

LSL for Mobile Brain EEG:

Take it to the wire – wire less!

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Neuropsychology Lab Oldenburg

Stefan Debener's lab. EEG to go.

1 follower Germany <https://uol.de/neuropsychologie> @NeuropsychOL

Overview Repositories 6 Projects Packages People

Popular repositories

SCALA

Public

A signal processing Android application

Java 7

LSL_RECORDER

Public

Android Recorder for LSL streams in XDF Format

C++ 1 2

Pocketable-Labs

Public

Code repository for the paper Towards Pocketable Labs for Everyone:
Synchronized Multi-sensor Data Streaming and Recording on
Smartphones

MATLAB 1 1

SENDA

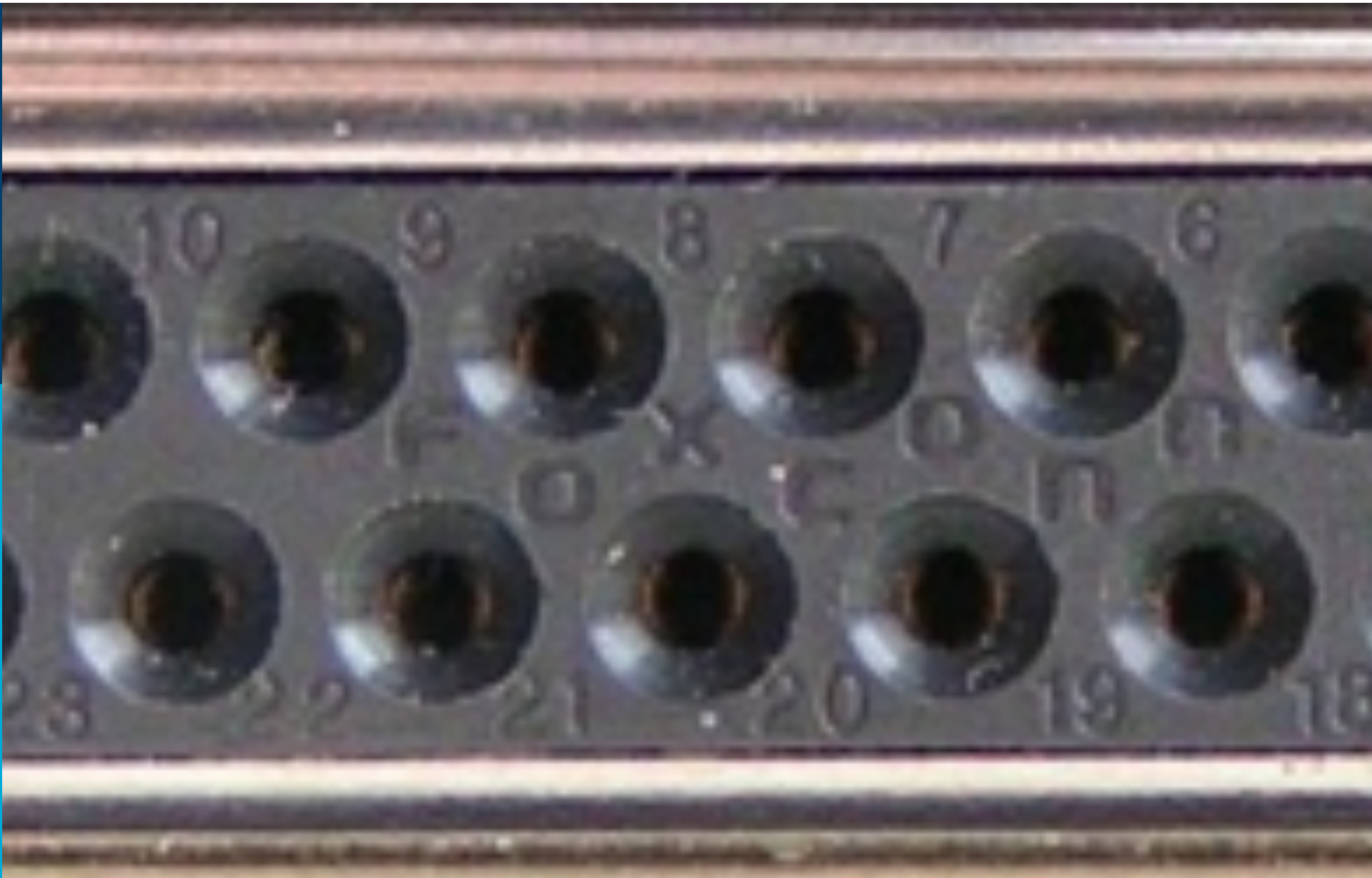
Public

Forked from AliAyub007/SENDA

Sensor Data Streamer on android using LSL (Lab Streaming Layer)

