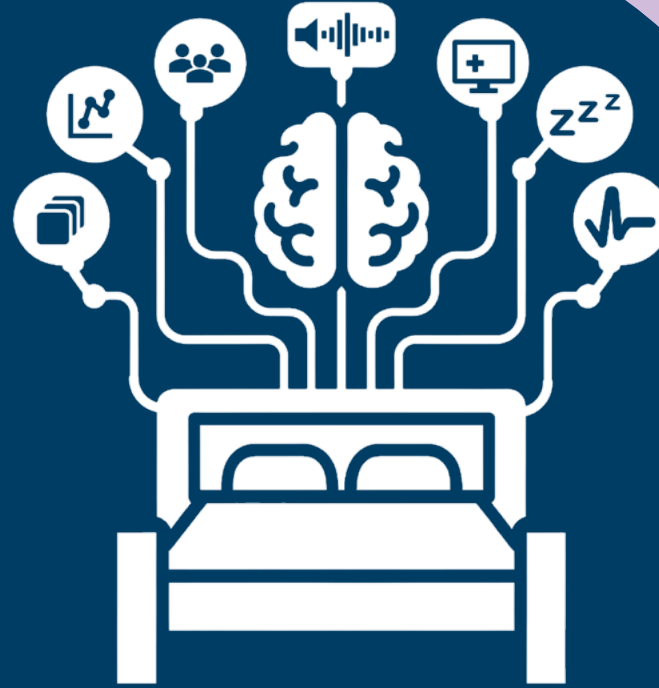




Zentralinstitut
für Seelische
Gesundheit



ManyBeds

Evaluating replicability of auditory
targeted memory reactivation

Information Event

Julia Beitner & Gordon Feld
Central Institute of Mental Health, Mannheim, Germany

5th of June, 2024

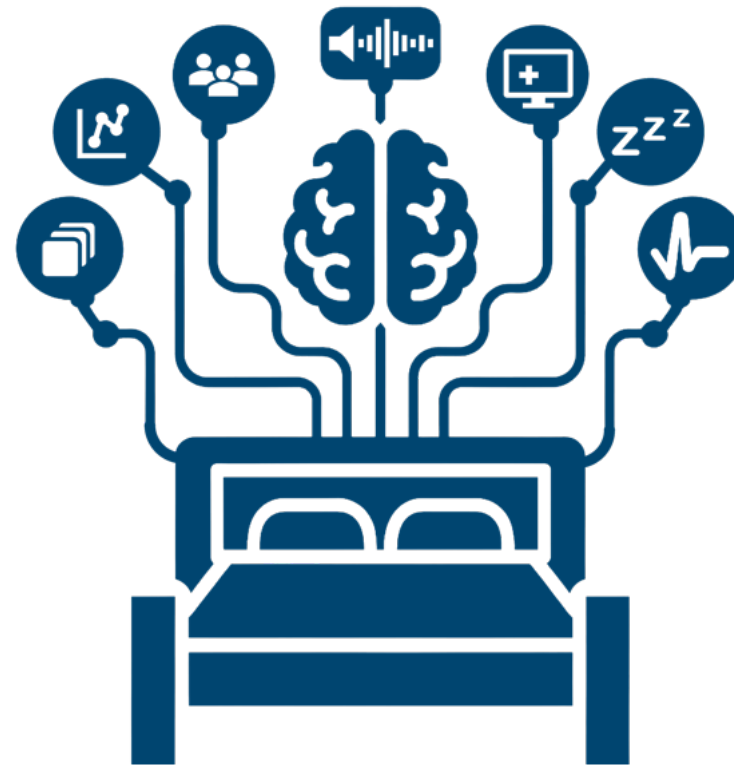
The ManyBeds Lead Lab



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Dr. Gordon Feld

Principal Investigator

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Question: What is the ManyBeds project?

Answer: A **multi-lab many-analysts replication** study

- **replication**: ManyBeds aims to study the **Targeted Memory Reactivation** effect (TMR) by running an adapted **replication** of [Rudoy et al. \(2009\)](#)
- **multi-lab**: Several **sleep labs** will collect data, resulting in **600 participants** in total
- **many-analysts**: Researchers can sign up to take part in a **many analysts approach** including feedbacked preregistrations for the replication

Overarching themes of ManyBeds

Advance sleep research

Replication of the Targeted Memory Reactivation (TMR) effect

Curation of a very large, high quality behavioral and sleep-EEG dataset

Include additional measures

Increase diversity

Conduct meta-research

Multi-lab & many analysts approach

Robustness and variability of analyses

Influence of researchers on outcomes

Transparent science

Preregistrations

High power

Open data (reusage, exploration)

Open materials, scripts, etc.

