

Motor task fingerprinting using OPM-MEG

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Recent advances in OPM-based, wearable magnetoencephalography (MEG) have enabled researchers to implement naturalistic movement experiments [1]. While the utility of these OPM-MEG systems has been shown in principle, the repeatability of OPM-MEG measurements must be proven experimentally. Here, we employed a maze completion paradigm, where subjects used hand movements to steer a virtual pointer through a maze. Six volunteers each completed two runs of the experiment on consecutive days. To quantify within-subject repeatability we performed a spatial fingerprinting analysis in which each subjects' activation pattern from their first experimental run is correlated with all subjects activation patterns from the second runs. We expected that each subject would display a unique pattern of activation – the “neural fingerprint” – which allows for the accurate identification of a subject from a database of activation maps, by selecting the map with the highest correlation. Results showed all subjects were correctly identified, implying that wearable OPM-MEG yields highly repeatable assessments of motor function using naturalistic paradigms.

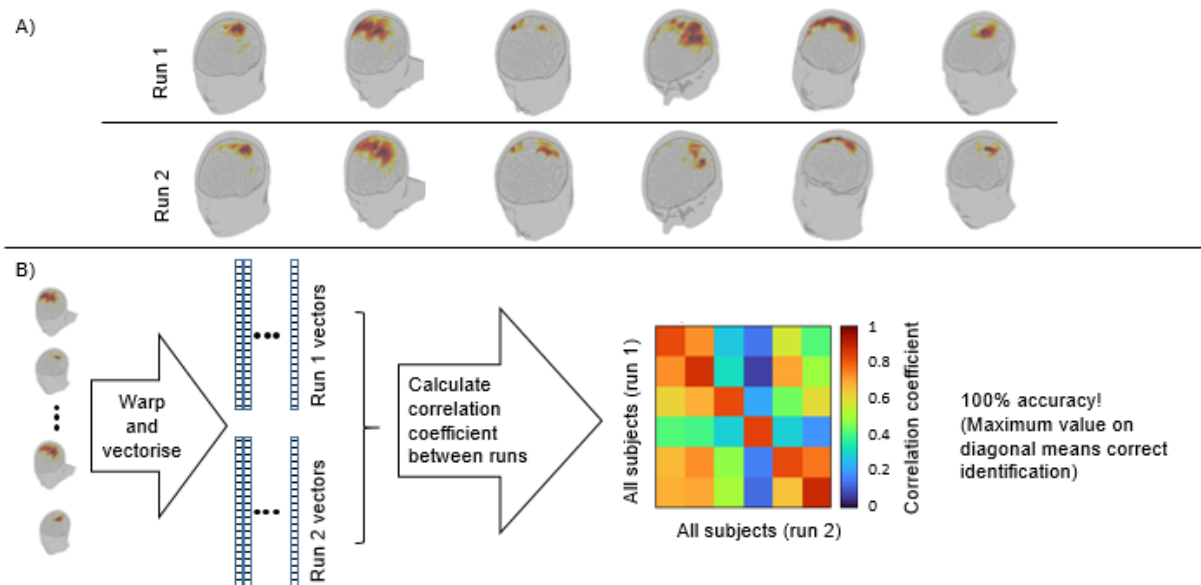


Figure 1: A) The unique patterns of activation for each subject are shown with good correspondence between the first and second run of the experiment. B) Outline of fingerprinting method: Source maps for beta desynchronization are warped to the MNI standard brain [2] using FLIRT [3] and vectorised. Correlation coefficients between each first and second run are calculated and an identifiability matrix is constructed. The maximum value in each row lies on the diagonal which means all subjects can be identified correctly.

References

- [1] E. Boto, *Nature* **555**, 657 (2018).
- [2] A. C. Evans, *NeuroImage* **62**, 911 (2012).
- [3] M. Jenkinson, S. Smith, *Medical image analysis* **5**, 143 (2001).