

ABSTRACT

Delirium related biochemical derangements result in changes in electroencephalographic (EEG) followed by behavioral. Studies using limited lead EEG show a large differences between patients with and without delirium while discriminating delirium from other causes. Hand-held rapid EEG devices may be capable of detecting delirium prior to symptom onset thus, providing an objective physiological method to detect delirium earlier. This study explored the potential for rapid EEG to detect these delirium related changes. A prospective exploratory pilot study used a correlational design was used explore the relationships between EEG data and delirium using a handheld EEG device. Although not powered to detect statistical differences, spectral density analysis revealed higher sleep/wake ratios in patients with delirium. Therefore, further investigation of limited lead EEG for delirium detection is warranted.

INTRODUCTION

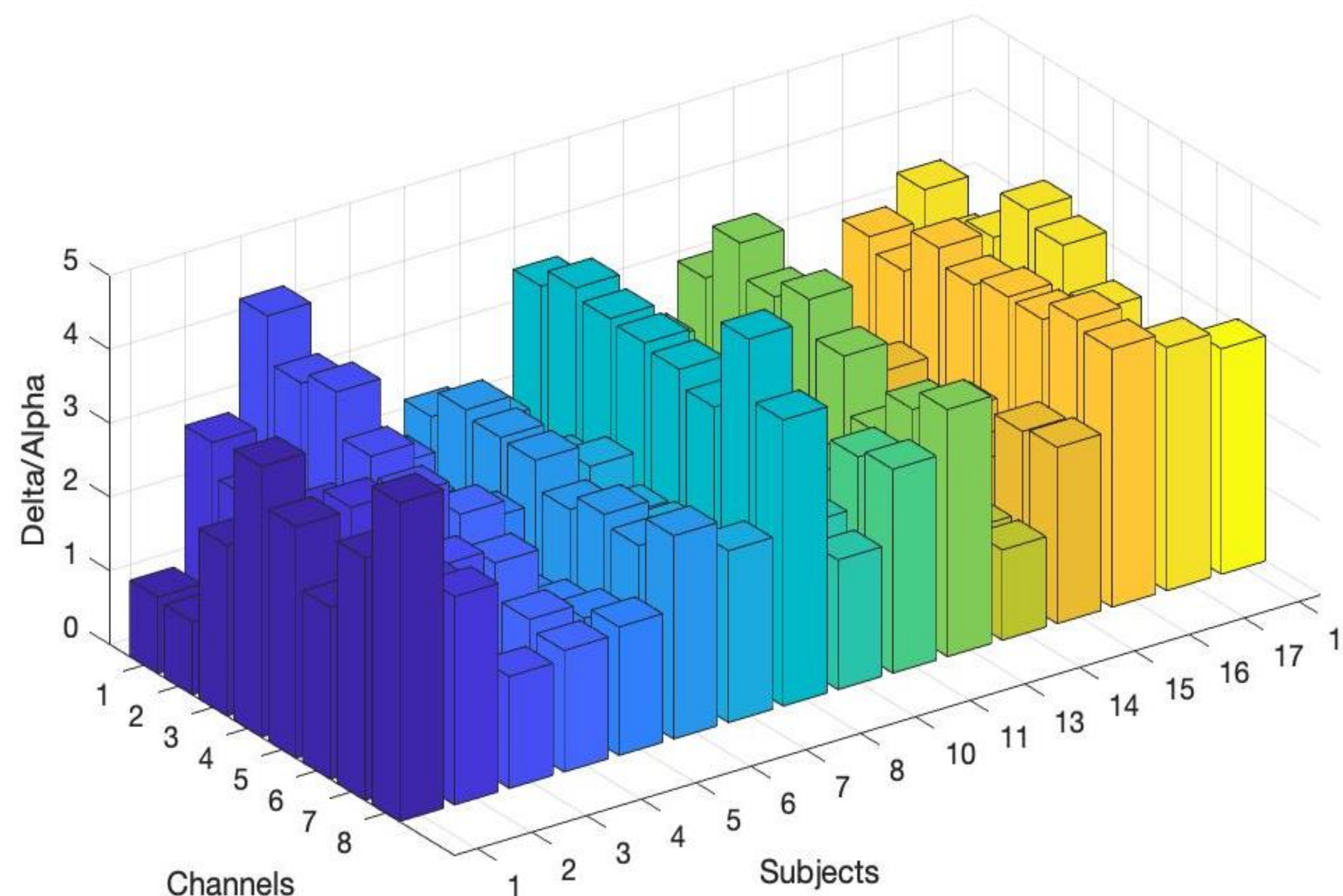
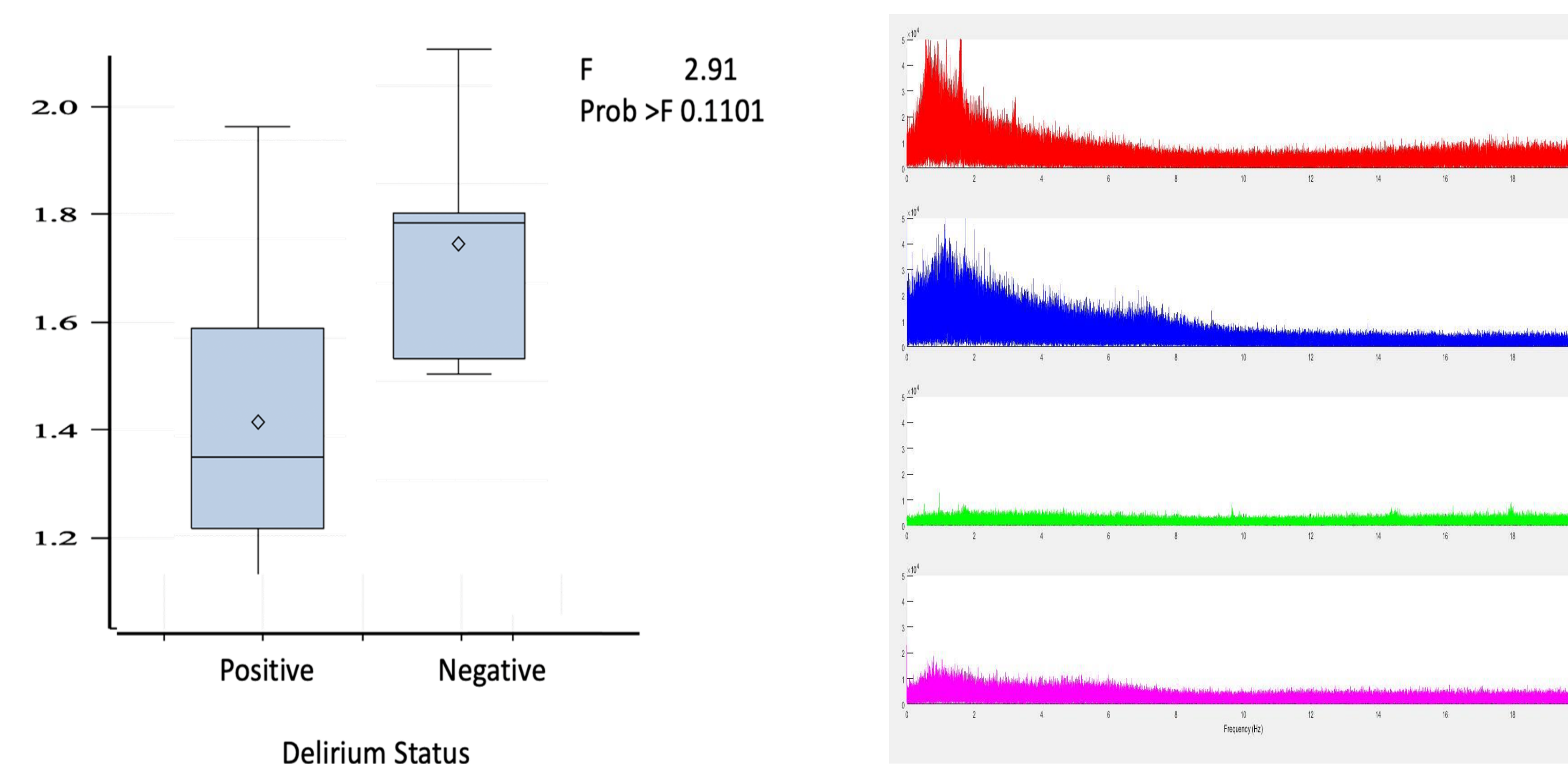
Delirium is synonymous with brain failure affecting ~ 80% ICU patients. Current assessment tools detect approximately 20% of delirium in the ICU. EEG is the gold standard but has not feasible. Newer devices provide rapid signal processing using handheld devices. This study examines the hypothesis that known differences in EEG waveforms can be detected using these newer devices.