Advance sleep research

- TMR describes the behavioral effect of better memory for stimuli which were cued during slow-wave sleep compared to memory for uncued stimuli (meta-analysis by [Hu et al., 2020](#))
- Average sample size: 22 participants
- Average age: 23 years old
- Of 88 experiments, only 6 were **not** in Europe & North America
- Significant TMR effect, but evidence of publication bias

Advance sleep research

Replication of the Targeted Memory Reactivation (TMR) effect

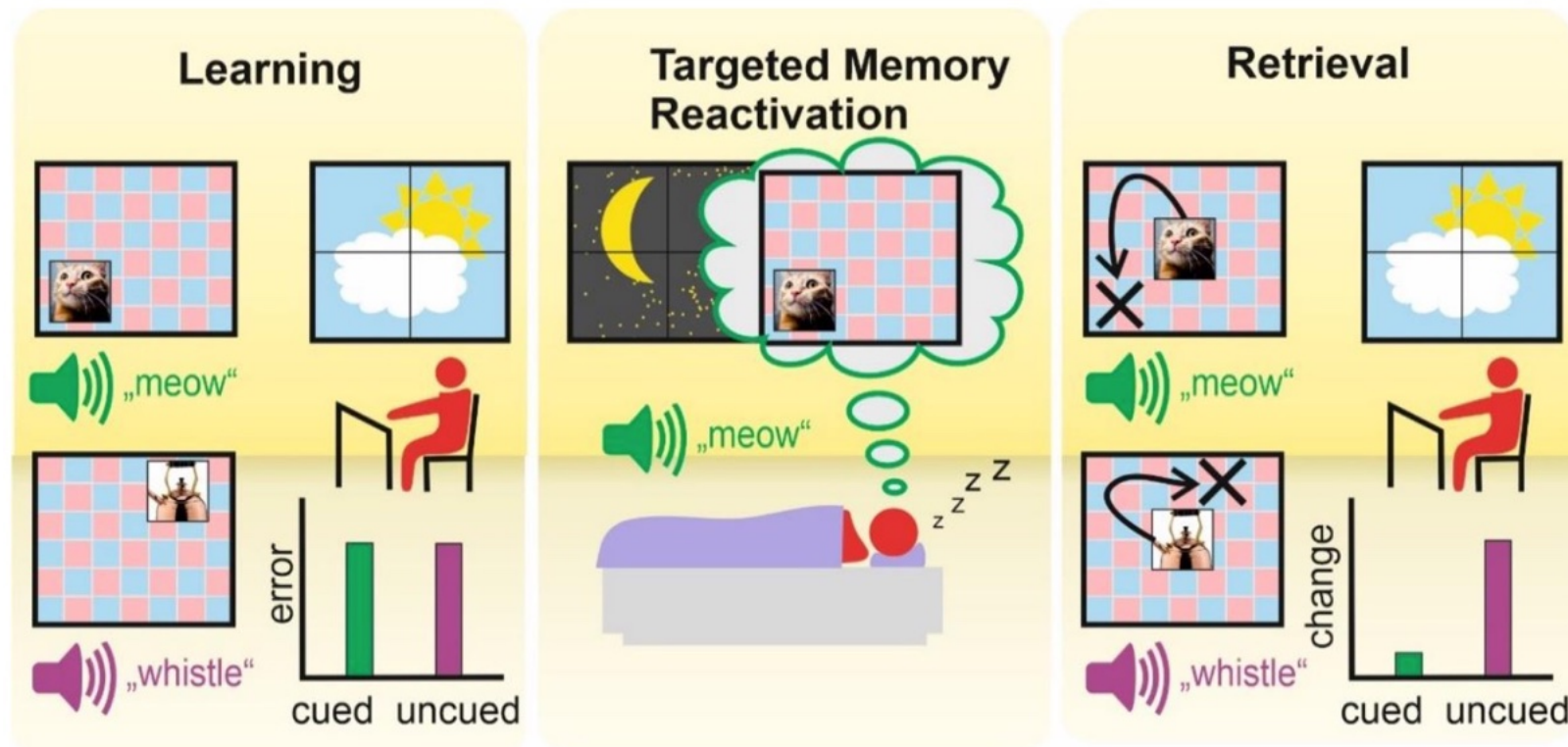
Curation of a very large, high quality behavioral and sleep-EEG dataset

Include additional measures

Increase diversity

Advance sleep research

- TMR describes the behavioral effect of better memory for stimuli which were cued during slow-wave sleep compared to memory for uncued stimuli (meta-analysis by [Hu et al., 2020](#))
- Goal: **precise estimate of the TMR effect**
- Adaptation of the paradigm by [Rudoy et al. \(2009\)](#):



Advance sleep research

Replication of the Targeted Memory Reactivation (TMR) effect

Curation of a very large, high quality behavioral and sleep-EEG dataset

Include additional measures

Increase diversity

Advance sleep research

- Several sleep labs collect data
 - Final data set should consist of 600 participants
 - Behavioral data + sleep EEG
- Adaptation of the behavioral paradigm to maximize power and sensitivity of the TMR effect
 - Slight changes of the procedure
 - Repeated auditory stimulation during sleep
 - Adapted wake control condition

Advance sleep research

Replication of the Targeted Memory
Reactivation (TMR) effect

Curation of a very large, high quality
behavioral and sleep-EEG dataset

Include additional measures

Increase diversity

Advance sleep research

- If it does not affect the replication and feasibility of the study, we can include additional measures such as:
 - Dreaming questionnaire
 - Delayed memory test (e.g., 1 week after)
 - IQ test
 - ...
- We will ask data collecting labs for suggestions!

