD are no less than those of MDD, with the higher prevalence of sD increasing its impact in terms of excess economic costs and mortality. Therefore, research into sD will contribute to a more detailed estimation of depressive states in healthy individuals, and thus to symptomatic treatment, and exploration of the neural mechanisms will help to explain the pathological mechanisms of depression. Electroencephalogram (EEG) holds promise in the diagnosis and management of depression, with potential applications in treatment selection, classification, and prediction of treatment response. Electroencephalography (EEG) serves as a non-invasive, powerful tool in depression research, with many studies employing it to discover biomarkers and explore underlying mechanisms for depression identification and diagnosis. Despite this progress, research into how sD states affect brain activity remains limited. Since depression leads to cognitive biases and affects brain function and structure, this study concentrates on exploring the variations in visual processing properties and the functional connectivity features. This study aims to determine whether neurophysiological differences exist among healthy individuals with various intensities of depressive states during resting state and stimulus processing, providing valuable biomarkers for assessing depressive conditions. This paper is organized as follows. Chapter 1, "Introduction," delved into the definition and symptoms of MDD, explored the continuum of severity between MDD and sD, along with their social and economic consequences. The chapter also discussed the causes of depression within the framework of the cognitive model of depression and how cognitive biases influence the behavioral and neural responses of depressed individuals during information processing. Chapter 2, "Experimental Methods," shifted the focus to the evaluation methods for depressive states and the use of external stimuli designed to evoke distinct emotions. Participants were categorized into high, middle, and low depressive state groups based on their responses to the Beck Depression Inventory-II (BDI-II). The International Affective Picture System (IAPS) was employed as the visual stimulus, with pictures categorized as negative, neutral, and positive based on their valence. The experimental conditions, setup, and procedures were comprehensively described, noting that measurements included the eye-open resting state and brain activity, alongside behavioral responses, in reaction to various emotional states triggered by external visual stimuli. Chapter 3, "Analysis of Neural Activity during the Resting State," focused on identifying critical EEG biomarkers in the resting state, a dynamic substrate recognized for its broad spectrum of operational modes, from sensory processing to attention mechanisms. This chapter detailed an investigation into the power spectrum density (PSD) and the region-based phase-locking value (PLV) across individuals with various depressive states. Significant differences in theta and beta band power were observed, as well as correlations in the theta-beta ratio for the frontal lobe and phase-locking connections across the frontal, parietal, and temporal lobes. Notable differences in resting state neural networks, particularly in the frontal and temporal lobes among the three groups, were identified using standardized low-resolution brain electromagnetic tomography (sLORETA). Chapter 4, "Analysis of Cognitive Biases during Visual Stimuli Processing," investigated whether attentional bias could be detected through reaction times during the perception of image stimuli
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and whether significant differences in neural activities existed during emotional visual information processing. The analysis of event-related potentials (ERPs) and event-related spectrum perturbation (ERSP) changes in the delta, theta, and alpha bands was conducted. It was observed that as depressive states increased, the P300 amplitude tended to decrease, and latency increased for all emotional stimuli. For ERSPs, the high depressive group showed a more pronounced decrease in alpha amplitude. The identification of these neural patterns associated with depressive states could act as the parameters for evaluating depressive states in healthy individuals, potentially serving as early diagnosis methods for depression.

Chapter 5, “Conclusion,” summarized the key findings and highlighted new insights gained from this study. The chapter also outlined specific directions for future research, discussed how the results of this research could potentially contribute to the well-being of society, particularly in mental health, by enhancing early diagnosis and interventions for depression.

備考：論文要旨は、和文 2000 字と英文 300 語を 1 部ずつ提出するか、もしくは英文 800 語を 1 部提出してください。

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