EEG in Europe and Africa

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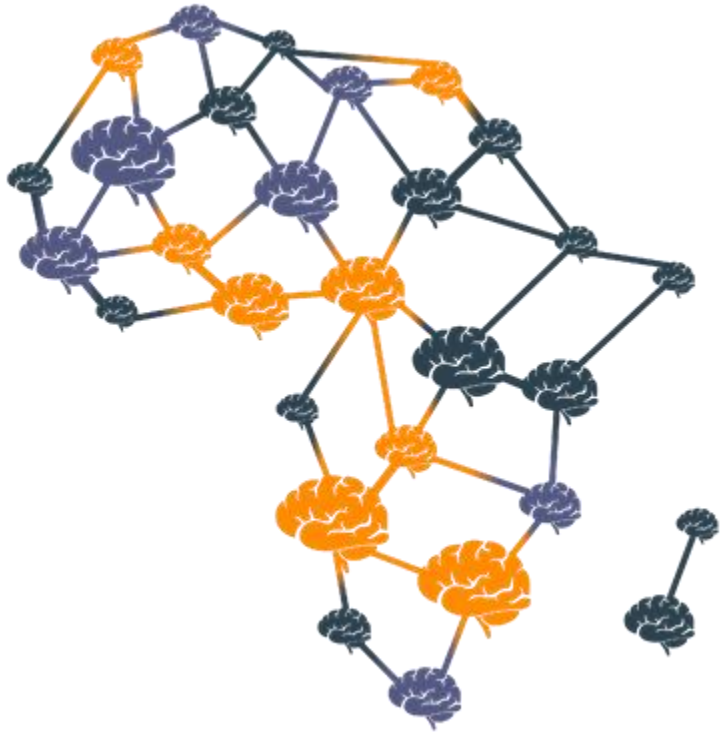
9-14 June 2025
Port Harcourt, Nigeria



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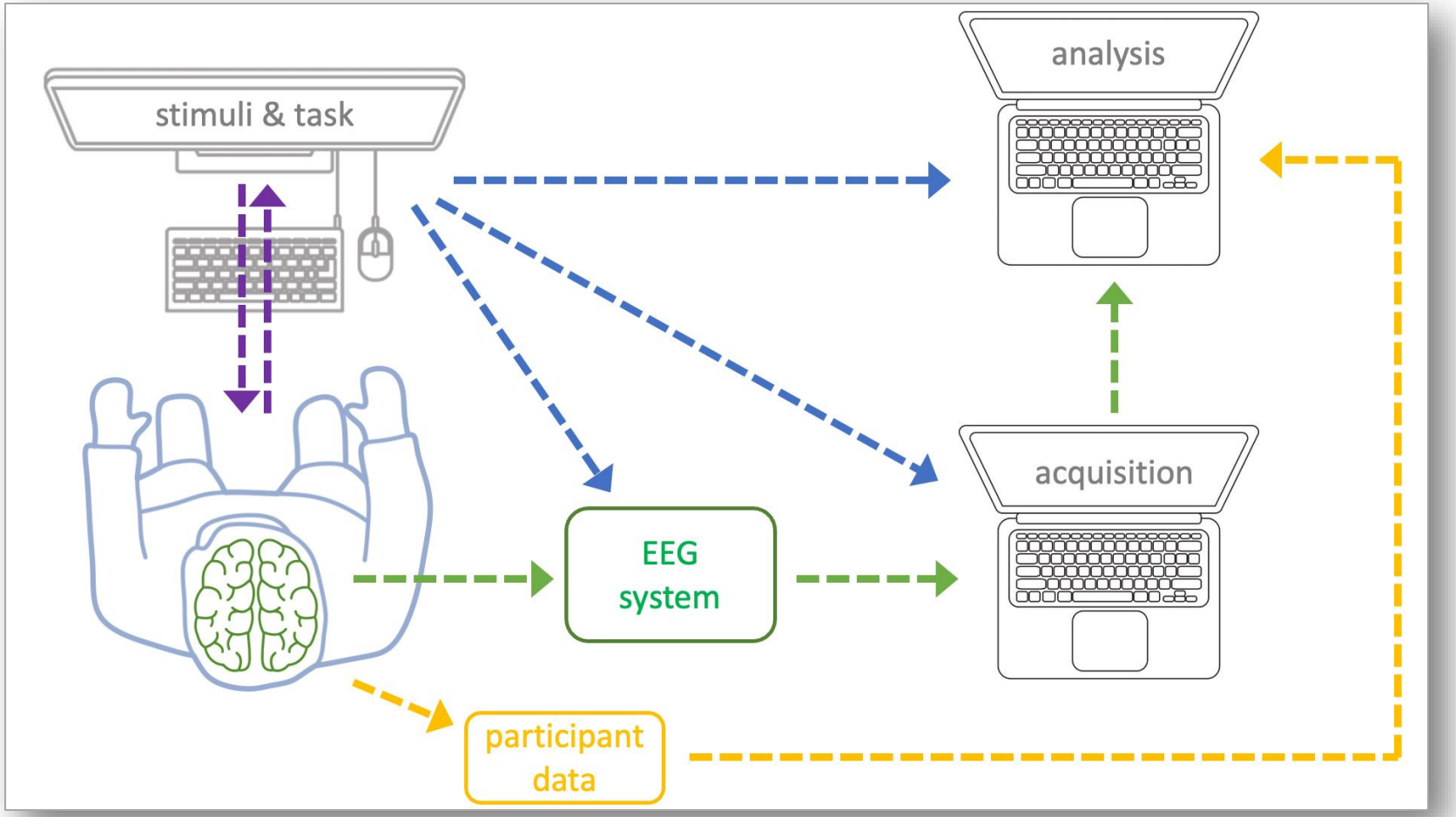
Zooming out from the person and experimental perspective