Advance sleep research

Replication of the Targeted Memory Reactivation (TMR) effect

Curation of a very large, high quality behavioral and sleep-EEG dataset

Include additional measures

Increase diversity

Advance sleep research

- We want to increase diversity by
 - ensuring a balanced male/female ratio
 - possibly including participants from a larger age range (18 – 40 years)
 - geographic diversity of researchers and participants beyond WEIRD (Western, Educated, Industrialized, Rich, Democratic)^{1,2} countries
- Psychological Science Accelerator
 - Spread the word and facilitate recruitment of data collecting labs outside of the US and Europe
- Facilitate participation:
 - Funding for reimbursement of participants
 - Funding for research assistants

Advance sleep research

Replication of the Targeted Memory Reactivation (TMR) effect

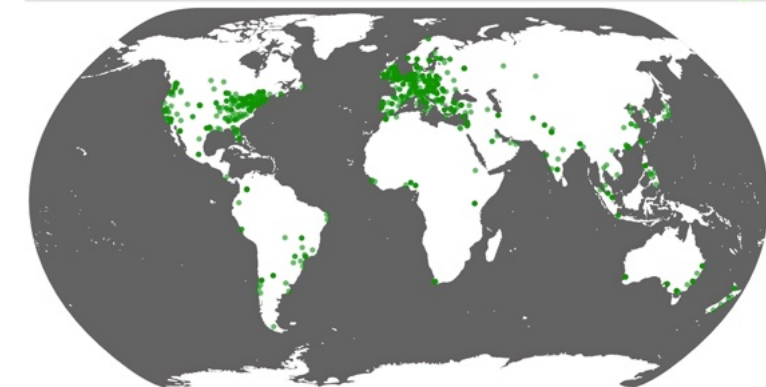
Curation of a very large, high quality behavioral and sleep-EEG dataset

Include additional measures

Increase diversity

The Psychological Science Accelerator

2468 researchers, 73 countries



Conduct meta-research

- 10 data-collecting labs
- ≥ 10 data-analyzing labs

- Will provide insights about the effect of lab sites and how researchers in the field analyze TMR effects
- Note that analysis teams will receive an anonymized ID
(see [Botvinik-Nezer et al. \(2020\)](#) for an example of a neuroimaging many-analysts study)

Conduct meta-research

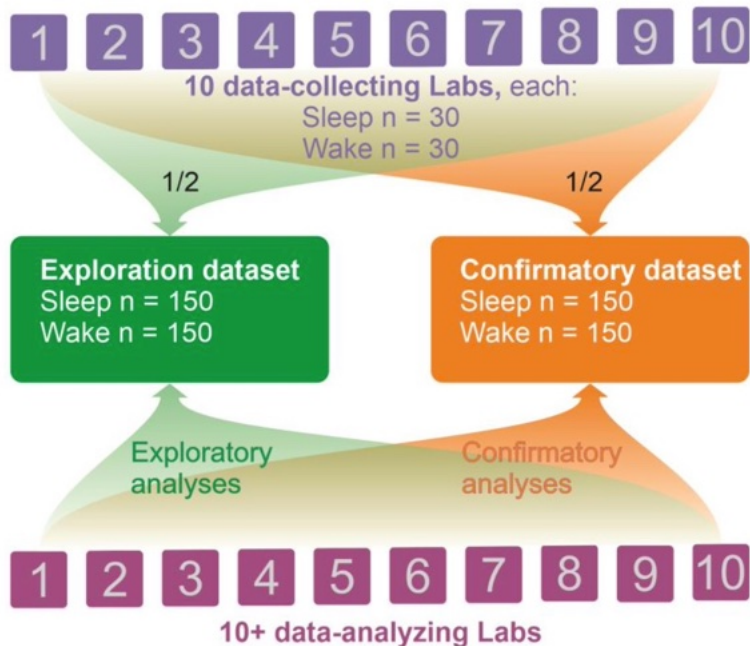
Multi-lab & many analysts approach

Robustness and variability of analyses

Influence of researchers on outcomes

Conduct meta-research

- Analysis teams will report their results using the exploration dataset
- Assess variability across analyses and reported results
- Rerunning the identical analyses on the withheld confirmation dataset will yield insights into the robustness of analysis types



Conduct meta-research

Multi-lab & many analysts approach

Robustness and variability of analyses

Influence of researchers on outcomes

- Second funding period (expected 2027)
- Researchers can explore the entire exploration dataset including covariates
- Withheld confirmation dataset allows test of robustness

