The Human Brain Dynamics Lab

"Are You Listening to Me?": Studying Attention in Real-life Classrooms

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Why Real-Life?

Real-life learning environments are **NOISY, chaotic and full of distractors.** Traditional research on attention is carried out primarily in labs under highly controlled conditions. Thus, it gives little insights on real learning abilities and academic performance in school.

Objectives:

- Launch a **novel in-classroom experimental setup**
- Measure **attention** in real learning environment
- **Educate** and **empower** children using knowledge on their own brains

Proof of Concept!

Experimental Design

In-school collaboration with 'Begin' high-school at Ramat-Efal, Israel. 9th-grade students from 'Neuroscience' course participated in group sessions and personal meetings **in their real classrooms**.

Group Sessions

Two sessions ● Small groups (5-8)
Behavioral and neural measurements ● Online experiments

CPT –AX
A --- X   A --- Y
B --- X   B --- Y

Stroop
2 9   7 3

Flanker
→ → → → → →
→ → ← → →

Oddball
♪♪ ♪♪

Results: Individual Subjects

Flanker:

% Accuracy Rates — 100%, 95%, 90%, 85%, 80%, 75% (Congruent → Incongruent)

Reaction Times [ms] — 650, 600, 550, 500, 450 (Congruent → Incongruent)

Stroop:

Reaction Times [ms] — 700, 650, 600, 550, 500 — 7 3

"~7~" Numerical value → "~3~" Physical size
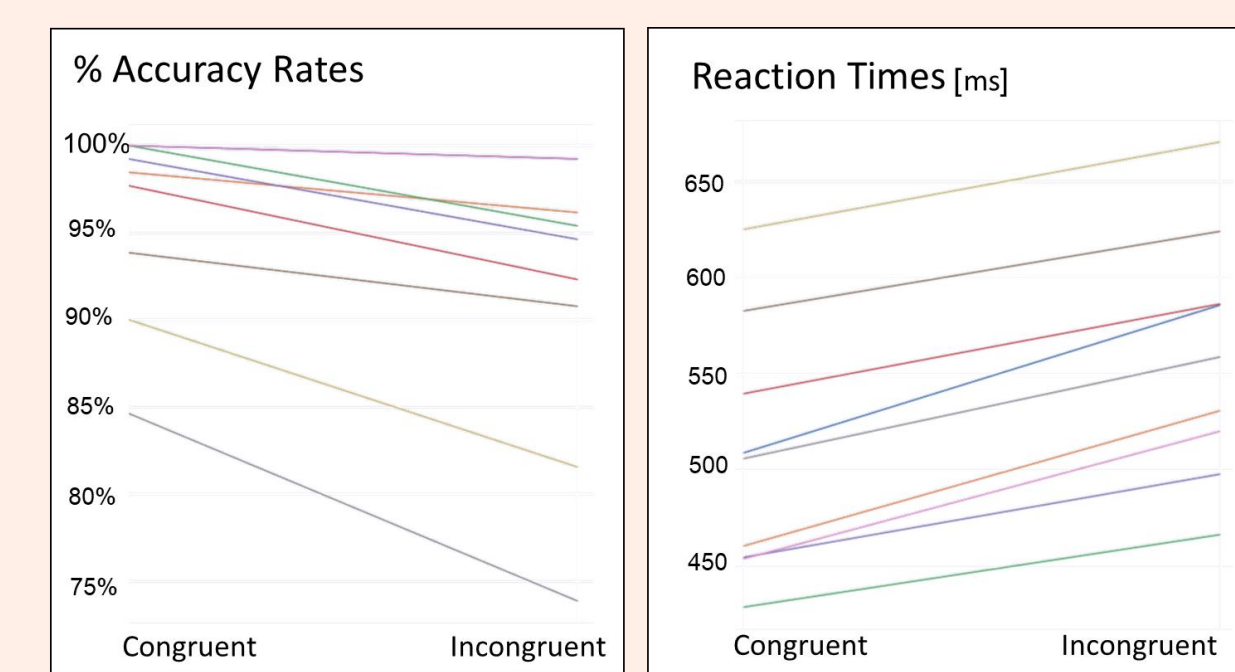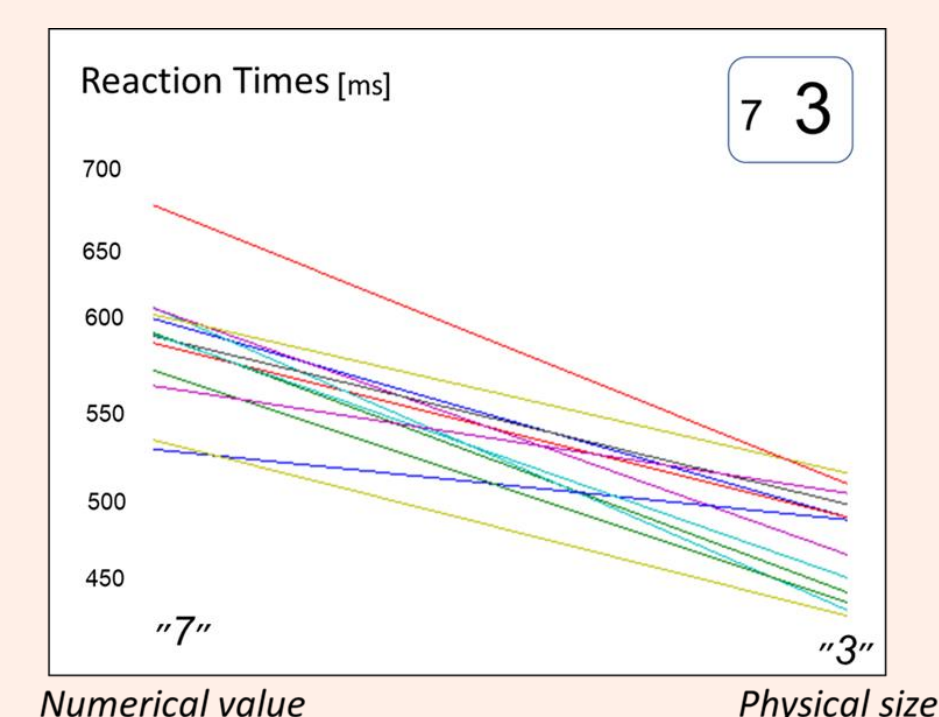
Oddball: auditory neural response