Outline and topics to cover

What makes EEG in Africa different from EEG in Europe

Organization of research infrastructure

Financial and organizational constraints

What does it cost

Running an efficient lab

Practical differences like African hair

Ethical and legal differences

A typical(?) EEG lab - The Donders Centre for Cognitive Neuroimaging

The DCCN is part of the Donders Institute for Brain, Cognition and Behavior. The institute is part of Radboud University Nijmegen.

The DCCN has 2 EEG labs, an MEG scanner, 3 MRI scanners, brain stimulation, and multiple behavioral labs.

About 250 researchers use the labs at the DCCN.

At the DCCN there is a technical lab support group (3 people) plus an EEG/MEG lab manager and an MRI lab manager.

Over the whole Radboud University campus there are about ten EEG labs, some of them used by only a few people -> EEG does not have to be done in a big center like the DCCN.

Organizational and financial structure – high-end at the DCCN

All DCCN research facilities (including EEG labs) are available to all researchers that are part of the Radboud University.

The university pays a lump sum for the infrastructure (building, labs, support staff).

The professors apply for grants, hire students and postdocs, and include budget for lab usage.

The researchers pay for the use of the EEG lab (~30 euro/hour) from those grants.

New equipment is often acquired based on grants.

The Dutch Government (NWO) and the European Union (EU) are the main funding agencies for the research grants.

The costs of using the DCCN labs (from our intranet)

Rental tariff for participants of DCCN

- Radboud University (FSW-BSI, FSW-DCC, FNWI-DCN)
- Radboudumc (MNS, Psychiatry, Neurology)
- Max Planck Institute

Tariffs 2025:

Lab	Estimated direct costs (a)	Estimated indirect costs (b)	Total (a+b)	VAT (c)	Total (A+b+c)
MRI 3T	€ 233,32	*See (1)*		*See (2)*	
MEG	€ 506,00	*See (1)*		*See (2)*	
EEG	€ 29,42	*See (1)*		*See (2)*	
TMS	€ 34,84	*See (1)*		*See (2)*	
OPM	€ 111,58	*See (1)*		*See (2)*	
FUS	€ 60,25	*See (1)*		*See (2)*	
Behavioral (incl. Cubicles)	€ -	*See (1)*		*See (2)*	
MRI 7T (ELH - Essen)	See (3)	See (3)		See (3)	

(1): Note that the surcharge for indirect costs is subject to the grant conditions and may vary per call.

