

ERP Differences In Auditory And Visual Memory Processing Between MCI And Long COVID Cognitive Complaints

P3-007



Chris Berka¹, Amir H. Meghdadi¹, Gisselle Paez², Shandel Odom², Natasha Kovacevic¹, Ella Thunen¹, Aimee Johnston¹, Eliana Prosnitz¹, Jennifer Graves²

UC San Diego

¹ Advanced Brain Monitoring Inc., Carlsbad, CA, USA, ² University of California San Diego, San Diego, CA, USA

Key Takeaway: Long COVID and MCI exhibited distinct ERP signatures despite similar cognitive complaints, suggesting different underlying neurophysiological mechanisms.

INTRODUCTION

Cognitive complaints following SARS-CoV-2 infection (Long COVID) remain a public health concern, while their underlying neurophysiological correlates are less understood. Comparison with better studied conditions such as mild cognitive impairment (MCI) within the Alzheimer's disease (AD) continuum may provide useful reference for interpreting these symptoms. Event-related potentials (ERPs) provide objective measures of neural processing that may help distinguish underlying mechanisms across conditions.

METHODS

Participants included individuals with MCI (n=45 ages 68-85) and individuals reporting cognitive symptoms following COVID-19 infection (Long COVID, n=11 ages 28-70), compared against a database of cognitively unimpaired age-matched healthy controls (HC).

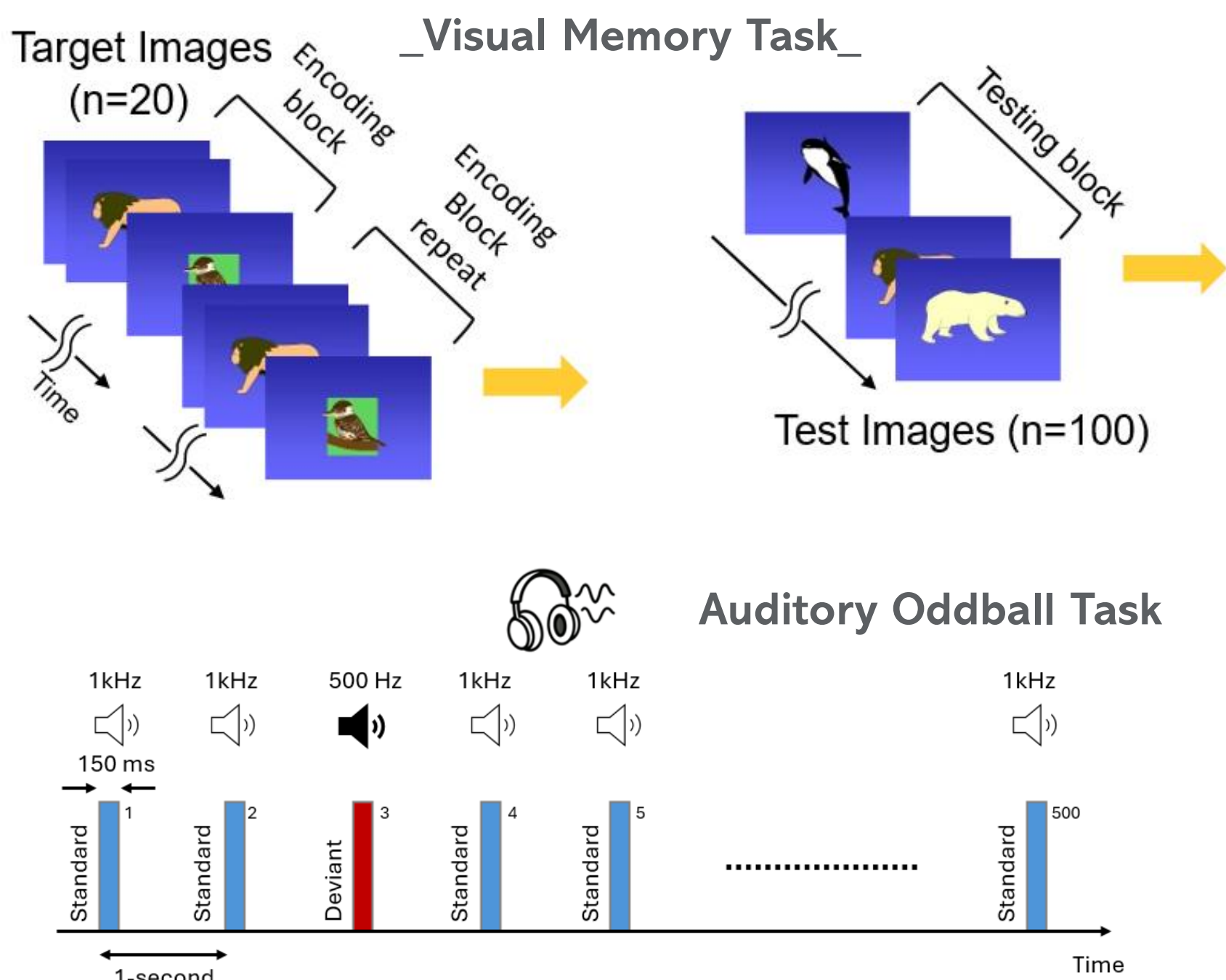


Figure 1. A visual memory task and auditory oddball task paradigms concurrent with EEG

Group differences in latency and amplitude of task-relevant ERP components were examined and quantified using normalized effect size (ES) at the most significant ($p < 0.05$) channel.

