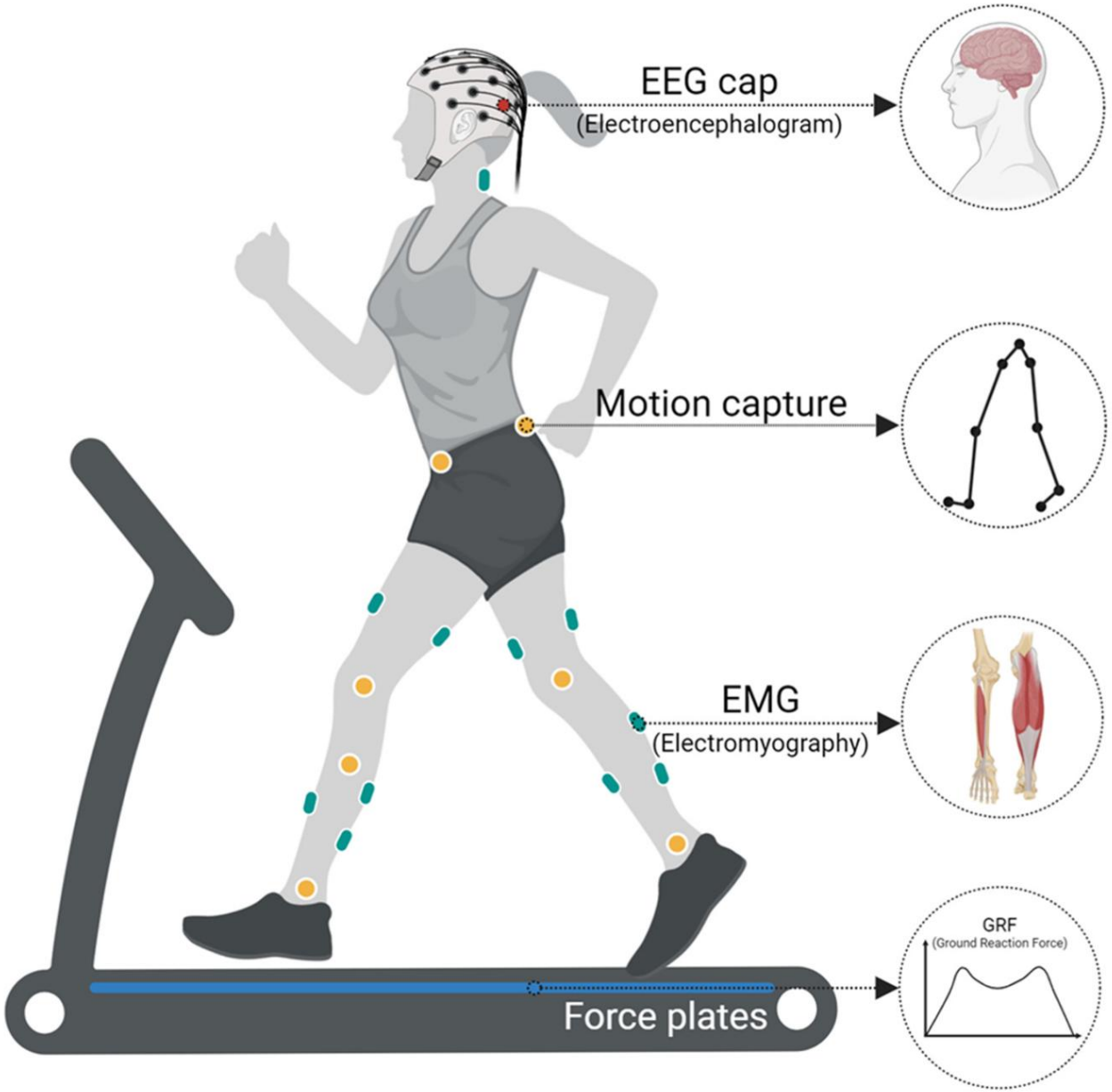
ISPGR WS
Bridging the Gap
Best Practices in Mobile Brain Imaging
Processing of EEG data in relation to the gait cycle