(2):The rental tariffs for MPI and RUMC are subject to 21% VAT.

(3): Direct costs are subject to grant conditions and agreement conditions with the Erwin L. Hahn Institute. Please contact **finance@donders.ru.nl** for more information.

The costs of setting up an EEG lab

EEG system purchased from a company.

Say 1.000-30.000 euro

Computers for acquisition, stimulus presentation, etc.

Say 1.500-3.000 euro?

Supplies/consumables depends on how much you measure.

A few euro per measurement?

Maintenance and repairs, assuming replacement within 5-10 years.

Say 10-20% ?

Dedicated room for the EEG lab

??

Initial investment range from 2.500 for a minimal system, up to 50.000 euro or above for a fancy system in a nice room. Yearly operating costs range from 250 up to 5.000 euro.

Making efficient use of an EEG lab

✓ Having **many users** means that investments and operational costs can be **distributed** over them.

✓ Having more users means that the EEG lab is **more used and more expertise** is built up. However, this does require that you also work together and share expertise.

✓ EEG research is by nature very **interdisciplinary**, so having multiple disciplines working together contributes to the quality and efficiency.

✗ Having more users means that it is harder to ensure that equipment is properly handled. Untrained users are more likely to **break things**. Hence more coordination and support is needed.

Virtual EEG lab tour at the DCCN and DCC

See video

Why is the DCCN *not* typical

Only cognitive research, often also with functional MRI scanners, many tasks with the participant sitting still (or lying in the scanner).

Mostly healthy young participants.

Very well-controlled (sound-proofed and distraction-free) labs, for example for language research.

The DCCN has multiple neuroimaging methods and researchers will use what is most suited for the research question. EEG is not used that much.

The DCCN does not explore or utilize everything that EEG has to offer.

- EEG with participants that move around (mobile/wearable)
- EEG in the field (mobile labs)
- EEG on large cohorts

African hair is different from Caucasian/European hair

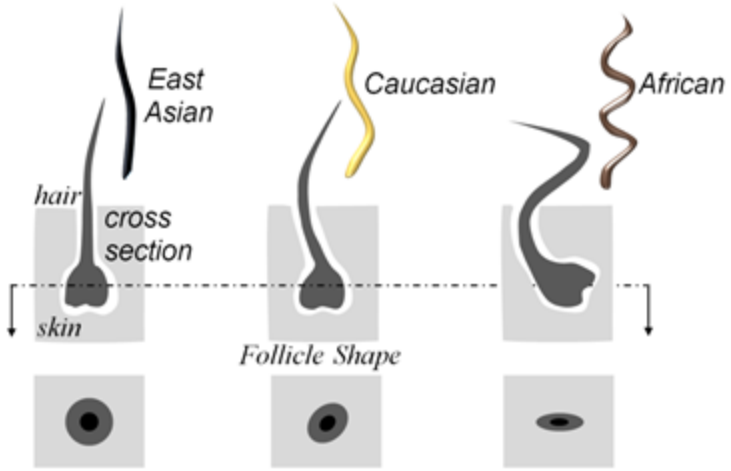


Fig. 1: People of different ethnic origin have varying hair types that originate from different follicle sizes and shapes. People of African descent have particularly coarse and curly hair [8].

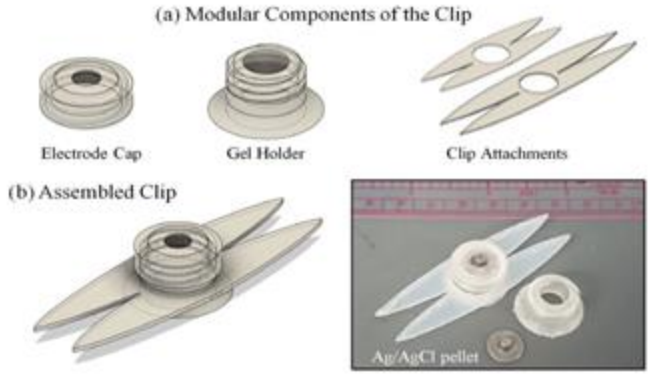


Fig. 3: Components of the *Sevo* electrode prototype. (a) CAD drawings of the modular components of the electrode and (b) CAD drawing of the assembled clip shown alongside a photograph of the 3D printed prototype

Fig. 4: Our experimental protocol setup: The right half of each participant's hair was braided, while the left half remained unbraided. Every labeled point bore a gold cup electrode, while the braided points bore a *Sevo* electrode as well. *(left)* Schematic diagram of electrode placements; *(right)* Photograph of *Sevo* electrodes placed on a braided participant.