RESULTS

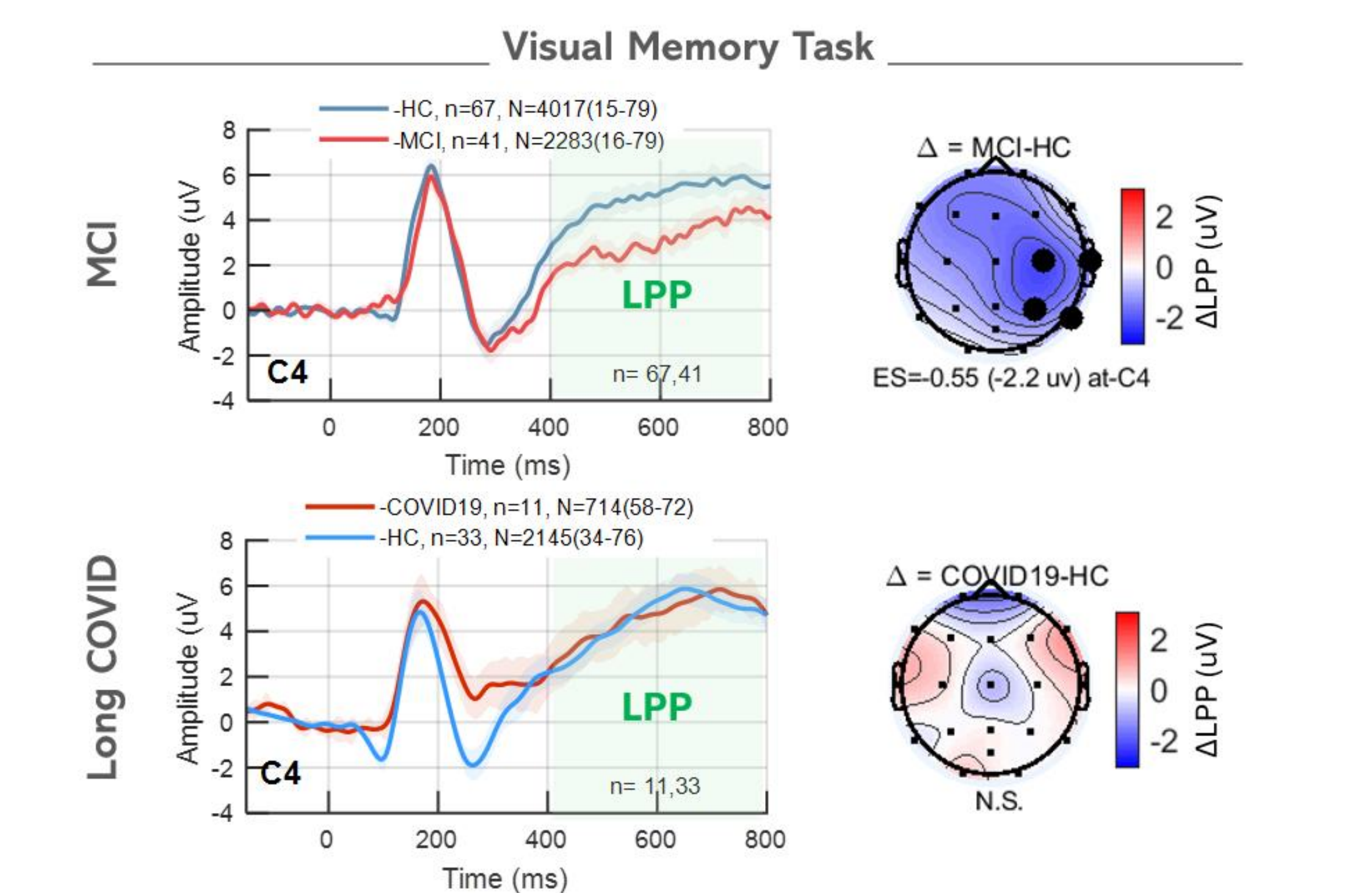


Figure 2. Reduced Late Positive Potential (LPP) amplitude (2.2 uV reduction, normalized effect size = -0.55) in response to novel stimuli during a visual memory task in the MCI group was not observed in the Long COVID group.

