EEGManySteps

Advisory board Meeting

3rd December 2024

Agenda

1) Progress so far

2) Current members

3) Project goals + *Discussion*

4) Work packages and data + *Discussion*

5) Moving forward

6) ISPGR workshop and project name

1) Progress so far/ current status

- Established bi-weekly meetings with SC
- Established communication protocols (Mail account, Discord server)
- Reached out to potential AB members (now n=21)
- Defined preliminary Project Goals
- Worked out minimal requirements for existing data to be contributed
- Designed a protocol for to be acquired data

2) Current SC members

- Liyu Cao (Zhejiang University, China)
- Elena Cesnaite (Münster University, Germany)
- Aitana Grasso Cladera (Osnabrück University)
- Nadine Jacobsen (Oldenburg University)
- Sein Jeung (TU Berlin, Germany)
- Simon Ladouce (KU Leuven, Belgium)

- Janna Protzak (Emory University, USA)
- Julian Elias Reiser (IfADo, Germany)
- Seyed Yahya Shirazi (SCCN, USA)
- Yu-Fang Yang (FU Berlin, Germany)
- Julius Welzel (Kiel University, Germany)
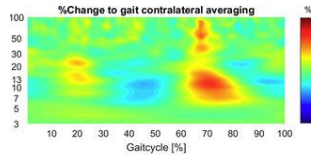- Anna Wunderlich (TU Berlin, Germany)

2) Current AB members

- Fiorenzo Artoni (University of Geneva, Switzerland)
- Tjeerd Boonstra (Maastricht University, Netherlands)
- Stefan Debener (Oldenburg University, Germany)
- Benedikt Ehinger (Stuttgart University, Germany)
- Dan Ferris (University of Florida, USA)
- Klaus Gramann (TU Berlin, Germany)
- Barbara Händel (Würzburg University, Germany)
- Julia Kline (National Institutes of Health, USA)
- John Iversen (SCCN, USA)
- Agatha Lenartowicz (UCLA, USA)
- Scott Makeig (SCCN, USA)
- Walter Maetzler (Kiel University, Germany)
- Uroš Marušič (Science and Research Centre Koper, Slovenia)
- Natalie Richer (University of Winnipeg, Canada)
- Pierfilippo De Sanctis (Albert Einstein College of Medicine)
- Mathias Vukelic (Universität Stuttgart/Fraunhofer IAO)
- Edmund Wascher (IfADO, Germany)
- Bernadette van Wijk (Vrije Universiteit Amsterdam)
- Bettina Wollesen (German Sport University Cologne, Germany)
- Tomer Yona (Israel Institute of Technology, Israel)
- Catharina Zich (University College London, UK)

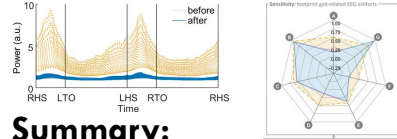https://juliuswelzel.github.io/eegmanysteps/team.html

3) Project Goals

1. Step-specific time-frequency pattern

Summary: Gait events, such as initial and final contacts, will be derived from multiple datasets. Time-frequency decompositions locked to these events will be analyzed, with potentially influencing factors parameterized.
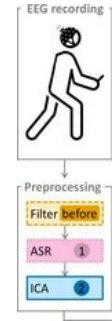
2. Characterization of gait artifacts across different systems

Summary:
Based on known parameters for assessing signal quality during gait, we can assess whether and how gait-related artifacts vary across different hardware systems and laboratories.
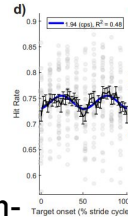
3. Influence of preprocessing on EEG results during walking

Summary:
Compare the impact of various defendable preprocessing pipelines on gait-related spectral perturbations (GRSP) and event-related potentials (ERP) across multiple hardware setups and laboratories.

4. Gait-related modulation of secondary task correlates

Summary:
Can we replicate often-reported modulations of EEG dynamics underlying cognitive task performance, e.g. reduced P3 amplitudes during walking?

Track A and Track B

Most goals can already be addressed with existing data

vs.

Goals can be addressed more specifically with newly acquired data

For **Track A**: Define minimal requirements for existing datasets

For **Track B**: Design protocol for to be acquired data

15 min discussion

If you want to say something, please raise your hand on Zoom

Please vote on how important a goal is to you and add other goals which you potentially had in mind
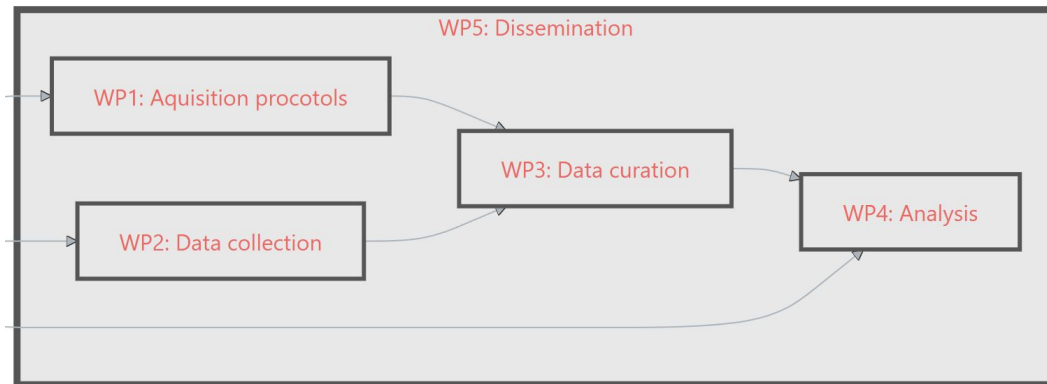
4) Work packages (WPs)