C++

<https://github.com/NeuropsychOL>



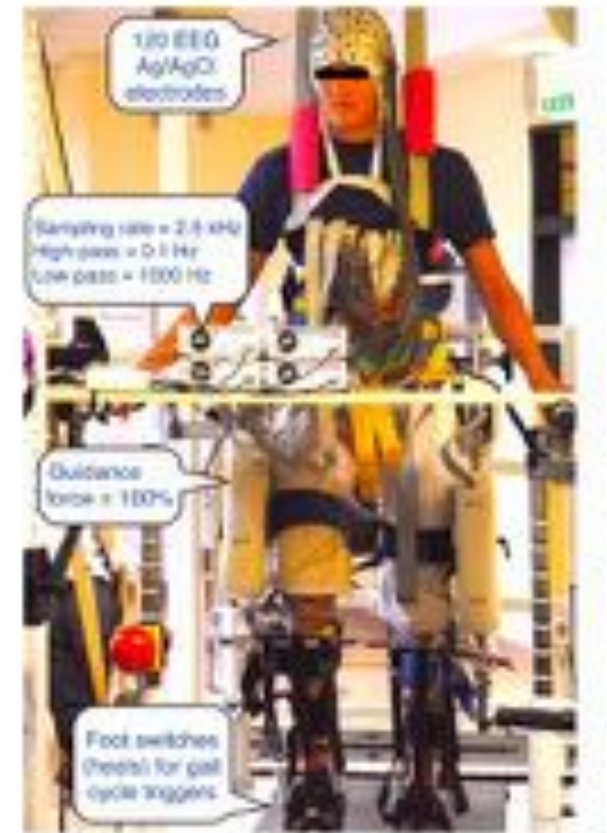


Mobile EEG requires device mobility & participant mobility

Device mobility



Participant mobility

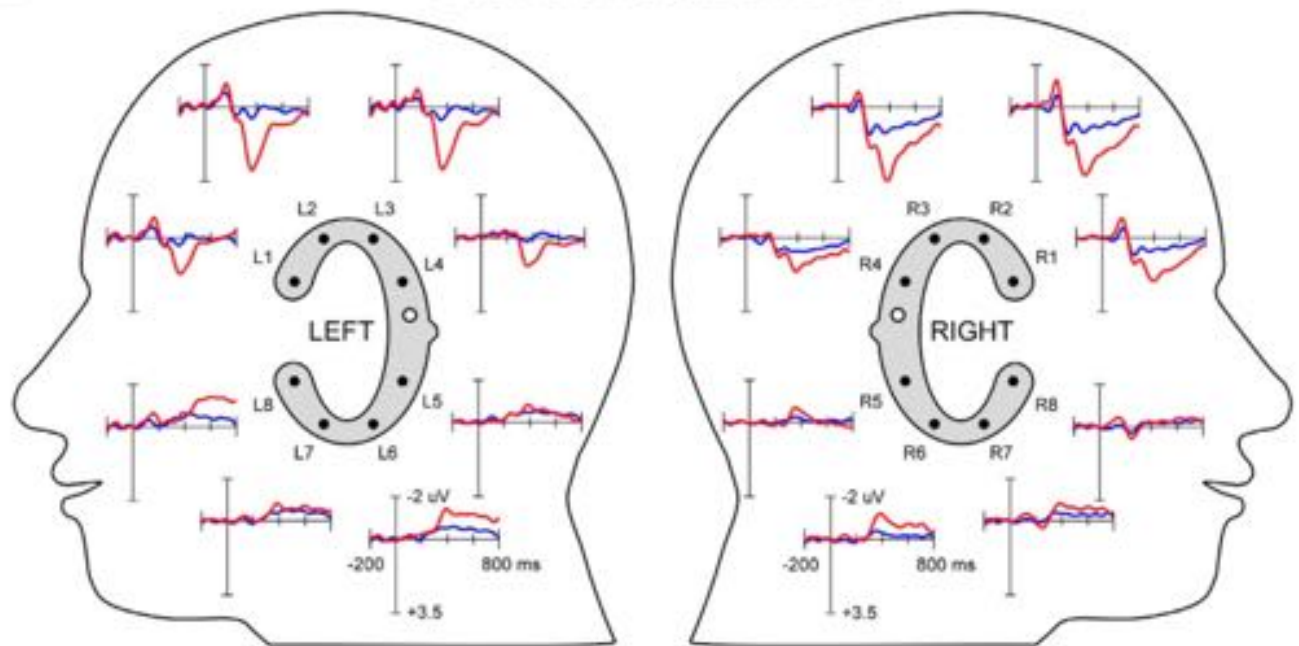
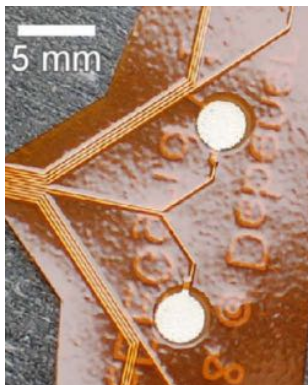