Richter ea., Neuroscience & Biobehavioral Reviews, 2024

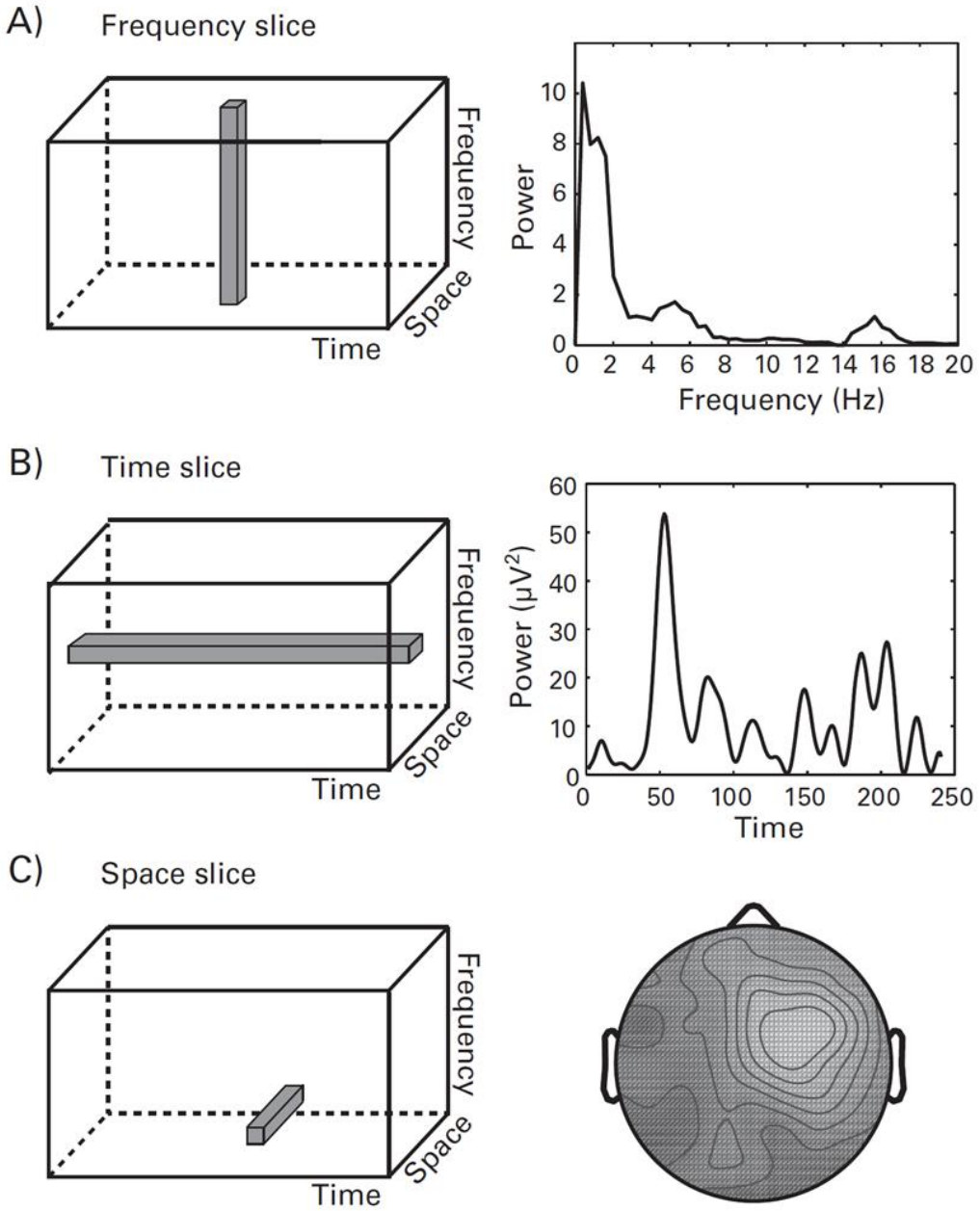
Dimension in the EEG

- Classic Lab based EEG experiments look for event-related potentials (ERPs) in many repetitions

- Mobile EEG studies can relate brain activity (from clean EEG) to motor processes (e.g. gait cycle)