Conduct meta-research

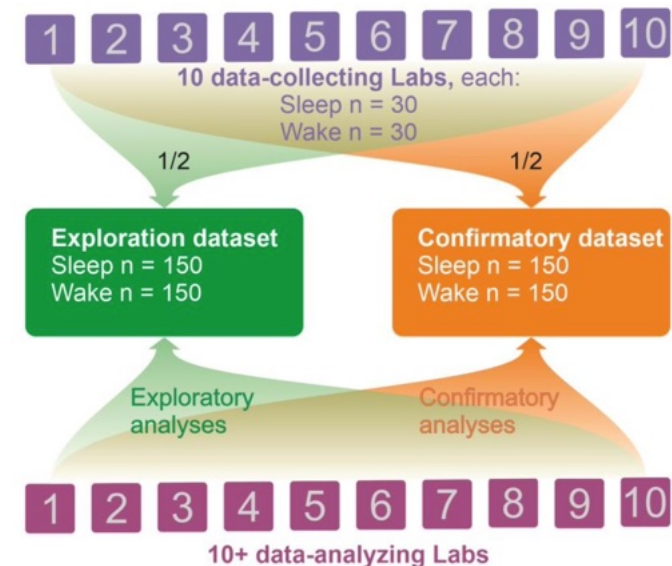
- This structure allows us to investigate the effect of researchers on outcomes (findings, replication success, characteristics of the data)
 - Beliefs:
 - “Do you believe in the TMR effect?”
 - Confidence:
 - “How confident are you in your statistical skills?”
 - “How confident are you in your EEG analysis skills?”
 - Experience:
 - “How many years of experience do you have with EEG data?”
 - “ ... with research on sleep?”
 - “ ... with research on memory?”
 - Basic characteristics
 - “How many people work in your lab?”
 - “What is your current academic position?” ...

Conduct meta-research

Multi-lab & many analysts approach

Robustness and variability of analyses

Influence of researchers on outcomes



Transparent science

- A principle of action that guides our project
- We will preregister our approach, and will have the analysis teams preregister their planned analyses
- Power of more than 90% to find interaction effects of Cohen's $f \geq 0.1$ in half the dataset
- Eventually, the exploration dataset will be shared openly
- Any materials, scripts (experimental & analysis) will be shared openly
- We will use non-proprietary software as much as possible

