Neural tracking in the classroom: Can song help with language learning?

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Introduction

Song can be more effective than speech in **language learning**[1,2].

The effectiveness of song may be due rhythmic predictability & enjoyment[3].

Song is processed (**neurally tracked**) more readily than speech in the brain[4], especially when the song is familiar[5], but this effect has only been investigated in **controlled laboratory settings.**

It is not yet clear how tracking/behavioural outcomes might be **improved** under engaging listening conditions in **ecological settings**.

Current research questions:
- In an **engaging classroom setting**, does **song aid learning**?
- How does the neural tracking in the brain support **learning?**

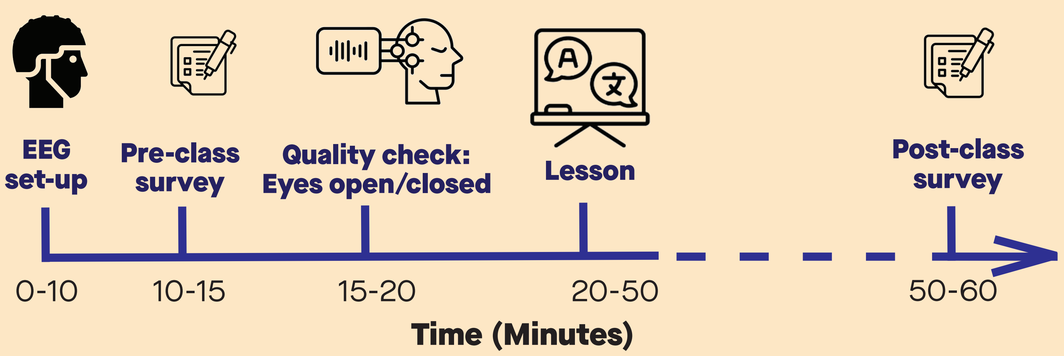
Proposed Method

Participants: Groups of 6 individuals (5 students, 1 instructor/teacher) Goal N=~45.

Materials:
- A short language course (German) covering **three topics** across **three sessions**
- 20 target phrases/20 target words to learn per topic (to be checked in pilot).

Design: Within-subjects, topics presented by an instructor in **three conditions**: **(1)** Speech, **(2)** Song, novel melody, **(3)** Song, familiar melody (e.g., 'Frere Jacque'). Conditions will be counter-balanced.

Example Session



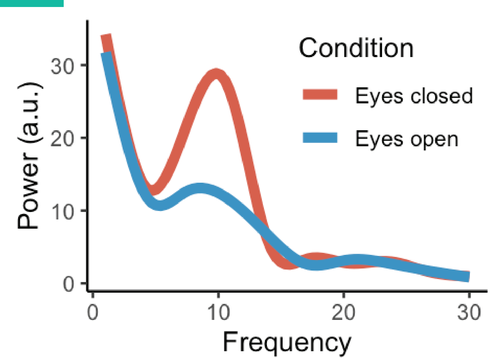
Measures:
- Learning: measured by recall (e.g., English prompt → recall in German) and calculated by proportion of **correctly recalled** phrases/words
- Engagement and focus ratings on a 7-point Likert scale.

Mobile EEG
- Collected with EMOTIV EPOCH X.
- EEGLAB/Fieldtrip[9,10], assessed at fronto-centro electrodes[4,5].
- Synchronised with lab streaming layer.

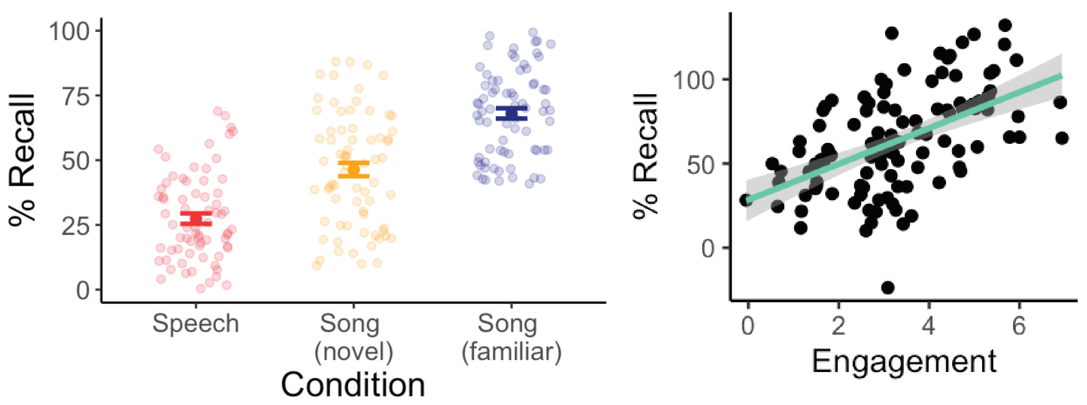
Planned analyses, expected results

Sanity checks:
- As mobile EEG is in it's early phases: we will run data quality checks.

→ Based on[11,12], we should see a **higher alpha [8-12 Hz] power in eyes closed condition.**



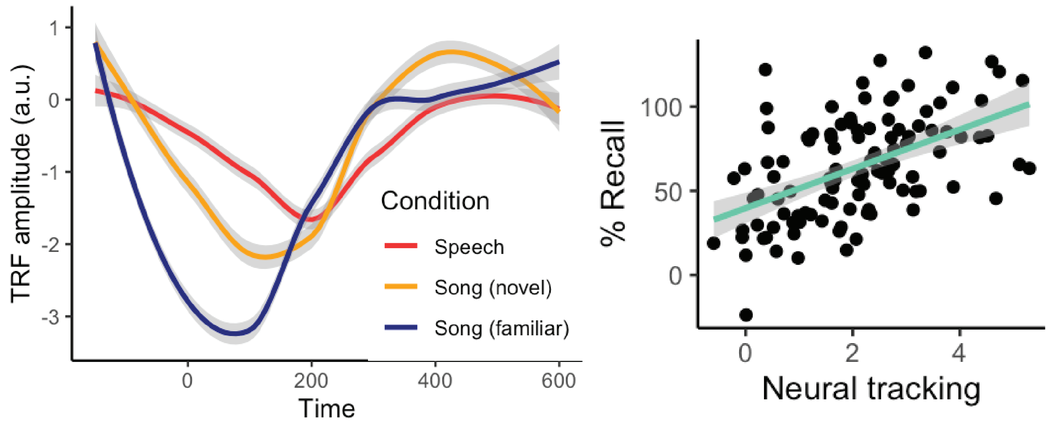
Behavioural analysis
- When comparing **learning** betweens condition (Speech, Song-novel, Song-familiar), we expect **highest learning** when target word/phrases in **Song-familiar** condition.



Neural tracking analysis

We will assess neural tracking using mTRF [10] & phase coherence[4,5].

We expect **neural tracking** will be **higher** and **faster in song-familiar condition** & **positively related to learning (recall).**



Outlook and implications

- Certain aspects of song > speech can be **beneficial for learning**[3,4].
- Challenges of **naturalistic design**: pilots planned in Dec2024 onwards.
- Could inspire **future interventions** for those with dyslexia/reading difficulties[6,7].

References

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