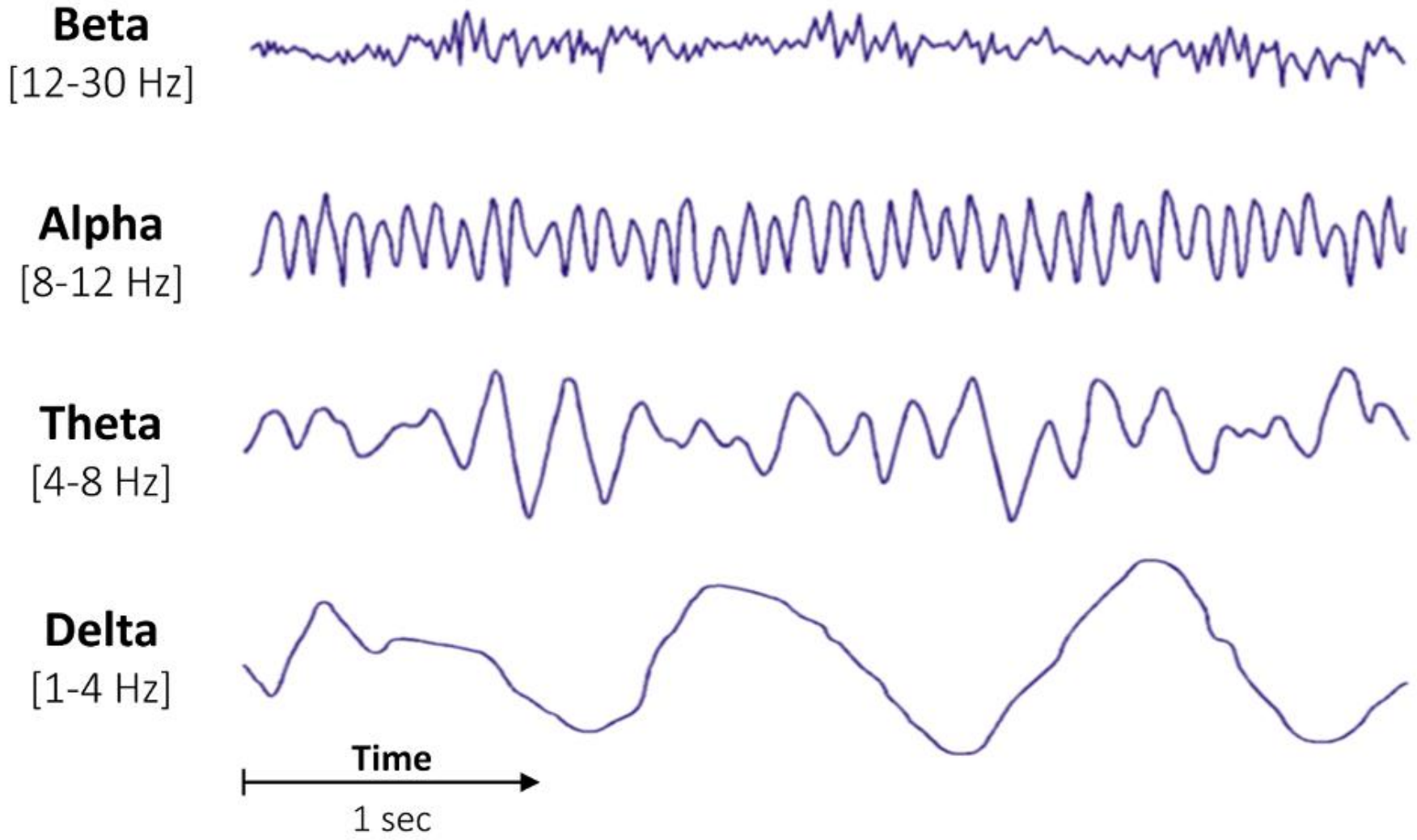
- Frequency, time and place of the brain activity can be used to explain neural control of motor processes or other activity (e.g. EMG)

-> How can this be done?



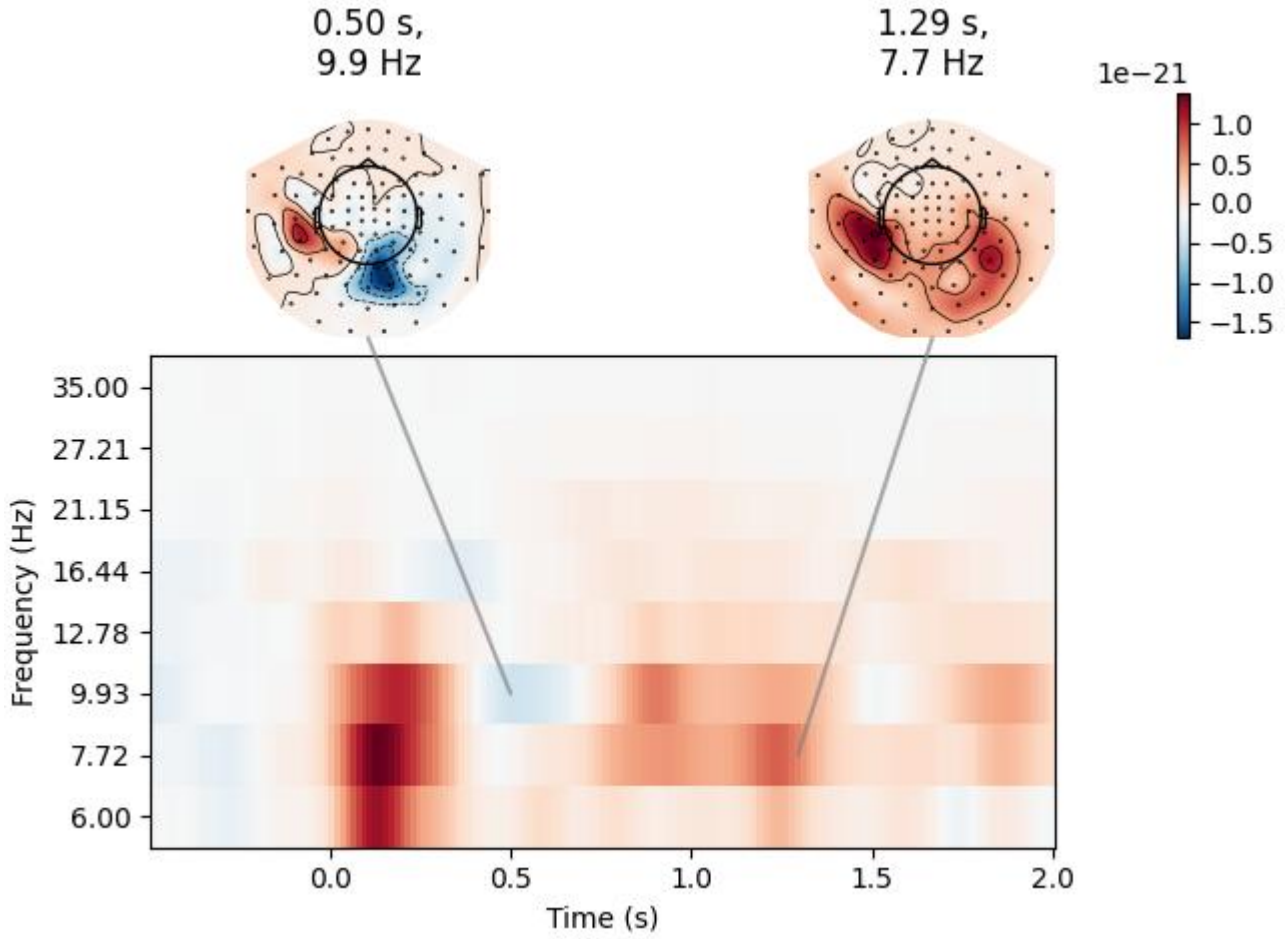
König ea., Electrical Neuroimaging, 2009