Etienne et al. (2020). *Novel Electrodes for Reliable EEG Recordings on Coarse and Curly Hair*. https://doi.org/10.1101/2020.02.26.965202

Hair preparation

The electrode contact is the best if the hair is clean and no hair products were used.

The hair should also be dry.

In the Netherlands …

- most people have straight hair and don't use products
- adolecent boys often use "wet-look" hair gel
- elderly ladies with thinner hair more likely to use hair spray

The EEG information brochure that we send to participants (part of the infomed consent) gives instructions.

Ethical and legal differences

The Radboud University Nijmegen (Robert) is in the Netherlands, part of the European Union.

The Copenhagen University (Mikkel) is in Denmark, part of the European Union.

Some laws are made at the level of the European Union

Some laws are made at the level of the country (e.g., NL or DK).

Some EU laws are translated or interpreted differently in one country than the other.

Regulations at the regional level, at the university, and at the department/center.

European Union - General Data Protection Regulation (GDPR)

Applies to all EU contries since 2014.

Implemented slightly differently over contries (in line with local law).

Interpreted differently by different instutitions/universities/departments, some take a more liberal, others a more constrained interpretation.

In the USA there is something similar but not as far-reaching: the Health Insurance Portability and Accountability Act (HIPAA, since 1996)

The Netherlands - law

Law on “medical scientific research on humans” specifies the conditions under which research on humans is allowed.

https://wetten.overheid.nl/BWBR0009408/2025-01-01

A plan needs to be made in advance and evaluated

- Central Committee for Human-boud research (CCMO)
- Regional Committees for Medical-Ethical assessment (METC)
- Local Ethical Committees, for example at universities or faculties (ECSW)

Approvals at the national or regional level are published online

- https://onderzoekmetmensen.nl/en
- https://onderzoekmetmensen.nl/en/trial/55541 (DCCN umbrella)
- https://clinicaltrials.gov

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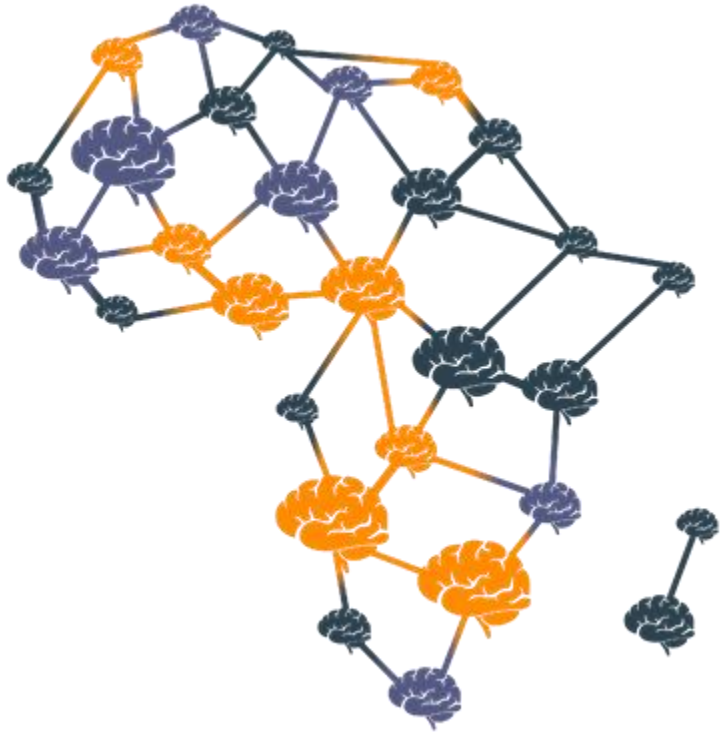

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