ERP on Android

Ear-EEG EEG & ERP

- unobtrusive
- chronic recordings
- outside of the lab

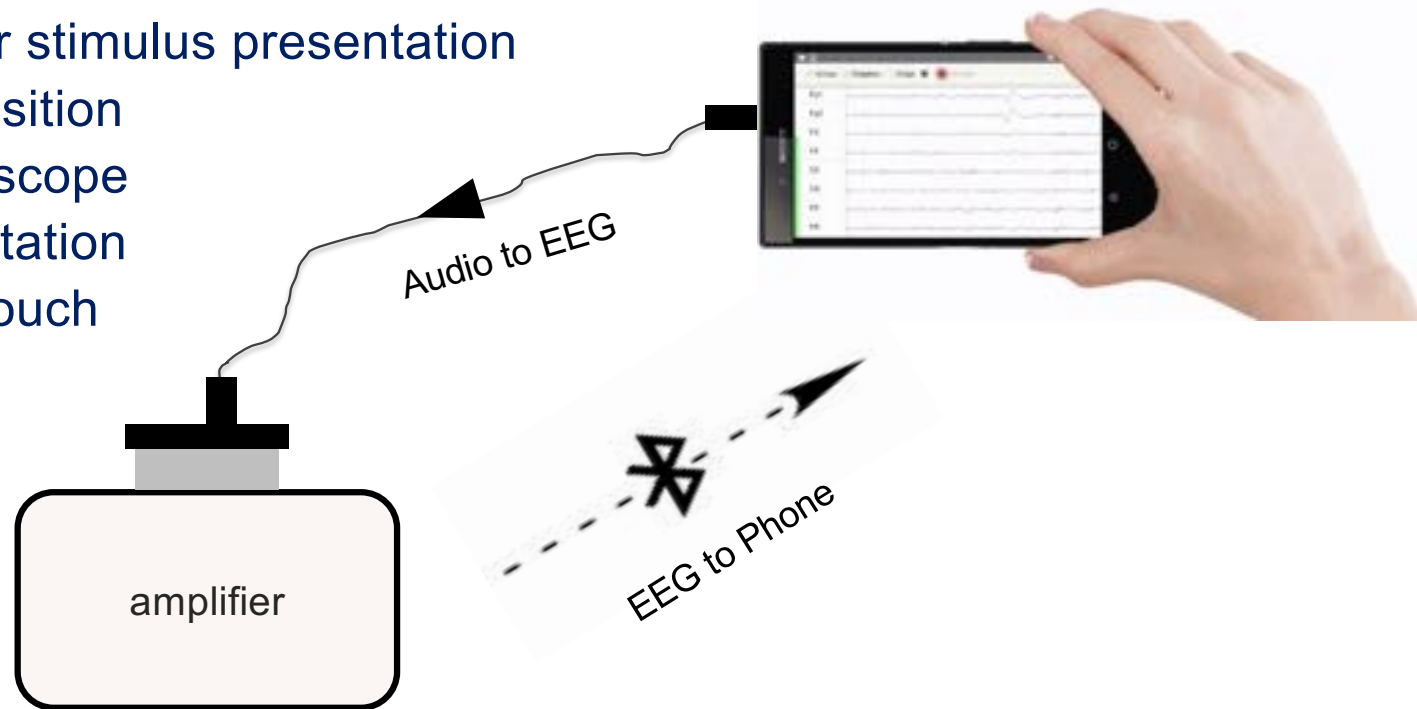


Debener et al., (2015). Unobtrusive ambulatory EEG using a smartphone and flexible printed electrodes around the ear. *Scientific Reports*

ERP on Android

Event timing

- Smartphone for stimulus presentation and EEG acquisition
- EEG as oscilloscope
- valid implementation
- audio, visual, touch



