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Abstract: Previous research finds that individuals with Intermittent Explosive Disorder (IED) display significantly higher levels of plasma inflammatory markers than individuals without IED. In addition to this systemic inflammation, evidence also finds reduced grey matter volume in several cortico-limbic areas in individuals with IED, compared to healthy volunteers. This study expands on those findings by exploring a potential relationship between composite fronto-limbic grey matter volume (FL-GMV) values and levels of plasma inflammatory markers: CRP, IL-6, SIL-1RII. A step-wise multiple regression analysis was used with composite FL-GMV as the dependent variable and levels of the three plasma inflammatory markers as the predictor variables. Relevant covariates for FL-GMV (age and gender) were entered on step 2, and relevant covariates for the inflammatory markers (BMI, Beck Depression score, past 6 month Life Experience Score, daily smoking and alcohol consumption) were entered on step 3. After the addition of these two sets of relevant covariates, a significant inverse relationship of composite FL-GMV in relation to plasma IL-6 levels ($p=.017$) but not to plasma CRP or SIL-1RII levels was found. These initial findings suggest that elevated circulating levels of inflammatory cytokine are associated with a reduction in grey matter in fronto-limbic areas and may account for structural and functional abnormalities in highly aggressive individuals.

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Poster

409. Mood Disorders: Biomarkers and Therapeutics

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Topic: C.16. Cognitive, Emotional, and Behavioral State Disorders

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Title: OMNI: A distributed, modular, closed-loop neuromodulation device for the treatment of neuropsychiatric disorders

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Abstract: We are developing an implantable medical device for the treatment of neuropsychiatric disorders based on closed-loop neuromodulation. The device is aimed at treating Major Depressive Disorder (MDD) and Generalized Anxiety Disorder (GAD). In order to realize this vision, we are developing a new neuromodulation system, OMNI, which acts at the systems level and provides real-time closed loop therapy. OMNI's unique properties can be summarized by the following keywords: multi-scale, distributed, modular and self-contained. The system supports simultaneous recording and stimulation from multiple sites, both cortical and subcortical, and in both hemispheres. It includes flexible and modular data aggregation, and contains sufficient computation, storage and energy to allow for the system to run independently over extended periods without recharging. Numerous advances in electronics, control systems and materials are employed to enable a highly scaled and modular device. The system is comprised of custom microfabricated, high-density cortical and sub-cortical electrode arrays with custom integrated circuits that enable 128 channels of simultaneous recording and stimulation capability within a single module. Custom hermetic packaging and cabling are employed to realize this modularity in a small form factor. Data aggregation is performed centrally and communicates with a computation unit, which contains the battery, processor, data storage, communication and telemetry. A programmable microcontroller enables stochastic control algorithms that close the loop in an energy-efficient and real-time manner.

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