## TOWARDS CLASSIFICATION & QUANTIFICATION OF EMOTIONS MEASUREMENT & ANALYIS OF BRAIN POTENTIALS DURING IMAGE PRESENTATION.

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## ABSTRACT

Modern society is said to be a stressful society, and stress is closely related to modern people. In recent years, the number of patients visiting a medical institution for mental disorders has increased significantly, reaching approximately 2.58 million in 2002 and 6.15 million in 2020. In particular, the number of patients with depression has increased significantly. According to a survey of 9,936 men and women, a total of 91.3% answered that they Ire feeling stress, which means that almost everyone has some form of stress. In addition, there are cases where people are actually under a great deal of stress even if they are not aware of any symptoms. Stress is a troublesome problem because it is invisible. Thus, the method of ascertaining the state of health in the form of questionnaires has become the mainstream. However, questionnaire data is a simplified way of grasping the state of stress, so it is a subjective evaluation, and there are limitations in grasping the state of health in different individual environments. Excessive stress not only increases the risk of mental illnesses such as depression, but also causes various diseases such as lowering immunity, increasing the risk of infectious diseases, and causing damage to the circulatory and digestive systems.

I therefore measure 'emotion', which is a physiological response to external stimuli and the recall of internal memories, and estimate 'feelings', which are the subjective, conscious experiences associated with the occurrence of emotions. By understanding the stress state caused by emotions and encouraging measures to reduce it, it may lead to the creation of an environment in which employees can promote their work in a safe and secure manner. As a specific method, to understand the stress state caused by an individual's 'emotion', the Electroencephalogram (EEG) is measured and the Event Related brain Potential (ERP), which indicates the response to a specific event, is quantified. The ERP measurement is thought to automatically detect features and abnormalities in the time series data and to be able to estimate objective stress.

The final goal of this research is to establish a real-time stress evaluation method by quantifying "emotions" using ERP, aiming at a stress-free social life for each individual. In order to resolve inadequacies in the setting of the measurement environment and conditions, I added images of unpleasant emotions as III as pleasant ones to the stimulus images and checked whether there were differences in the biological reactions.

As a result, positive EEG responses Ire observed in the T3 and T4 regions when the subjects viewed the cadaveric images, suggesting that they are likely to be related to fear emotion and memory processing rather than auditory stimuli. Positive potentials Ire also observed on the scalp of F3 approximately 0.5 s after the presentation of the cadaver image, possibly indicating an attentional or cognitive response. Furthermore, images of dead bodies induce discomfort, which may be related to emotional processing. On the other hand, images of insects and natural landscapes also showed low potentials at similar time points, which may act as a focus of attention, as they are not as terrifying as images of dead bodies. Positive potentials due to image processing are also possible. These differences in EEG responses suggest that it may be possible to distinguish between unpleasant and highly aroused emotions, but as emotions are subjective and vary between individuals, further research is needed to confirm their reproducibility.