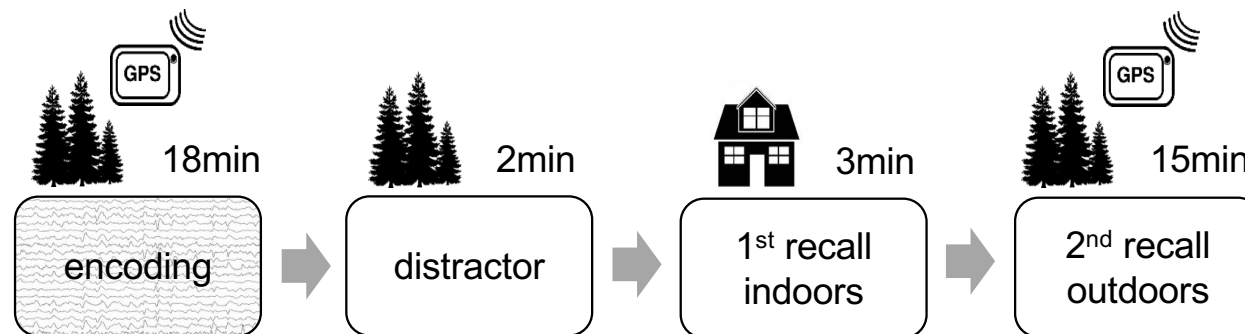
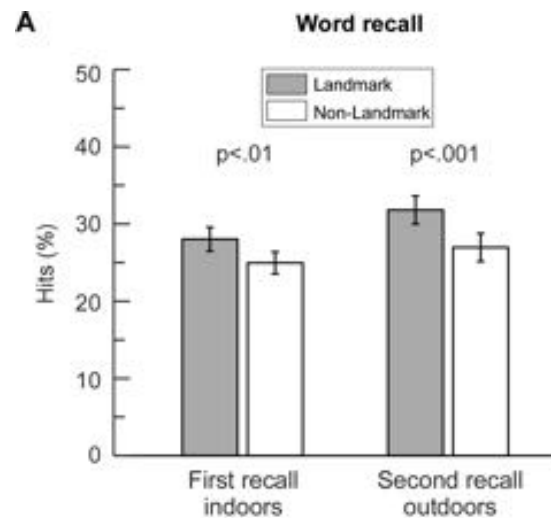
Debener et al., (2015). Unobtrusive ambulatory EEG using a smartphone and flexible printed electrodes around the ear. *Scientific Reports*

ERP on Android – on Campus



Pineyro S. et al., (2019). Out and about: Subsequent memory effect captured in a natural outdoor environment with smartphone EEG. *Psychophysiology*

ERP on Android – on Campus



Pineyro S. et al., (2019). Out and about: Subsequent memory effect captured in a natural outdoor environment with smartphone EEG. *Psychophysiology*

More ERP on Android

Time-sync:

- brain-electrical activity (EEG)
- body movements (IMUs)
- Auditory oddball (NBS Presentation)