Frequency bands in the EEG

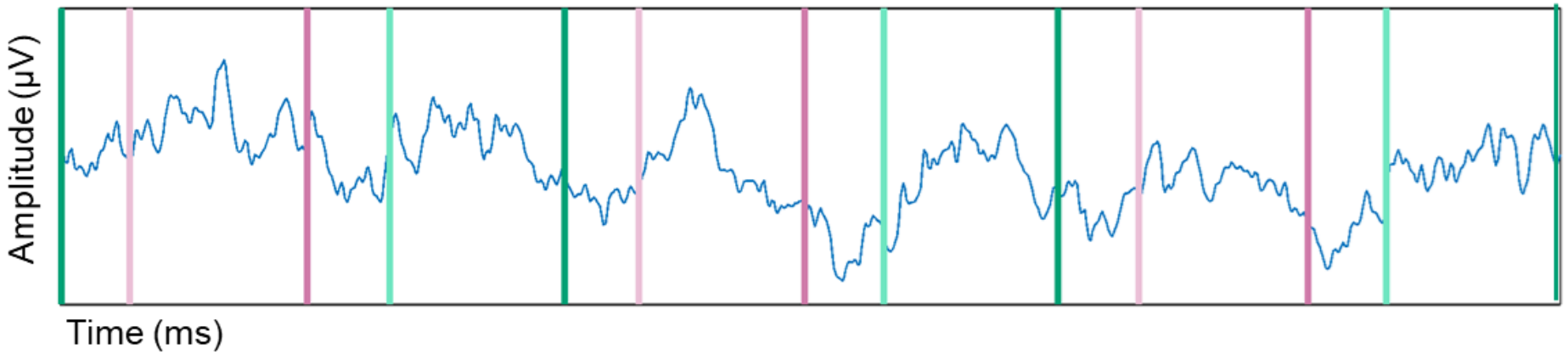


What is a time frequency representation?

- Frequency decomposition in windows (e.g. 1s) for every channel
- Task dynamics over time and in frequency
- Specific pipeline depends on the research question

