Alterations in EEG Beta Activity During Postural Control

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Summary

This study investigated the impact of COVID-19 infection on cortical activation during postural control. Results identified significant differences in the beta frequency band, indicating lasting neural effects following COVID-19 infection.

Introduction

Strong evidence for brain-related pathologies and increasing reports of long-term symptoms following COVID-19 infection, regardless of severity or presentation of symptoms, indicate a more expansive disease course[1,2]. The purpose of this study was to investigate the neurological impact of COVID-19 through the assessment of postural control and cortical activation. We hypothesized that differences in event-related spectral power would be seen between those who have experienced a COVID-19 infection and those with no known history of COVID-19 infection.

Methods

Cortical activation was assessed during completion of a series of postural control tasks in 30 individuals who had experienced COVID-19 infection (COVID) and 17 who had not (NO COVID). Cortical activation was measured using a 32-channel dry electrode EEG cap while participants completed two quiet standing tasks with no virtual reality (NVR) and three with virtual reality (YVR). The NVR task consisted of a 30 second (s) eyes open (EO) measurement followed by a 30s eyes closed task. This sequence was repeated for a total of 3 times. Next, participants completed 3 rounds of the YVR task. This included a 30s eyes open measurement in a virtual replication of the lab (VR) followed by a 30s perturbation in which the virtual lab oscillated at 0.5 Hz along the anterior-posterior axis (MR). Upon cessation of movement of the virtual lab, a 30s recovery period was collected (RC). EEG data was processed and analyzed using EEGLAB.

Results and Discussion

Results identified significant differences in mean event-related changes in spectral power within the beta frequency band (12-30 Hz) between the NO COVID and COVID groups during the NVR task in both the EO ($p < 0.01$) and EC ($p < 0.01$) conditions (Figure 1). Additionally, significant differences were seen in the YVR task during the MR ($p < 0.05$) and RC ($p < 0.05$) conditions (Figure 2). No significant differences in beta were seen during the VR condition.

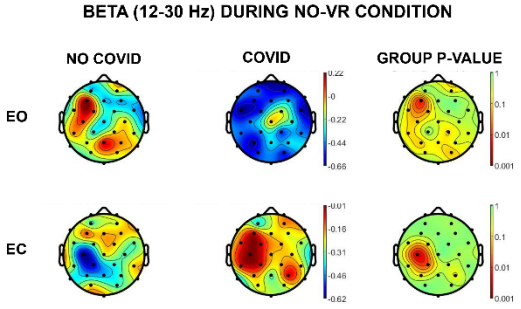

Figure 1: Differences in beta frequency band (12-30 Hz) activity between the NO COVID and COVID groups during performance of the eyes open (EO) and eyes closed (EC) NVR postural control task.

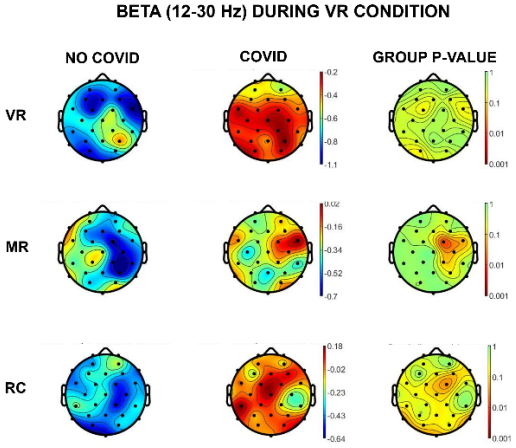

Figure 2 Differences in beta frequency band (12-30 Hz) activity between the NO COVID and COVID groups during performance of the eyes open in VR (VR), moving room perturbation (MR), and perturbation recovery period (RC) YVR postural control task.

Conclusions

Altered beta band activity following COVID-19 may indicate changes in processing related to postural control, suggesting that COVID-19 has long lasting neural effects.

Acknowledgments

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References

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[2] Vanichkachorn G et al. (2021) *Mayo Clinic Proceedings*, **96(7)**: 1782-1791.