

Detecting Readiness Potential for a Hybrid BCI

Comparing eye- and facial-movement onset channels for detecting movement intention in EEG

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1 Background & Rationale

Some children with severe motor disabilities cannot use typical assistive switches. Brain-computer interfaces (BCIs) that pair EEG with a second, more reliable body signal could offer a faster way to communicate. One promising EEG signal is the readiness potential (RP): a slow build-up of brain activity that begins about one second before a voluntary movement.

2 Research Question

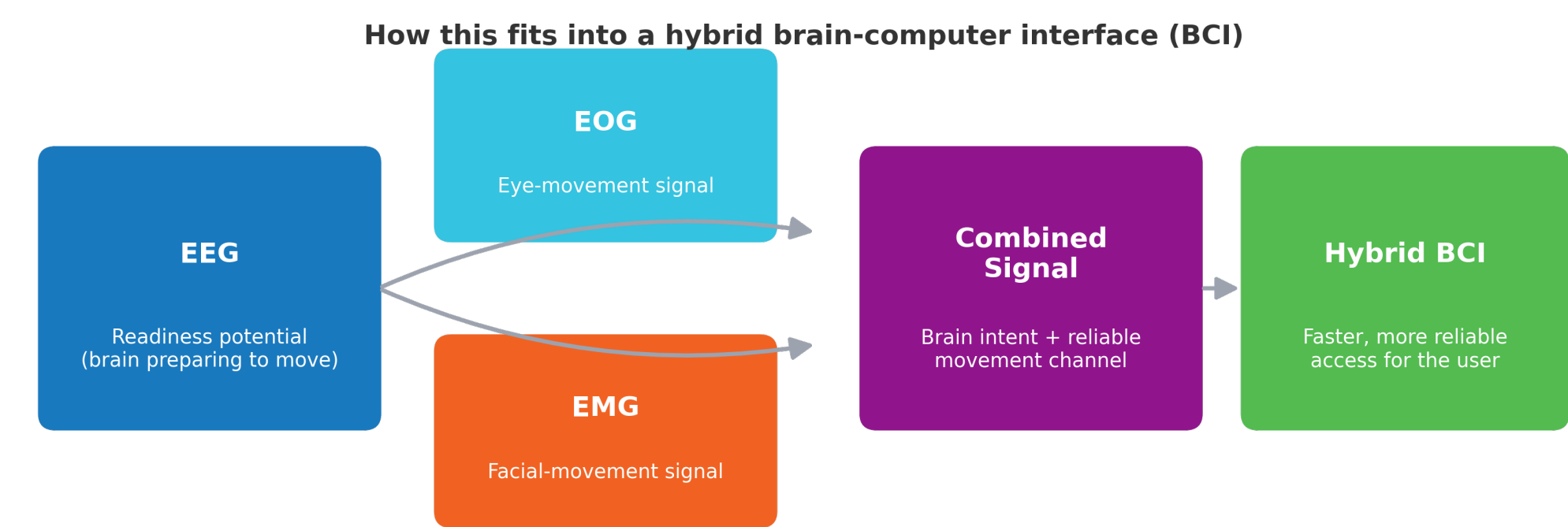
Can cortical signatures of movement intention (such as Movement-Related Cortical Potentials) for facial or eye movements be reliably detected in concurrent EEG data when EMG or EOG are the primary control modalities?