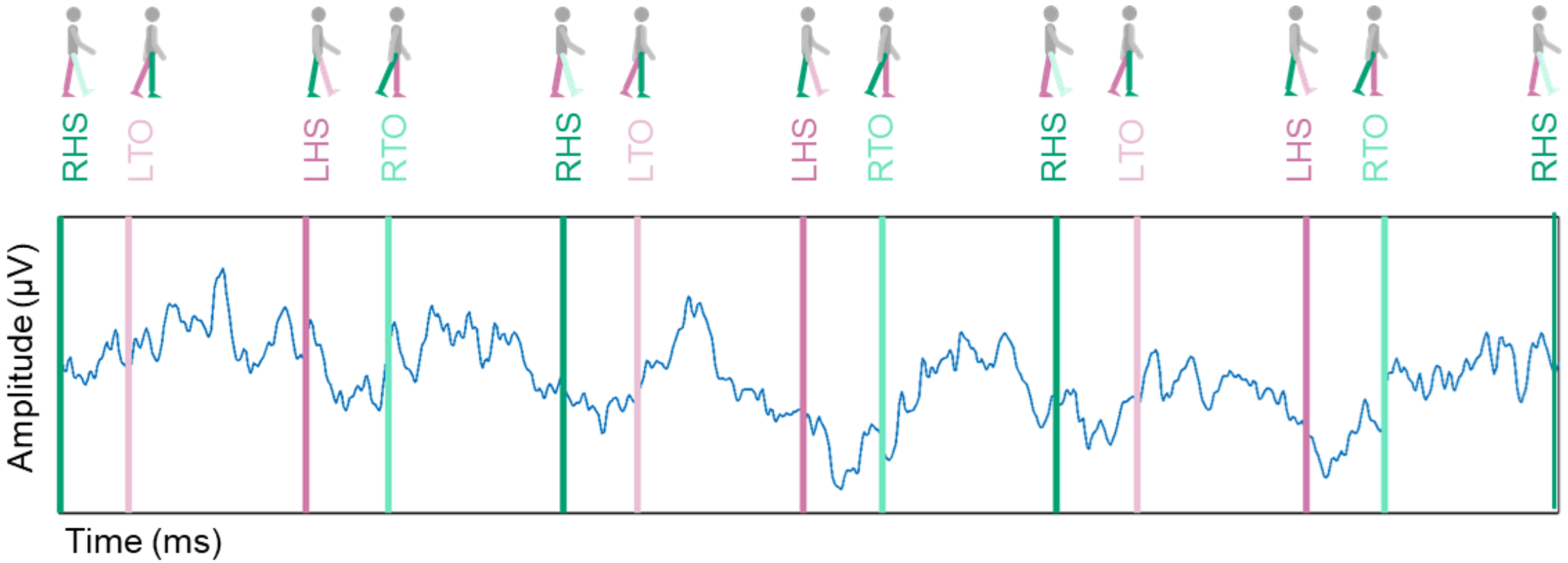


Clean EEG data to meaningful outcomes



Jacobsen ea., Frontiers in Sports and Active Living, 2022

Gait cycle + EEG

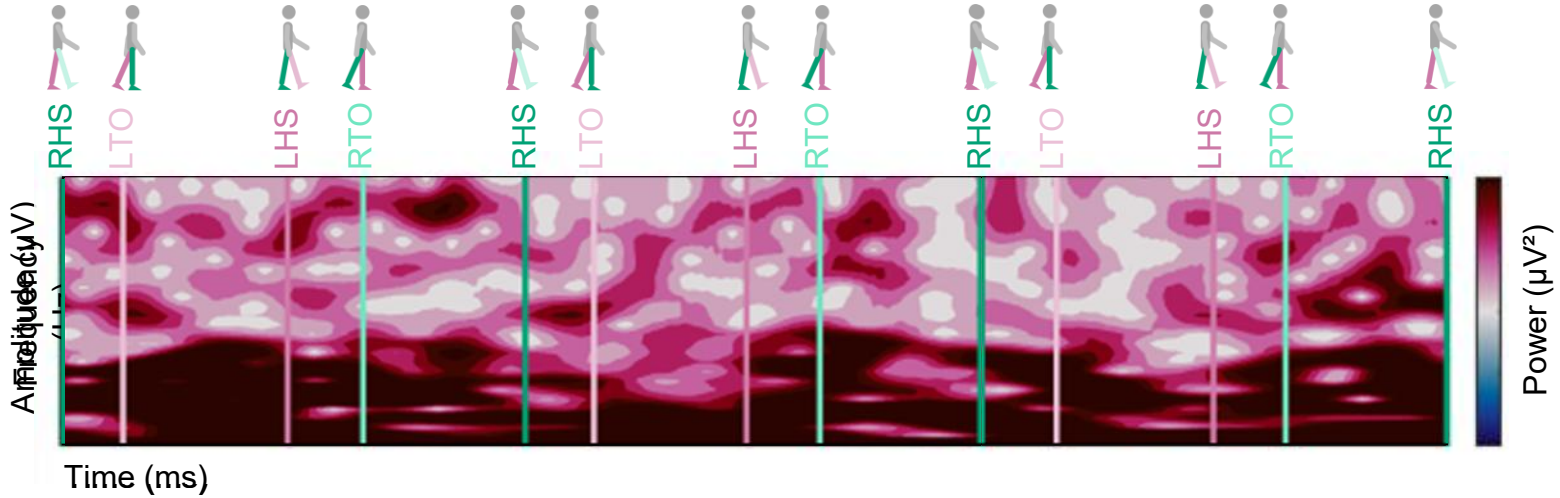


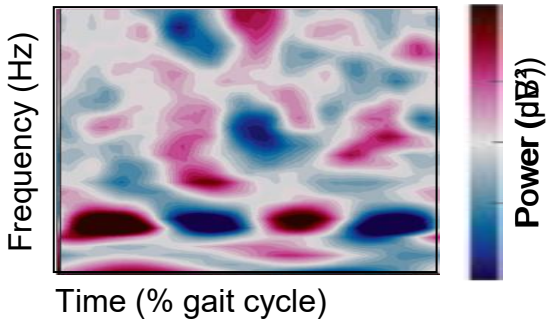
Gait cycle + EEG

Gait events