Transparent science

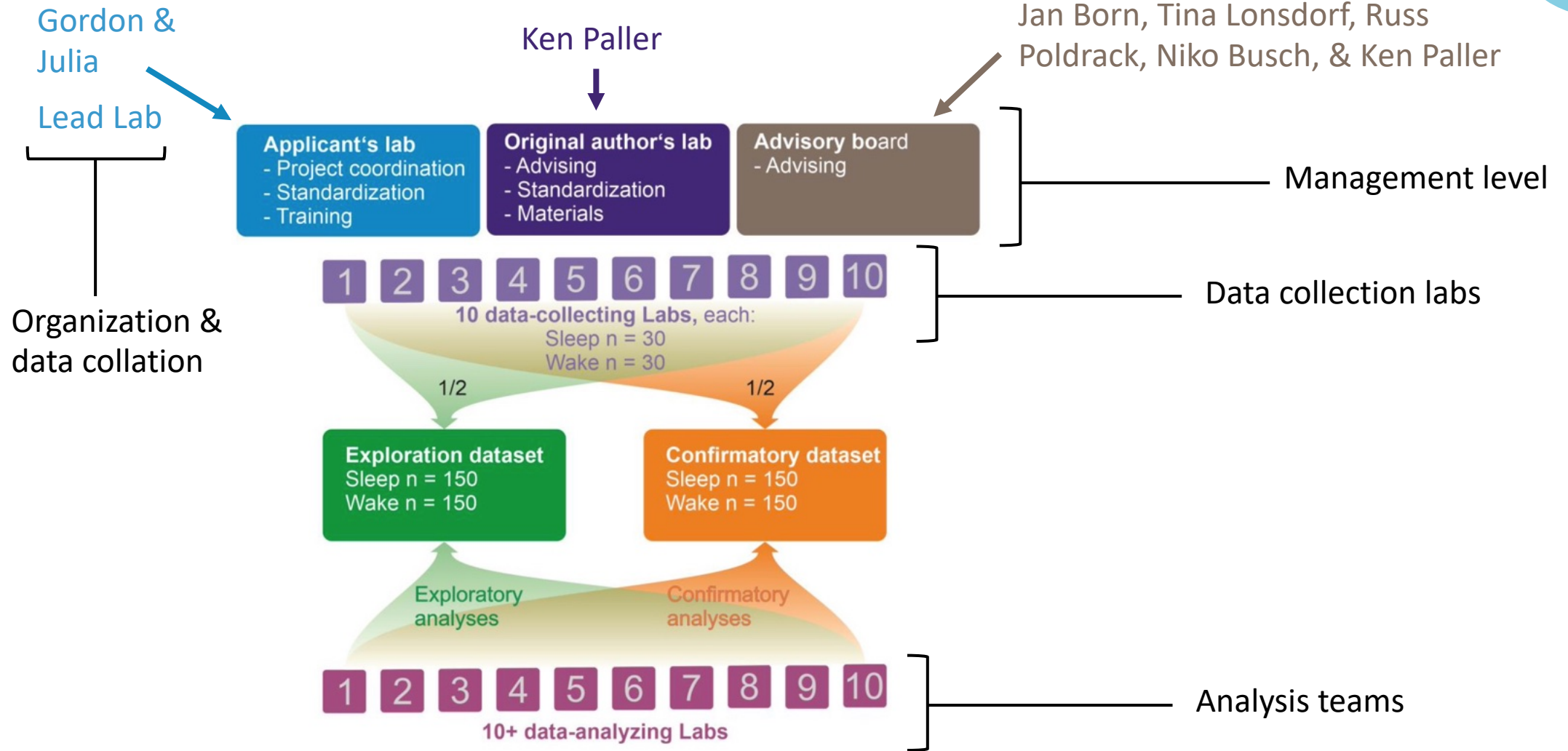
Preregistrations

High power

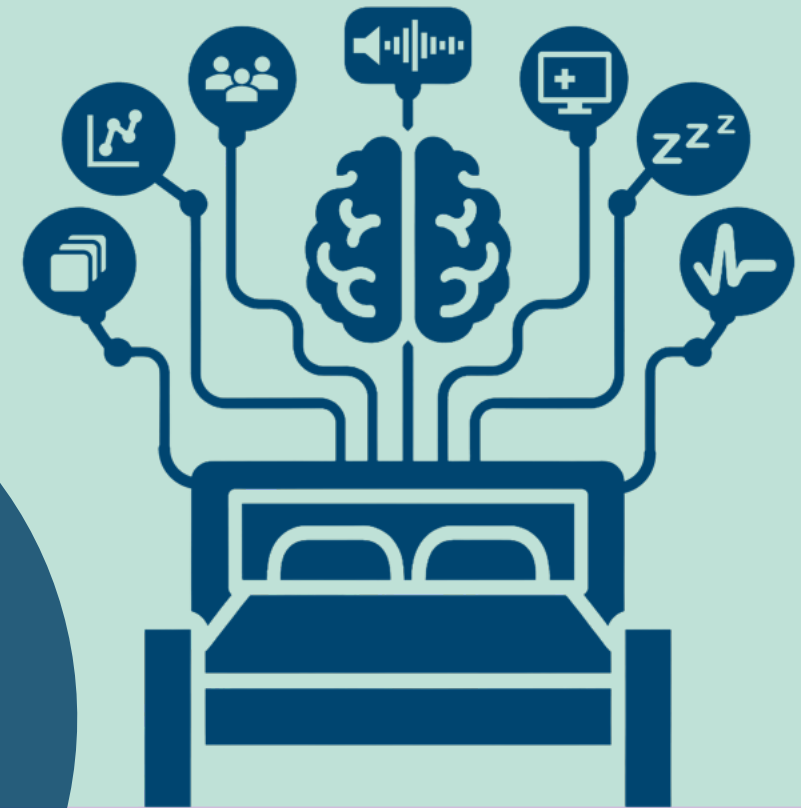
Open data (reusage, exploration)

Open materials, scripts, etc.