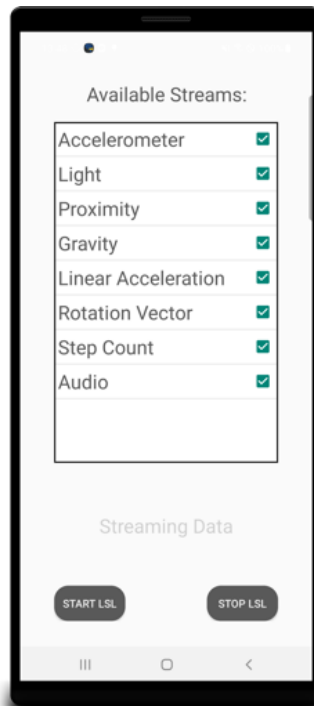
Pocketable Labs for Everyone



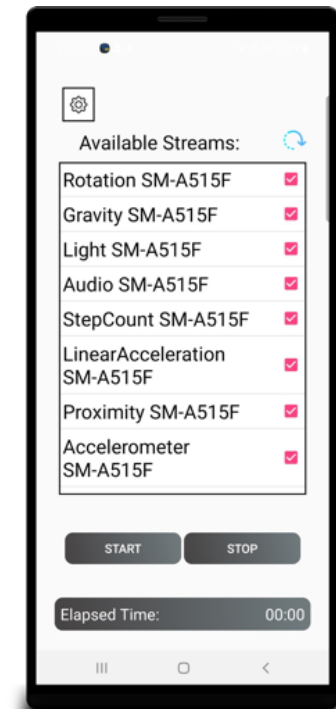
Pocketable Labs for Everyone

<https://github.com/NeuropsychOL>

SENDA



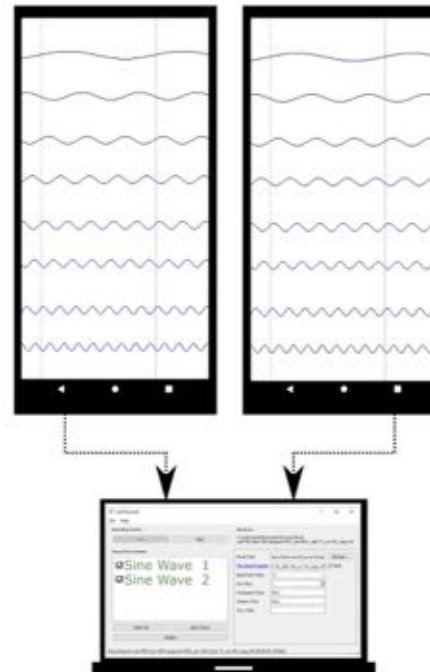
LSL_RECORDER



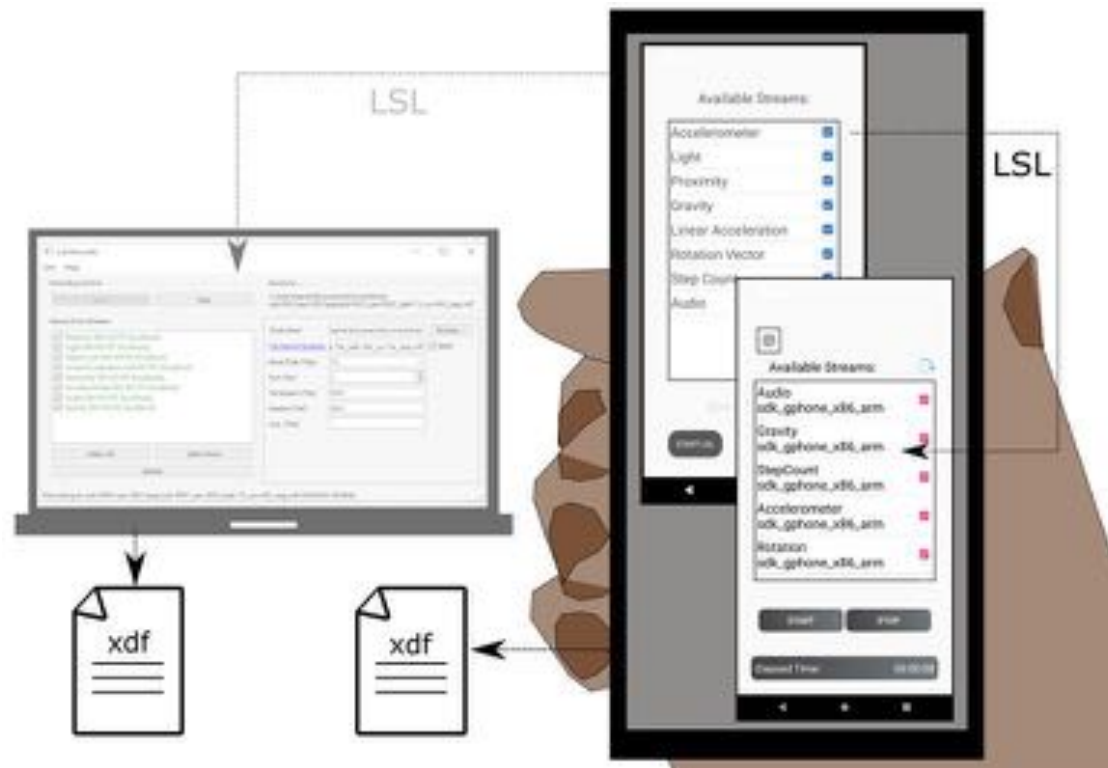
Blum et al., (2021). Pocketable Labs for Everyone: Synchronized multisensor data streaming and recording on smartphone. *Sensors*