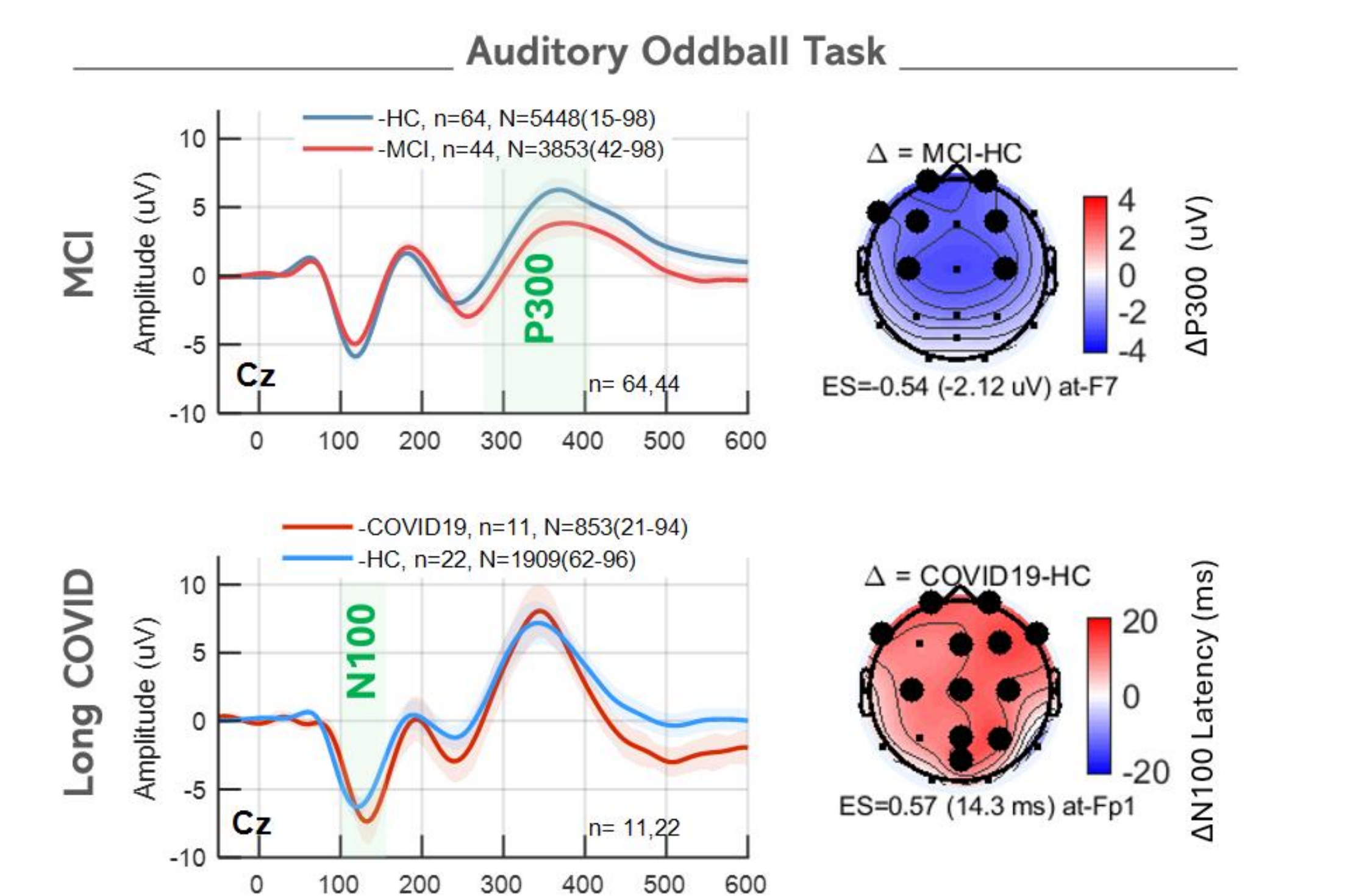


Figure 3. Reduced P300 amplitude (~2.1 uV reduction; normalized effect size = -0.54) in response to deviant tones during an auditory oddball task was observed in the MCI group (top) but not in the Long COVID group. In contrast, the Long COVID group exhibited delayed N1 latency (~14 ms) (bottom).

The MCI group exhibited a reduction in the amplitude of the late ERP components (LPP and P300) that was not observed in the Long COVID group. The Long COVID group exhibited delayed latency of the N1 component during the auditory oddball task

CONCLUSIONS

Although both Long COVID and MCI are associated with cognitive complaints, they exhibited distinct overall patterns of ERP abnormalities, suggesting differences in the underlying neurophysiological mechanisms. In the present study, the MCI group demonstrated prominent reductions in late positive ERP components (LPP and P300), whereas the Long COVID group was characterized by delayed auditory N1 latency without comparable reductions in late cognitive ERP components. These findings suggest that ERP biomarkers may help differentiate post-COVID cognitive dysfunction from cognitive impairment associated with the Alzheimer's disease continuum and warrant further investigation in larger longitudinal cohorts.

Acknowledgements: This work was partially supported by the National Institutes of Health (NIH) under Grant Numbers: R43AG094486 and R44AG050326.

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CONTACT



amir@b-alert.com
www.advancedbrainmonitoring.com