Organization of the overall project



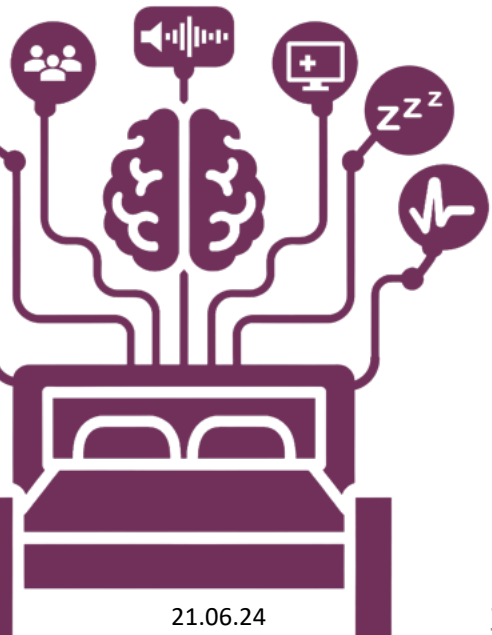
How to contribute



Track: Data collection

The procedure

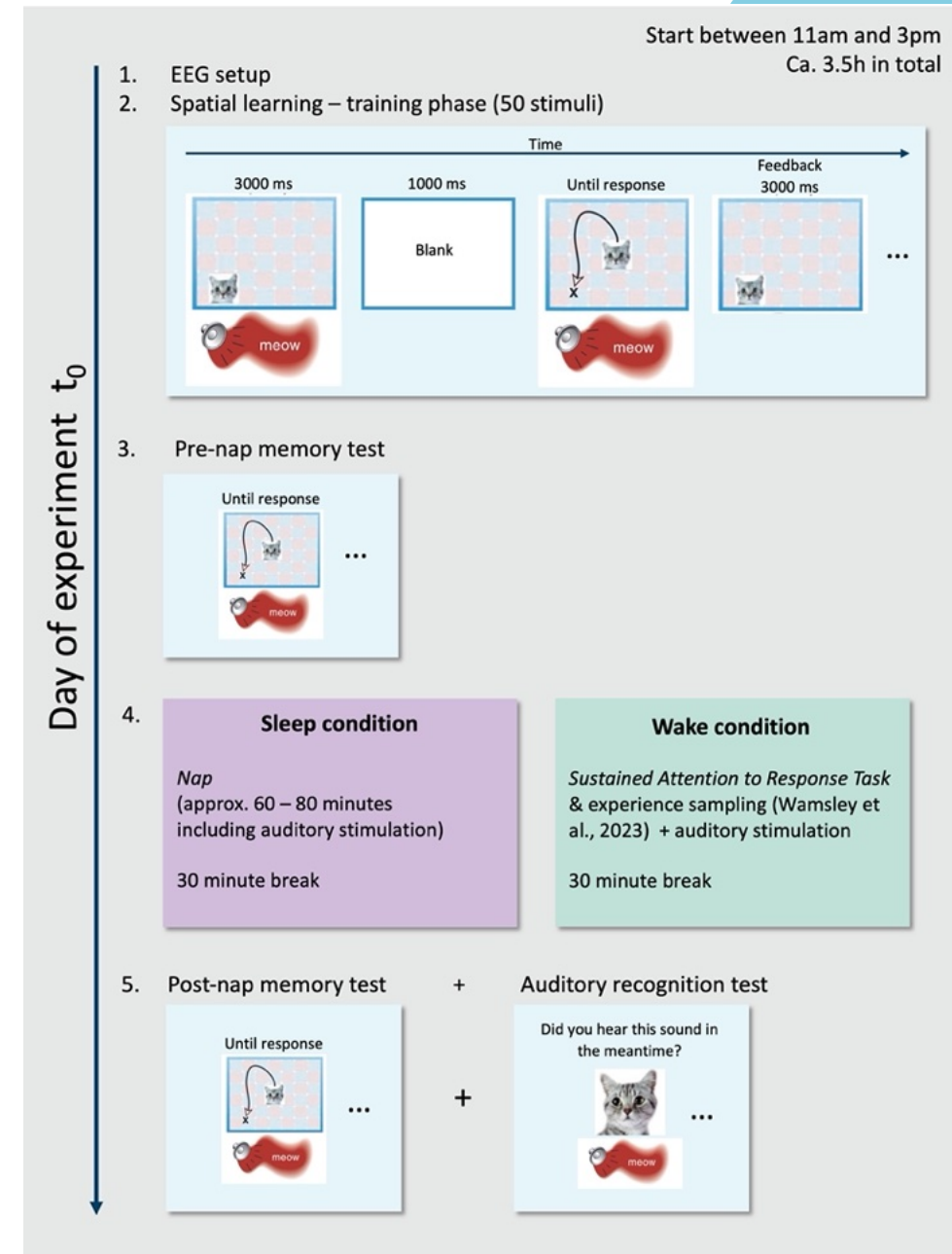
- Up to 3 researchers of a sleep lab can sign up as a **data collecting lab**
- Each lab collects data of **60 participants** (30 sleep, 30 wake) within **12 to 18 months**
- Labs can bundle forces as a group of up to 3 labs and distribute participant load among each other evenly
- **Labs should have experience with running sleep TMR studies and online sleep scoring**



- Adaptation nap (without EEG) prior to testing
- Screening prior and post experimental session
- One experimental session lasts approx. 3.5h

- Data collection will start from **January 2025** onwards

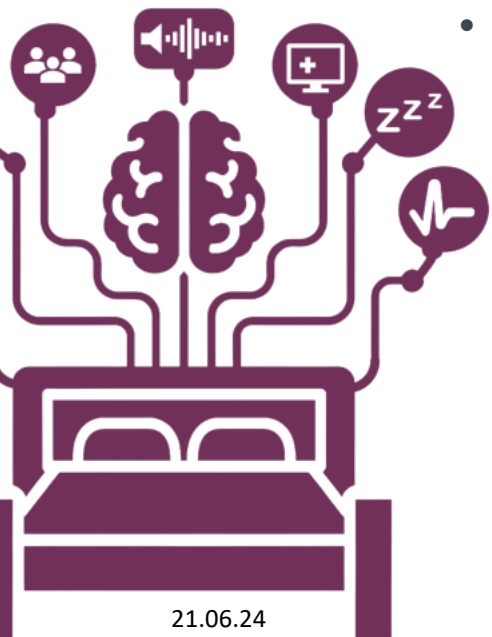
Wamsley et al. (2023). *Journal of Cognitive Neuroscience*.