3 Relevance to Holland Bloorview Clients & Families

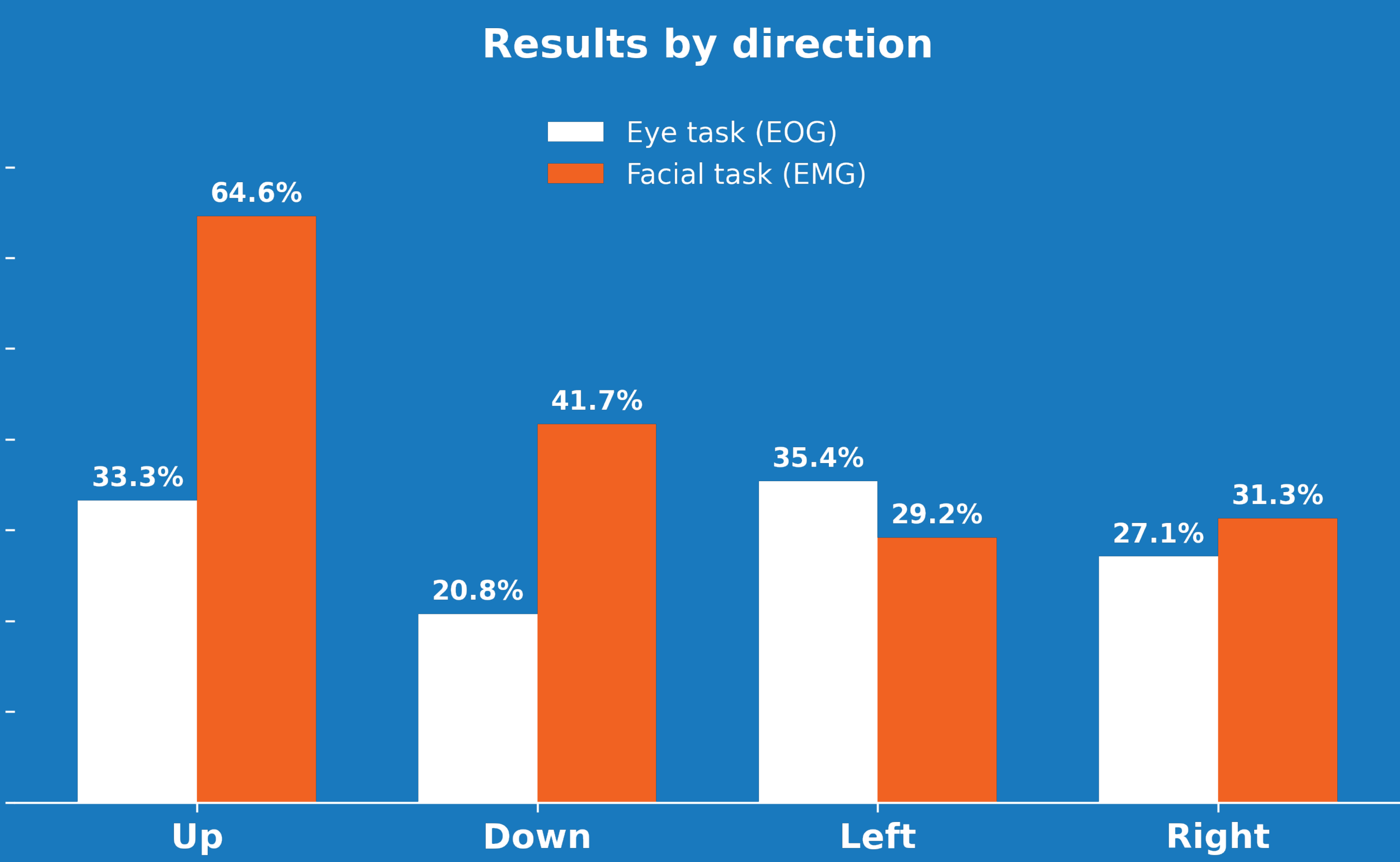
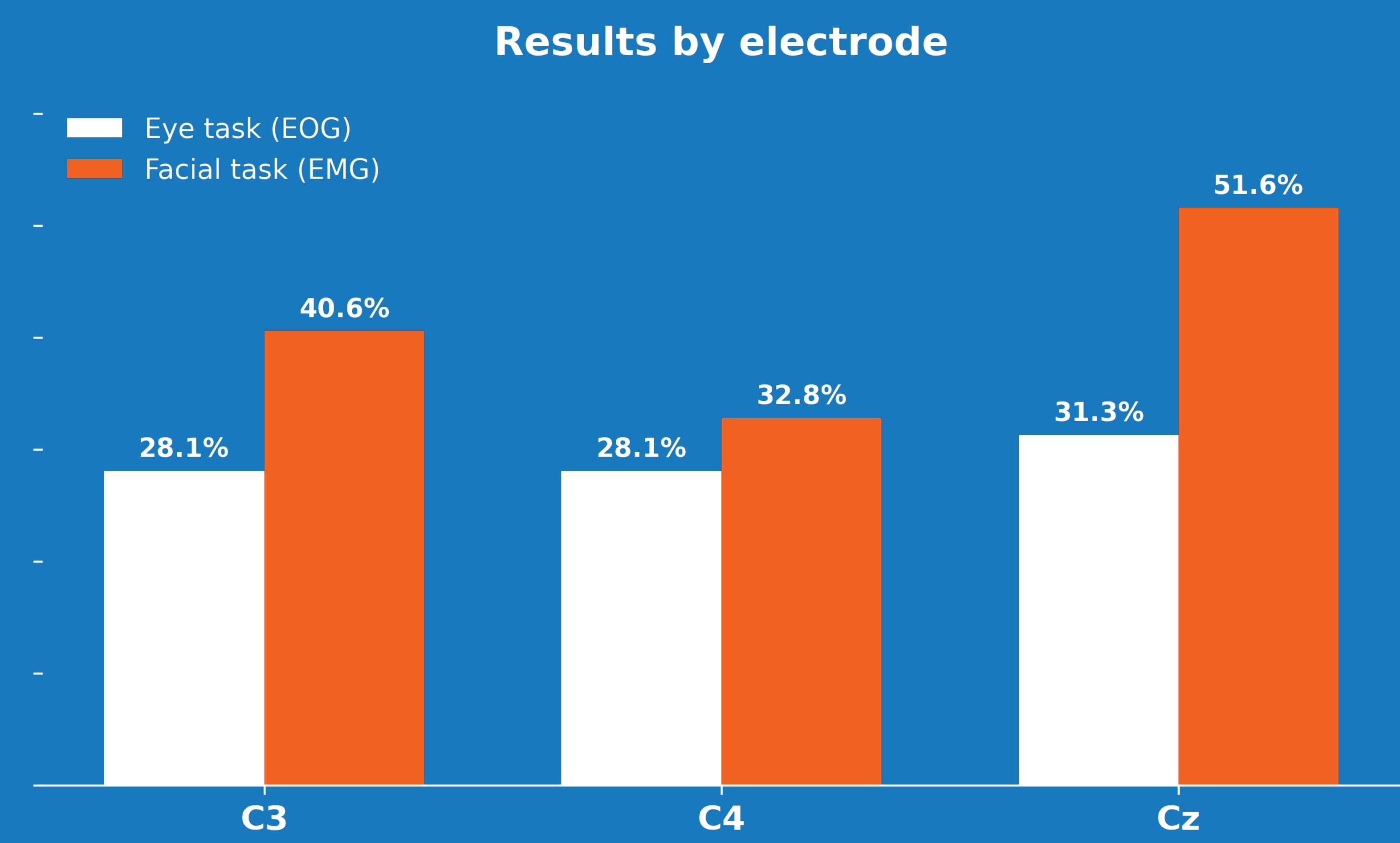
Reliable RP detection could help build faster, more accurate brain-computer interfaces for children who cannot use conventional switches. This is an early step toward BCIs that combine brain signals with a person's most reliable movement, giving more children an independent way to interact with their world.