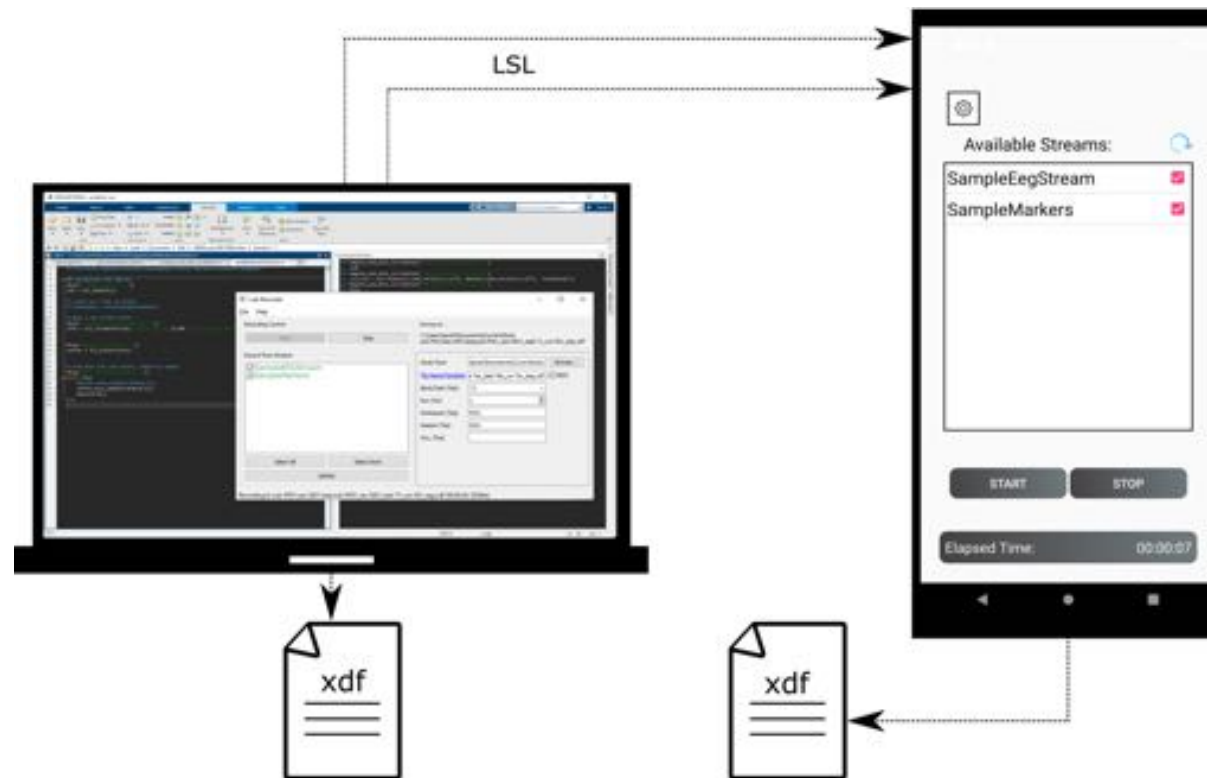
Pocketable Labs for Everyone – Validation Strategies



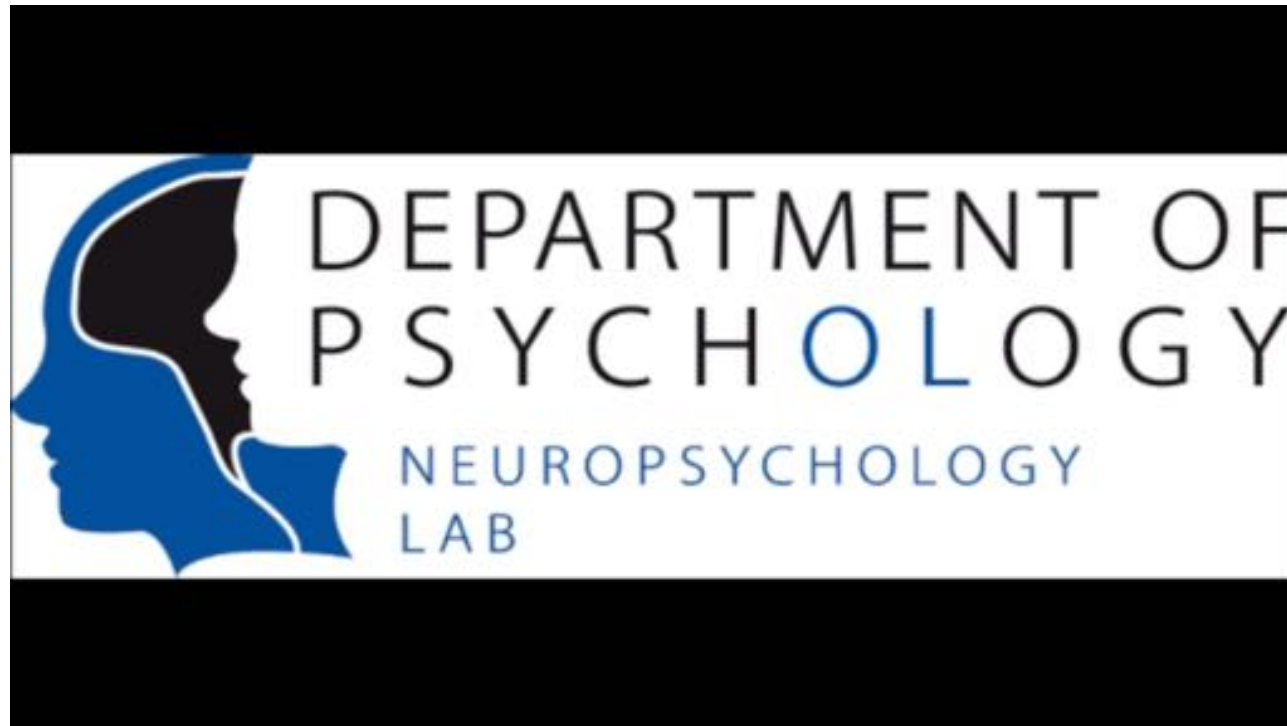
Pocketable Labs for Everyone – Validation Strategies