Track: Data collection

What we offer

- Funding:
 - For data collection → participant reimbursement + consumables
 - For assistance with data collection → research assistants
 - **Please note that since we have limited funding, we can only accept 10 data collecting labs or lab teams (measuring 60 participants each).** Labs will be selected based on a variety of characteristics which will be decided by the Advisory Board.

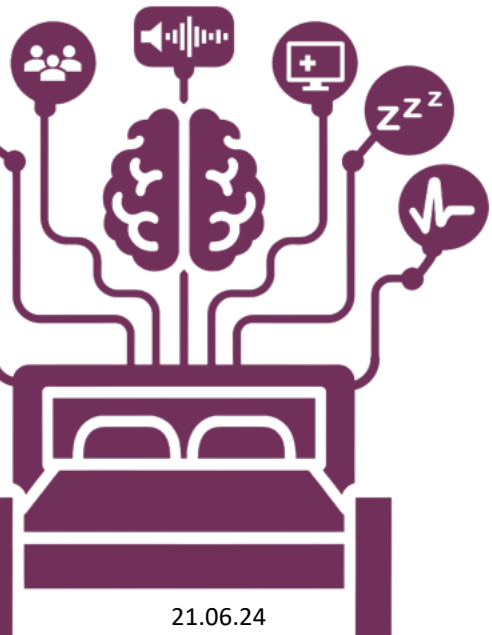


- Behavioral paradigm will be implemented and distributed by us in Mannheim via jsPsych
 - Data immediately gets stored on our servers
 - Standardized experimental procedure
- EEG scripts can be potentially implemented in MATLAB, Python, and jsPsych to facilitate implementation across different sites and software
- I (Julia) will visit data-collecting labs to ensure a smooth start of the data collection

Track: Data collection

What we offer

- Co-authorship: Researchers of data collecting labs are offered co-authorship on at least the following publications:
 - The replication study
 - The dataset publication
- Authorship order is defined by:
 - Track: **Collection & Analysis** > **Collection** > Analysis
 - CRediT contributions
 - Alphabet

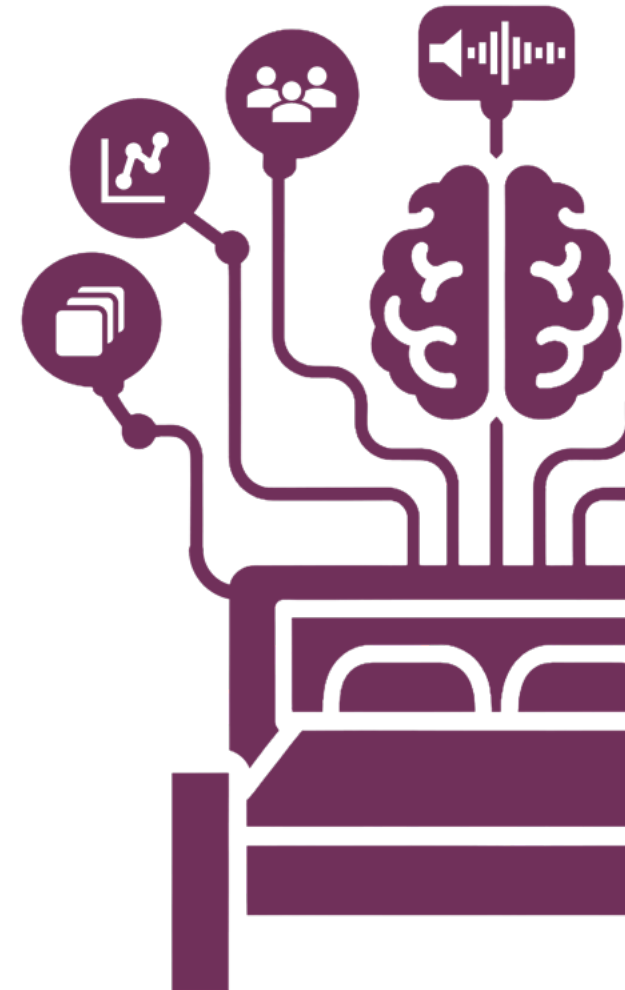


- Guaranteed position in the upcoming project studying exploratory analyses (expected 2027)
- Early access to the exploration dataset for secondary analyses while data is still embargoed