4 Acknowledgements

With thanks to the PRISM Lab team and study participants at Holland Bloorview Kids Rehabilitation Hospital.



Yes — we detected a pre-movement brain signal **consistent with the readiness potential**, in the large majority of people we tested.



2 Results

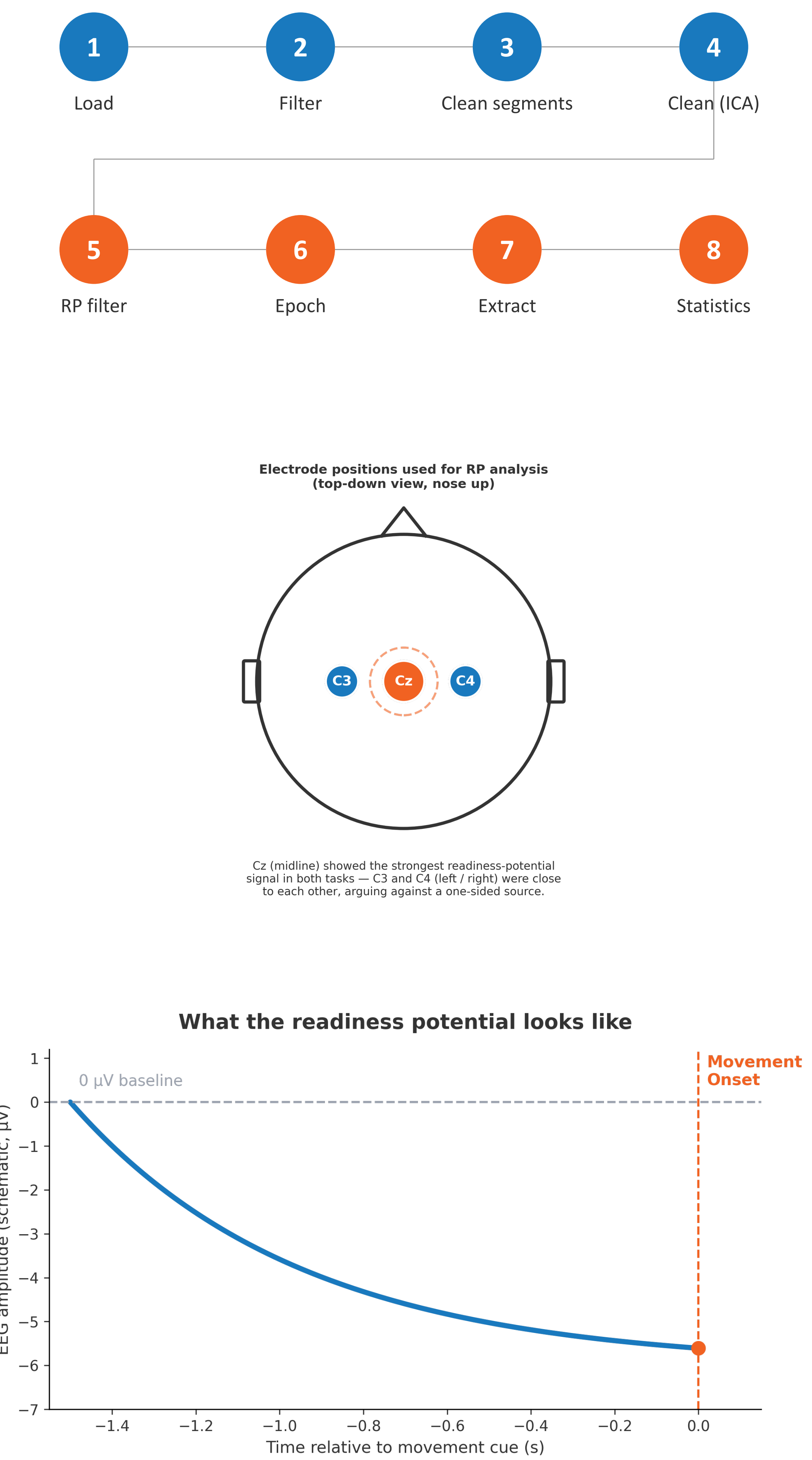
The RP was detected in 14 of 16 participants for the eye task, and 16 of 16 for the facial task. The signal was strongest at the central electrode (Cz) in both tasks. The facial task gave a bigger signal overall, but a noisier one — see the figures on the middle panel.



Scan to contact the research team

1 Methods & Analyses

16 neurotypical adults wore a 32-channel EEG cap for two cued tasks: eye movements (EOG) and facial movements (EMG), about 100 trials per direction, per task. Every recording went through the same 8-step pipeline, ending in a paired t-test against a 0 μV baseline, confirmed with a cluster-permutation test.



3 Conclusions & Next Steps

Yes — we detected a pre-movement brain signal consistent with the readiness potential, in most participants, for both tasks. This is early, solid evidence for a hybrid BCI that combines EEG with eye or facial movement. Next: a movement-locked time window, a true resting baseline, more participants, and testing with our target clinical population.

4 References

Full references and dataset details available on request — scan the QR code on the middle panel to contact the research team.