MATERIALS & METHODS

Data were collected from 17 consenting older adult critically ill participants who required mechanical ventilation. EEG were processed using higher order signal analysis and fieldtrip toolbox functionality. Advanced independent component analysis were performed to evaluate EEG waveform ratios in MatLab. Mixed models were then performed to evaluate differences based on delirium status while controlling for independent patient effects.

RESULTS

Daily Average Fixed Effects Model					
Effect	Estimate	Standard Error	DF	t Value	Pr> t
Intercept	-1.8713	1.4077	33.8	-1.33	0.1926
Delta/Alpha	-0.9863	0.5409	33.8	-1.82	0.0771
Theta/Alpha	1.6969	0.8300	33.9	2.04	0.0487
Delta/Theta	1.5194	0.8623	34	1.76	0.0871



DISCUSSION

Observable higher ratios were seen in patients with delirium. Although only associations theta/alpha ratios were statistically significant it is impressive that other ratios were approaching significance despite the small sample size. Future research will include repeating this study with a larger sample and exploration of other methods to analyze EEG

CONCLUSIONS/IMPLICATIONS FOR PRACTICE

EEG using the Ceribell device may still be a viable option. However, additional studies are needed to determine benefit. For now, it is recommended that nurses continue using the CAM-ICU with frequent re-education to minimize practice drift. Potentially combining CAM-ICU results with other screening methods for delirium such as the Intensive Care Delirium Screening Checklist and not discounting findings may further improve detection

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