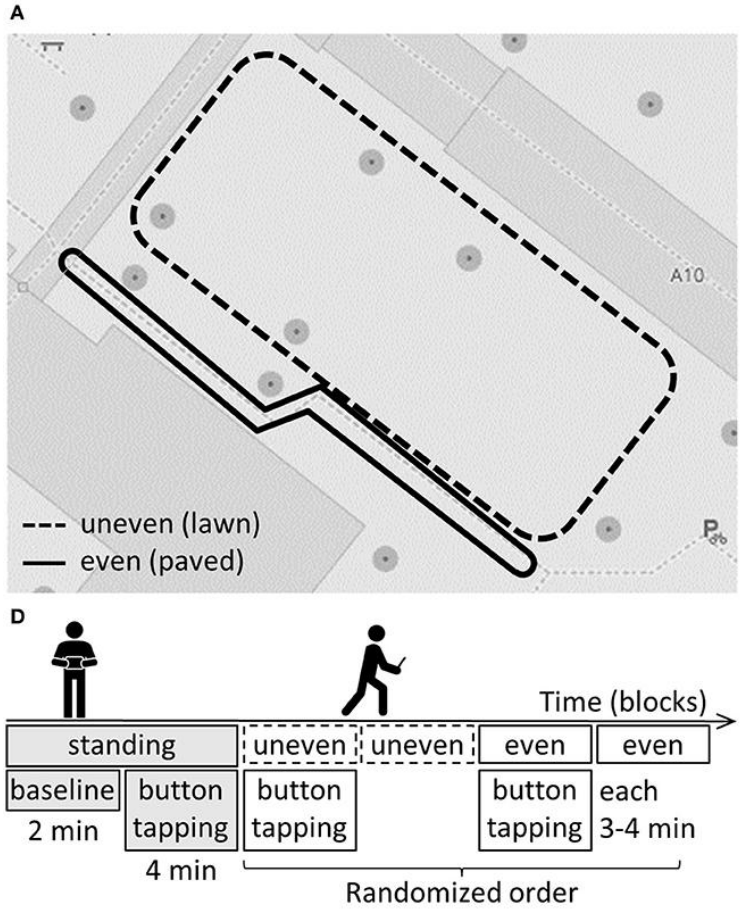
LHS	left heel strike
LTO	left toe-off
RHS	right heel strike
RTO	right toe-off

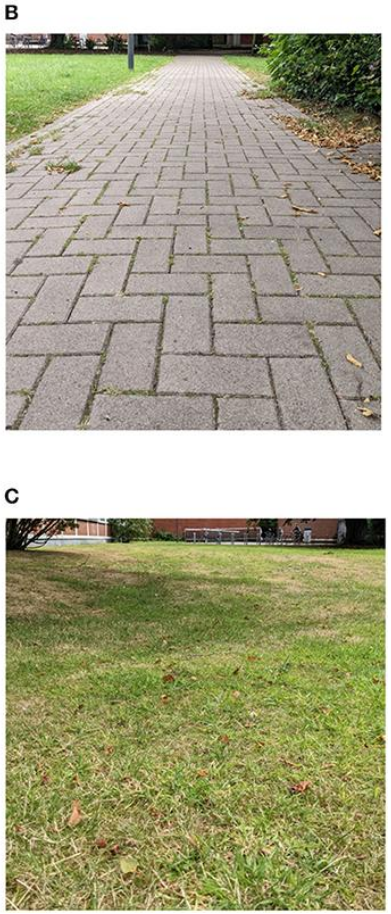
1. TF-decomposition
2. Cut to the gait cycle
3. Normalise length
4. Average gait cycles
5. Baseline correct