Track: Data analysis

The procedure

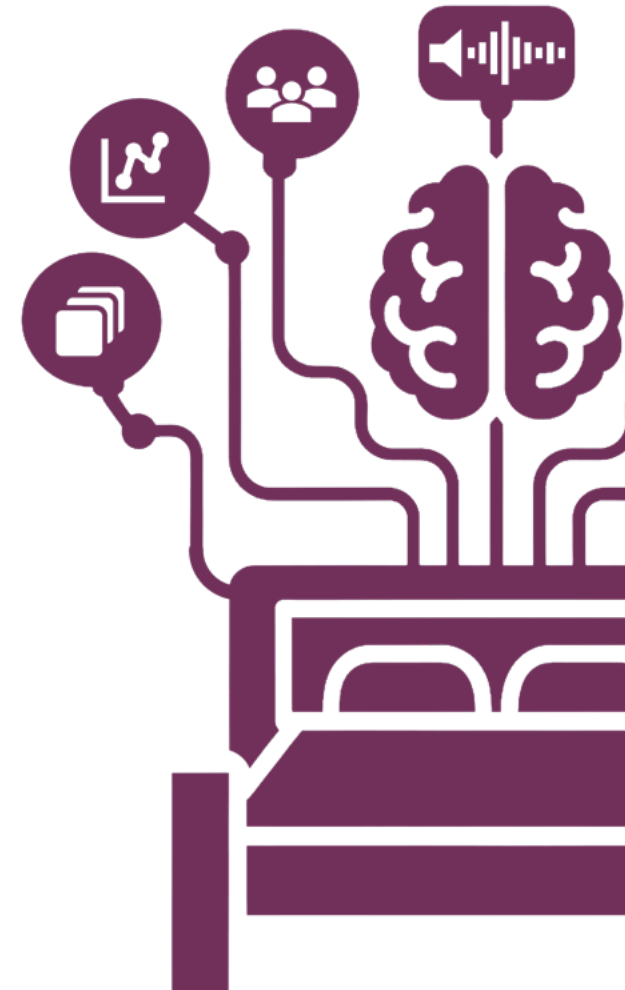
- Up to 3 researchers can sign up as an **analysis team**
- EEG analysis/expertise is a required skill
- Autumn 2024 Analysis teams have to **plan their analyses** beforehand with no restrictions on analysis types or preferred software
- Summer 2025 They will receive a very small dataset with shuffled condition labels to **finetune** their analyses **and fill out a custom preregistration**
- Autumn 2025 They will **review** the preregistration of another analysis team and **provide feedback** (and also receive feedback from a different team)
They then **preregister their planned analyses** for the replication
- 2026 Upon successful preregistration and completed data collection, teams receive the exploration dataset and **run their analyses**
- Later in 2026: They submit their **final reproducible analysis script** and **results** of their analyses



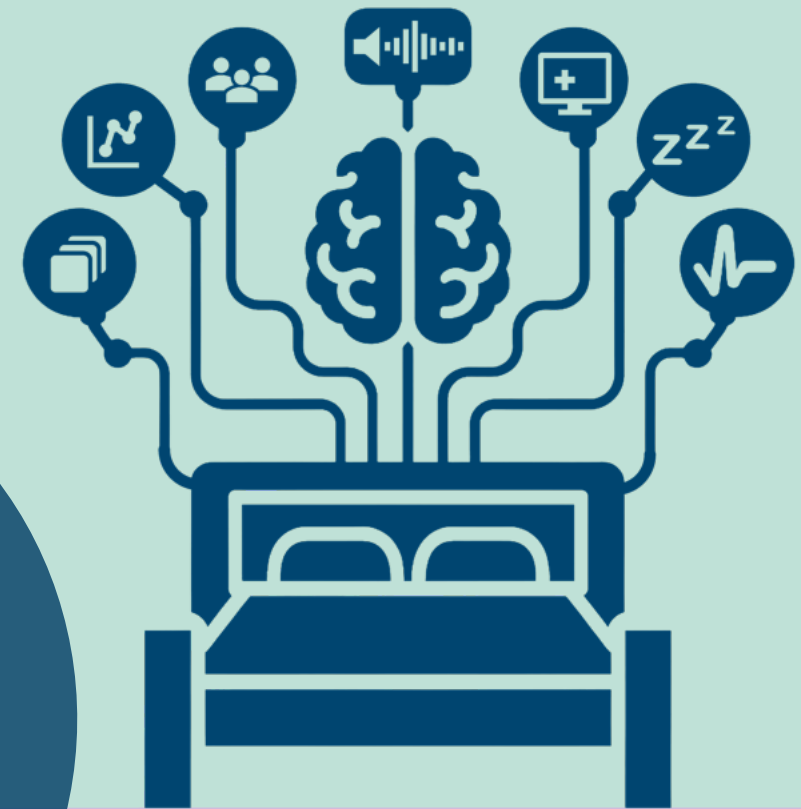
Track: Data analysis

What we offer

- Hypotheses (mainly behavioral)
- Based on planned analyses, we will create a custom preregistration template which will facilitate the process of preregistration
- Organizing the round robin feedback
- Funding:
 - Researchers with limited resources can apply for funding for research assistants
- Co-authorship: Researchers of analysis teams are offered co-authorship on the publication of the replication study
- Authorship order is defined by:
 - Track: **Collection & Analysis** > Collection > **Analysis**
 - CRediT contributions
 - Alphabet



Website and sign up form
go online soon!



Thank you for your attention!

Do you have questions
or feedback for us? 😊

And what do you think?
Do you consider contributing?

