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A LOW-BURDEN VISUAL EVOKED POTENTIAL MEASUREMENT OF NEUROPLASTICITY: REAL-WORLD FEASIBILITY AND DATA QUALITY FROM AN AT-HOME PILOT STUDY

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INTRODUCTION

- We developed short variants of a visual stimulation paradigm and recorded EEG responses using the low-burden wireless Cumulus platform [1,2]. The Visual Evoked Potential (VEP) modulation paradigm measures plasticity [3-5] with comparability to invasive Long-Term Potentiation (LTP) recordings in animals [6]
- We evaluated outcomes of 2 task variants, lasting 24 and 11 minutes, for strength of plasticity effect and data quality

Figure 1. Participants wore Cumulus 16-channel dry EEG headset while looking at an electronic tablet.



METHODS

- Twelve staff (mean age 35.8 years, 7 male) received a tablet, stand, and headset to home (Fig. 1.). One did 11-min task only. Instructions were given by email and ~5 min video call
- Participants viewed full-field checkerboard reversals while silently counting colour change of central dot
- After automated artifact correction and filtering (2-40Hz), epochs from O1, O2, and Pz were concatenated and robust-averaged. ERP was referenced to robust-average of concatenated epochs AF7, AF8, and Fpz
- Post-modulation and pre-modulation VEPs were compared in time window 50-300 ms post stimulus onset and difference waves were computed (Fig. 2)

RESULTS

- 11-minute task: Modulation difference from 73-83, 208-232, and 288-292 ms (p = 0.03; 0.03; 0.04, respectively, uncorrected). 24-minute task: difference from 216 to 260 ms (p = 0.02, uncorrected)
- SME values were mean 0.86-1.13 microvolts across C1, P1, and N1 components, within range reported elsewhere for lab-recorded ERP datasets [7]

CONCLUSION

- Outcomes from this small-scale pilot suggest that translational markers of LTP-like plasticity can be collected in low-support environments

Figure 2. Group mean ERPs and difference waves, and single-session ERPs.
A. Group mean ERPs. B. Difference waves. Confidence intervals (95%; shading) and regions of significant difference (Wilcoxon; uncorrected, grey bars). C. Single-session ERPs

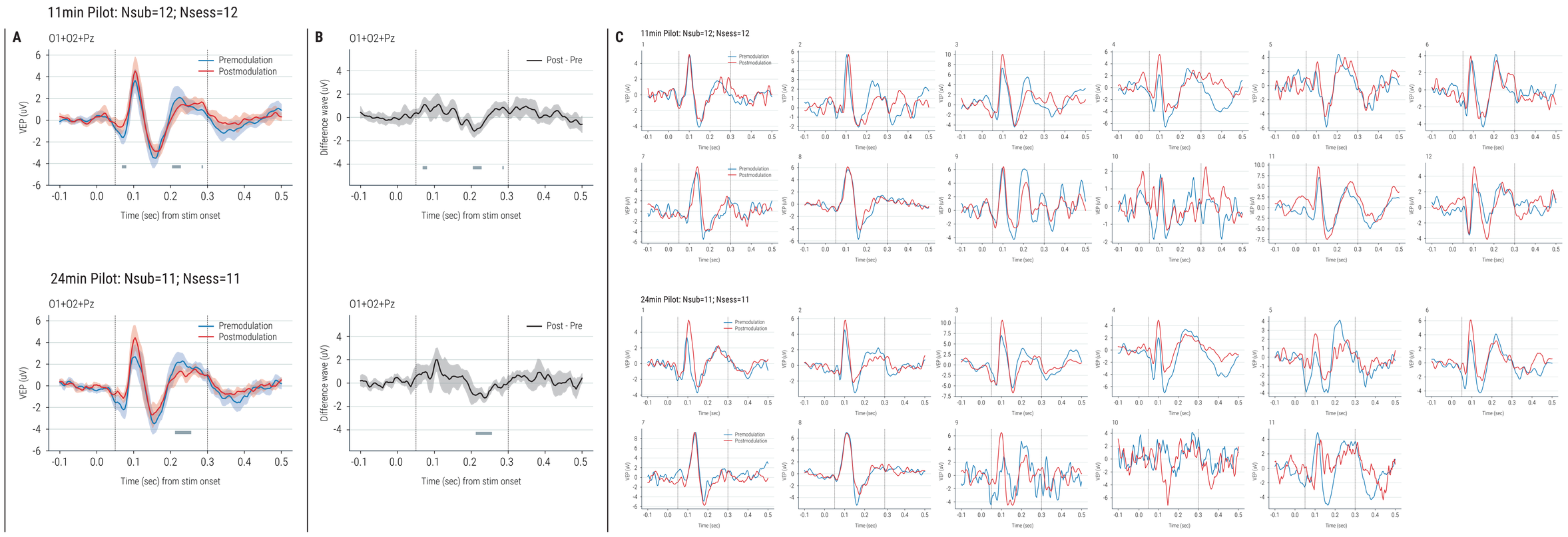
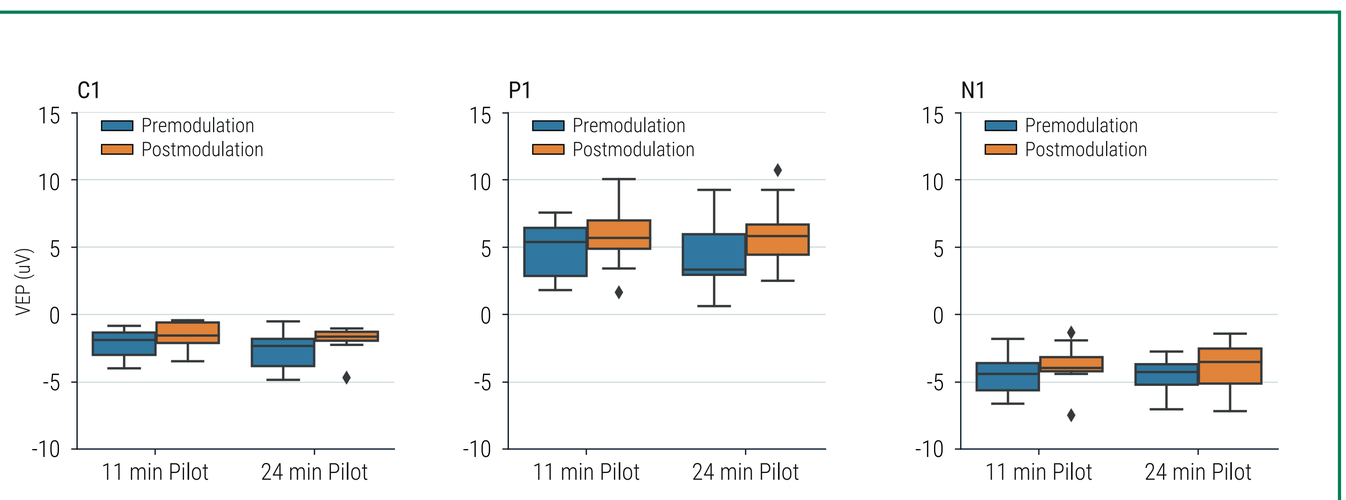


Figure 3. Summary Statistics of Peak Metrics. Boxplots representing the spread (upper and lower quartiles, median, and outliers) of per-participant C1, P1, and N1 mean peak amplitude values.



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Conflict of Interest Statement

MNI, AB, BM, HN, and EM are employees of Cumulus Neuroscience Ltd. SH, KSK, and SM are employees of Sumitomo Pharma America, Inc.

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