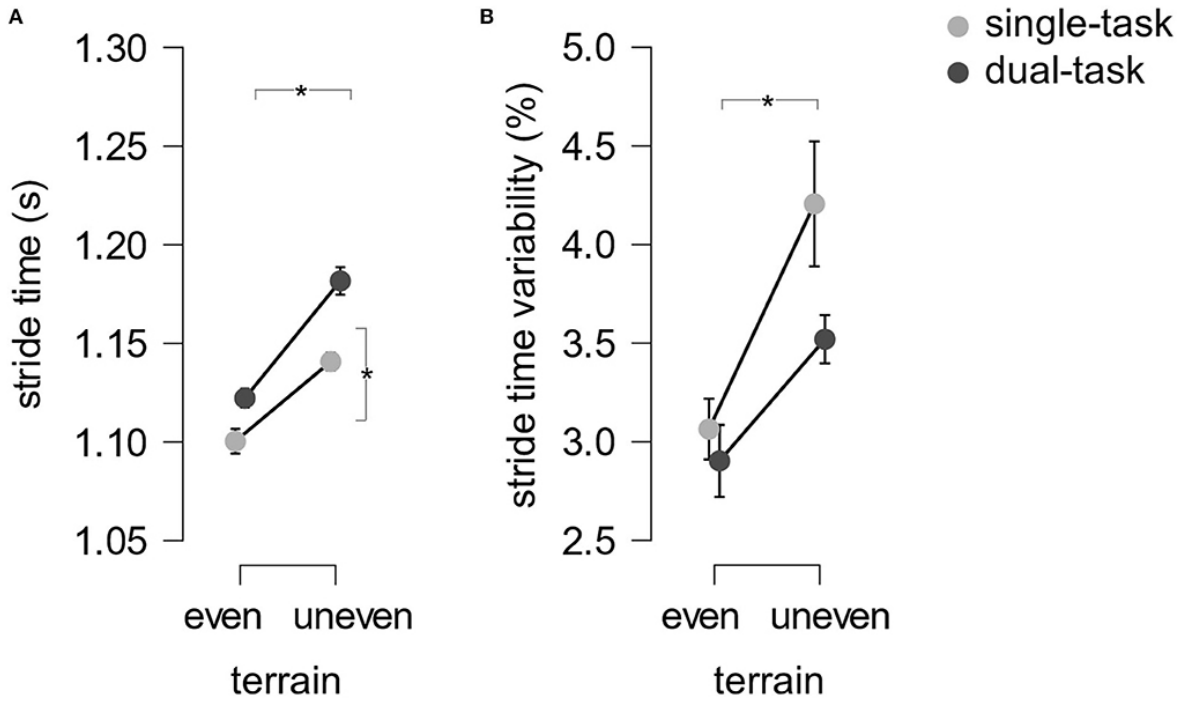




Gait during different conditions

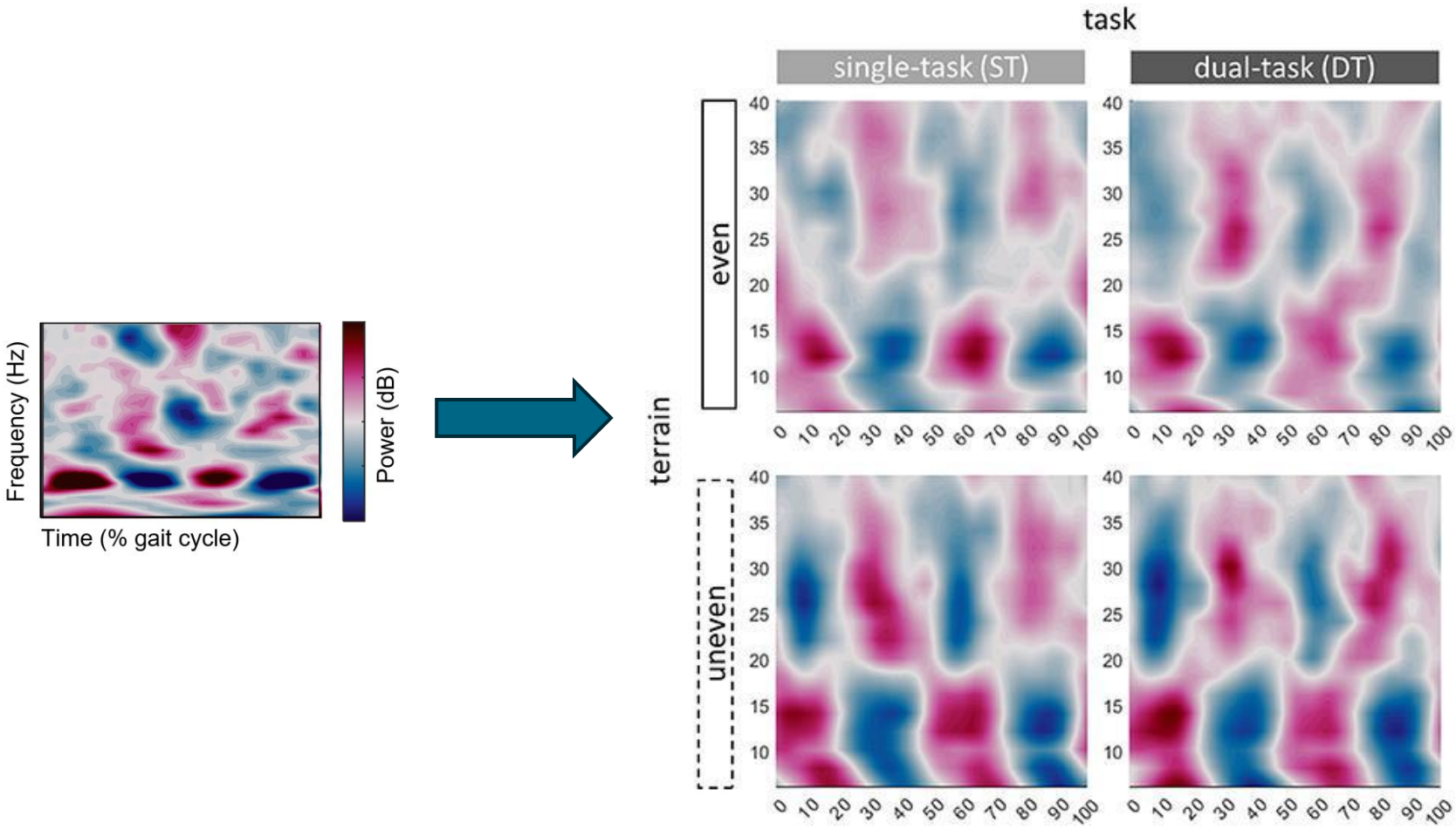




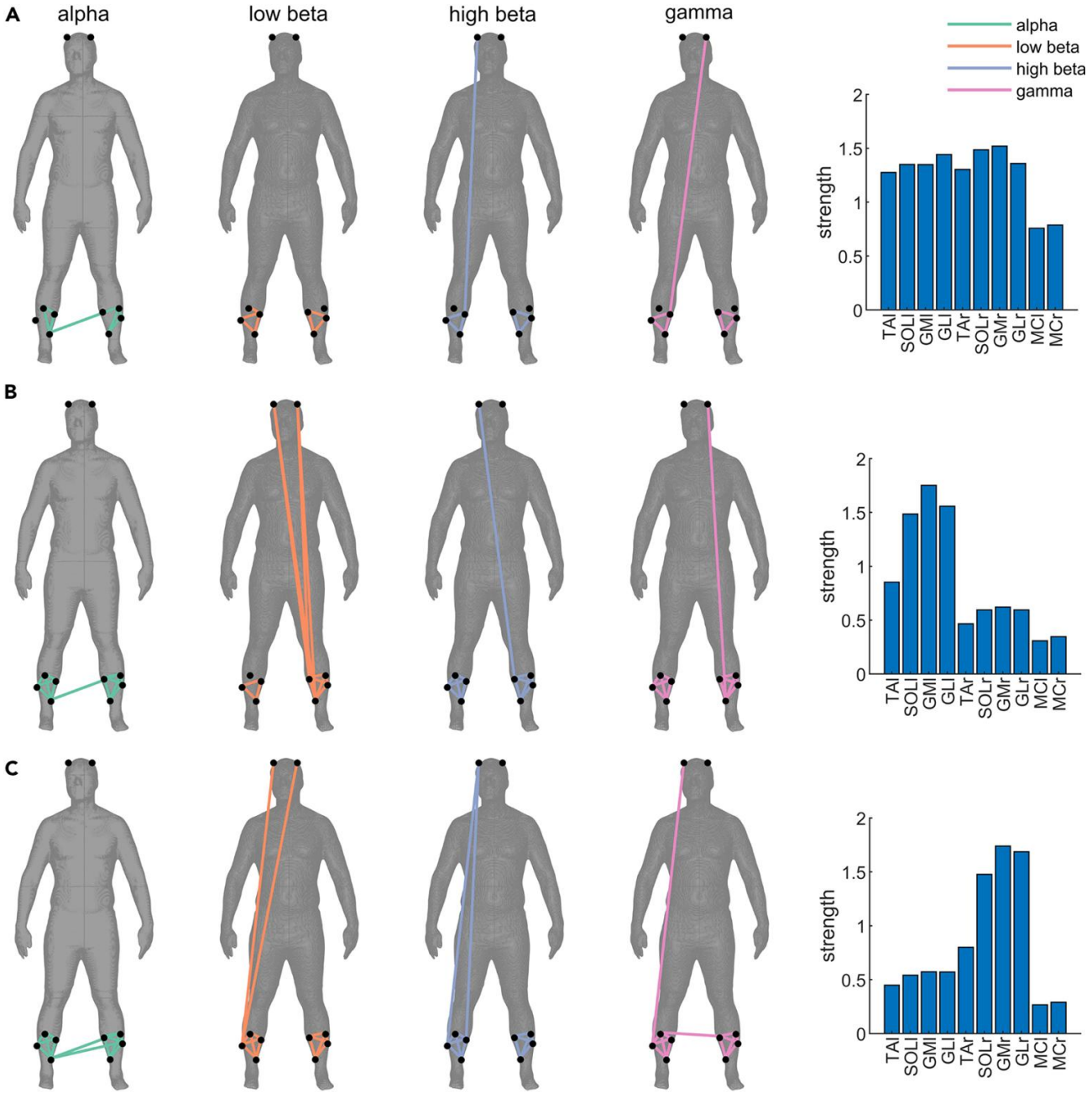


Jacobsen ea., Frontiers in Sports and Active Living, 2022

EEG during different conditions



EEG-EMG data



Roeder ea., iScience, 2024

Thank you for listening

Any questions?