Pocketable Labs for Everyone – Validation Strategies

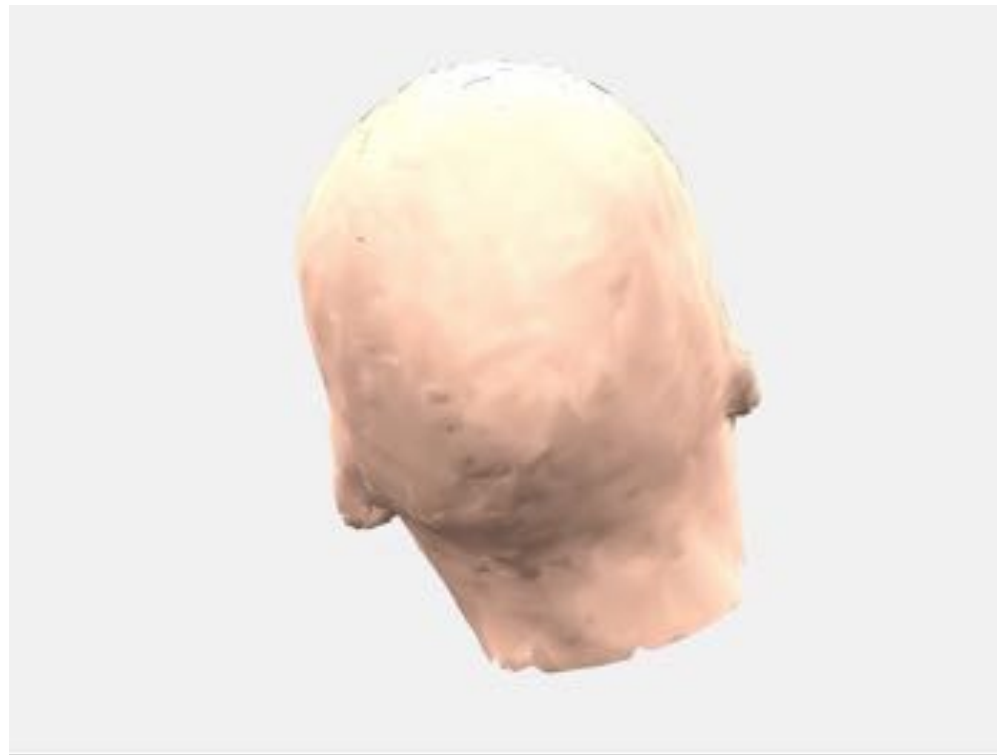
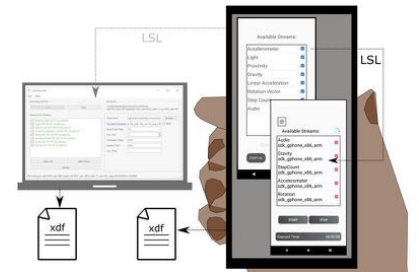