WP1. Acquisition protocols

WP2. Data collection

WP3. Data curation

WP4. Analysis

WP5. Dissemination

4) Work packages (WPs)

WP1: Acquisition protocols

- Identify existing public datasets
- Reach out to authors if data has not been shared

WP2: Data collection

- Design final protocol and manual for data collection
- Help with experimental setups

WP3: Data curation

- Convert all existing dataset to BIDS (EEG & Motion)
- Identify and parameterize covariates (age, task, …)

4) Data

WP1: Acquisition protocols

Track A: Already collected data:

Minimal requirements:

      EEG: 8 channels, 250Hz sRate

      MoCap: IMU (feet, lower back or head), OMC, (probably video)

      Task: Overground or Treadmill walking

WP2: Data collection

Track B: Protocol based approach for *dual-task gait*

Open questions:

      Treadmill vs. overground

      Visual vs. auditory

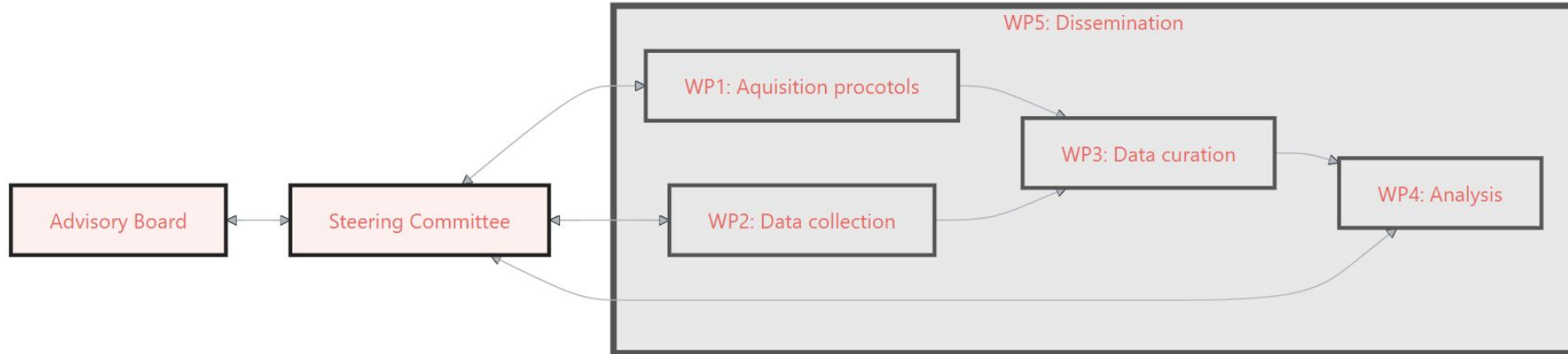   Attached vs. standalone protocol

10 min discussion

If you want to say something, please raise your hand on Zoom

Please vote on which type of data collection you prefer for EEGManySteps

5) Moving forward

- Self commitment for data collection from AB/SC
- Funding (Data collection, WPs based)

- Protocol deadline Q2 (April-June) 2025 (incl. preregistration)

6) ISPGR workshop |
"Walking Brains": Best Practices in Mobile Brain Imaging

Workshop Goals and Objectives

Mobile brain/body imaging (MoBI) is a rapidly growing field with immense potential for understanding the neural control of gait. However, there is a notable gap in integrating biomechanical expertise within the MoBI research community, limiting the application in gait studies. Early evidence indicates that combining neuroscience and biomechanics can provide profound insights into how the brain controls movement to help understanding pathophysiology underlying movement disorders.

Therefore, we aim to give a workshop that aims to:

1. Introduce the fundamentals of mobile brain/body imaging.
2. Demonstrate practical techniques for multimodal data collection, including EEG, IMUs, and video motion tracking.
3. Equip attendees with skills for analyzing multimodal data to derive gait-related neural correlates.

Takeaway Skill, Knowledge, or Material

By participating in this workshop, attendees will learn how to implement mobile brain/body imaging in their own studies, broadening the scope of gait research and its applications.

Proposed Format of the Workshop

- *Part 1 (90 minutes):* Hands-on activity where participants will set up a multimodal recording system, including an EEG cap, IMUs, and a motion-tracking system. This session will include live data synchronization using the Lab Streaming Layer.

- *Part 2 (90 minutes):* Data processing and analysis session, focusing on (pre-recorded) EEG data. We will showcase how to remove motion artifacts and then explore techniques for deriving and interpreting gait-related neural activity from the cleaned data.

6) Project name

Current option: **EEGManySteps**

Alternative option: **EEGManyMoves** (or other suggestions, e.g. ManyBehaviors?)

with EEGManySteps as its first project.

Next projects could be EEGManyReaches, EEGManyInteractions, EEGManyFalls, …

If you have opinions about the
alternative option please approach us

EEGManyMoves

EEGManySteps

EEGManyFalls

EEG…