LSL data acquisition and validation



Klapproth et al., (ongoing). Master thesis project

LSL data acquisition and validation



Celik et al., (ongoing). Master thesis project

LSL on the Portable Hearing Lab

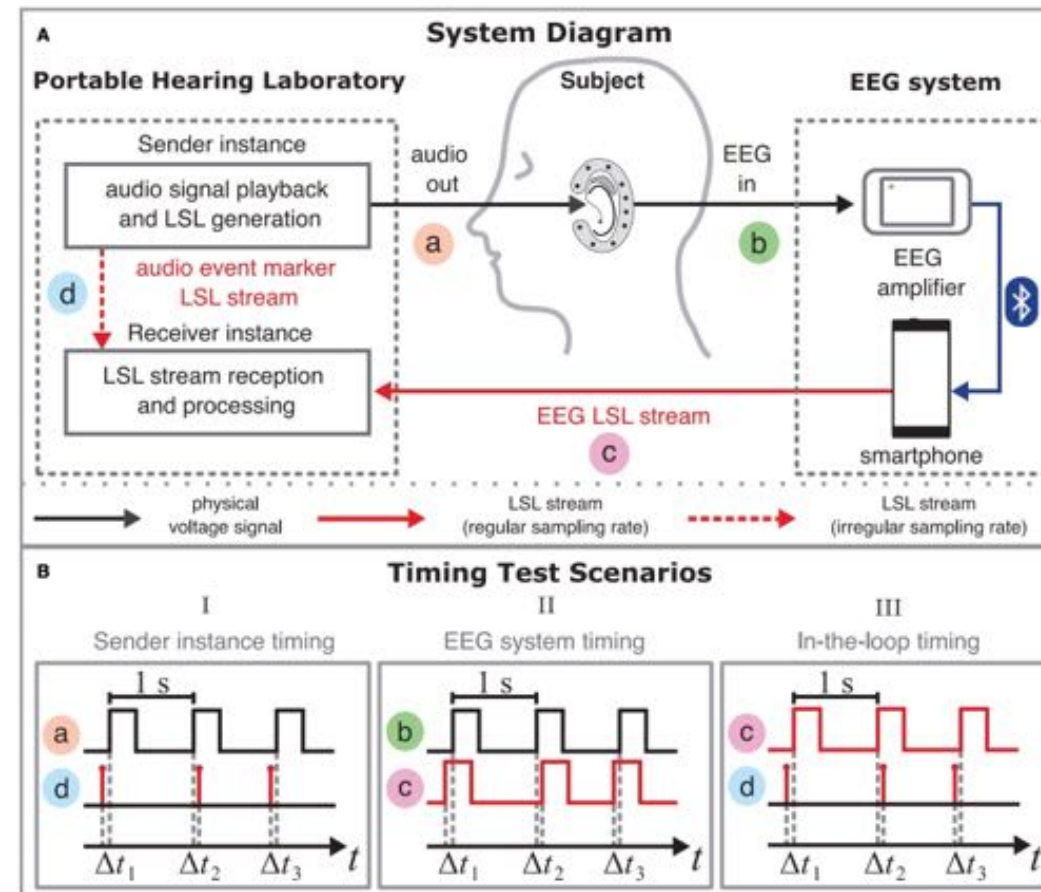


<https://batandcat.com/portable-hearing-laboratory-phl.html>

<http://www.openmha.org/>

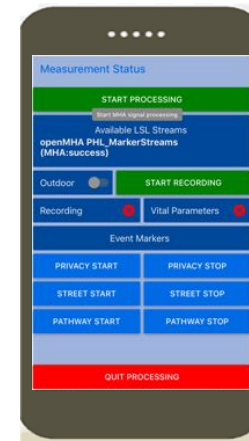


LSL on the Portable Hearing Lab

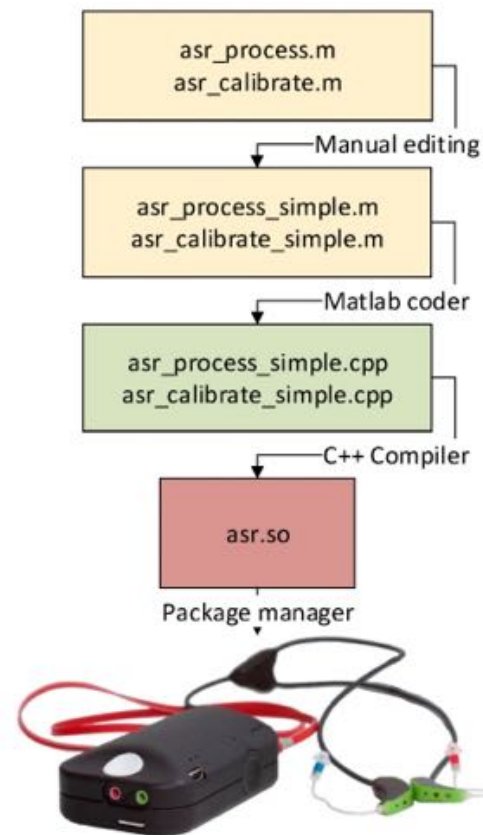


Dasenbrock et al., (2022). Synchronization of ear-EEG and audio streams in a portable research hearing device. *Frontiers Auditory Cognitive Neuroscience*

LSL on the Portable Hearing Lab



ASR on the Portable Hearing Lab



Maanen et al., (2022). Mobile EEG artifact correction on limited hardware using ASR.
arXiv: [arXiv:2204.13444](https://arxiv.org/abs/2204.13444)

Summary

- **don't be careless, test your timing**
- **LSL is amazingly good!**