Example 1

N1, P300
Amplitude (µV): 2, 0, -2, -4, -6
Standard, Target, Novel
Time (s): -0.3 to 0.6

Example 2

Amplitude (µV): 6, 4, 2, 0, -2, -4
Time (s): -0.3 to 0.6
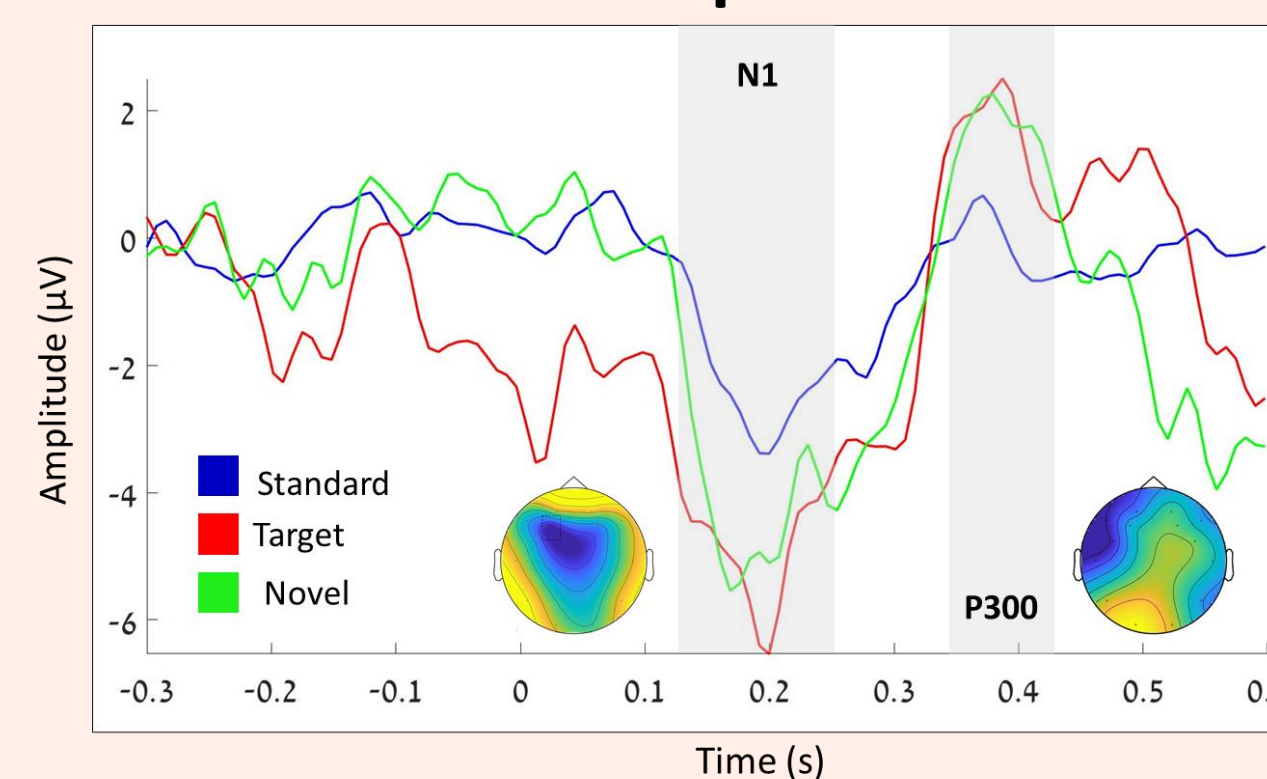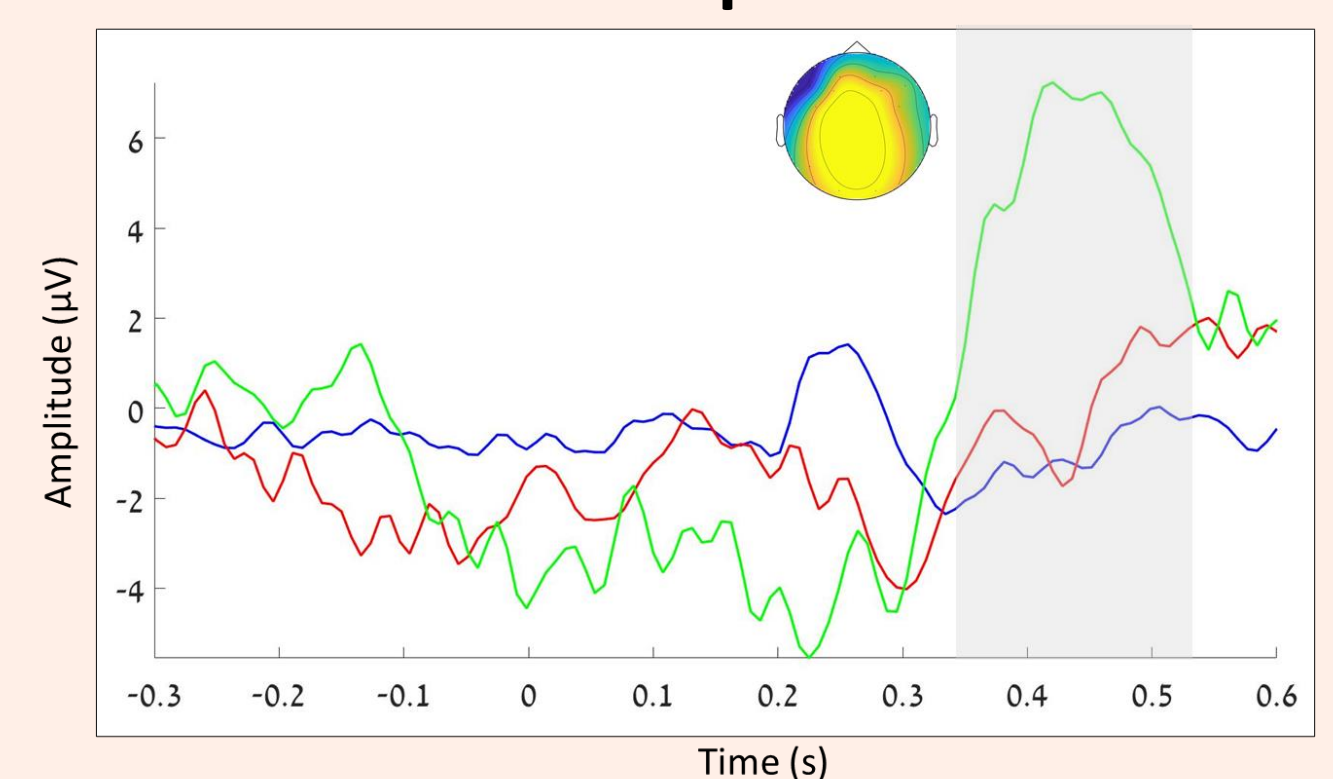
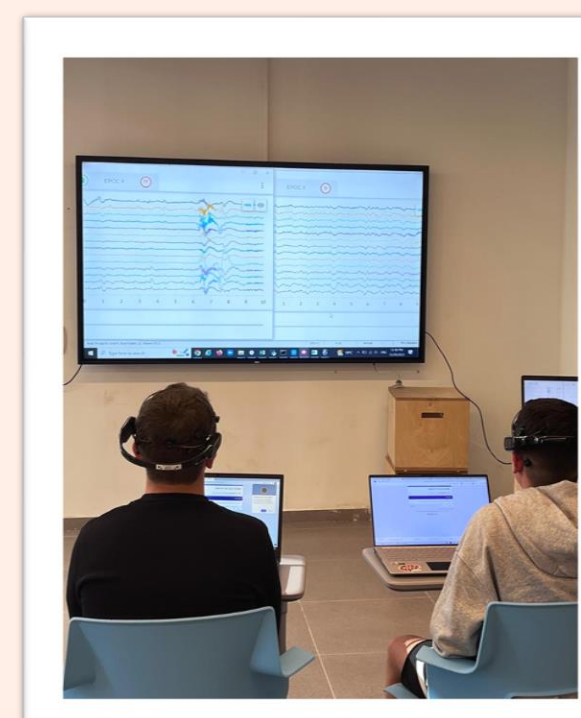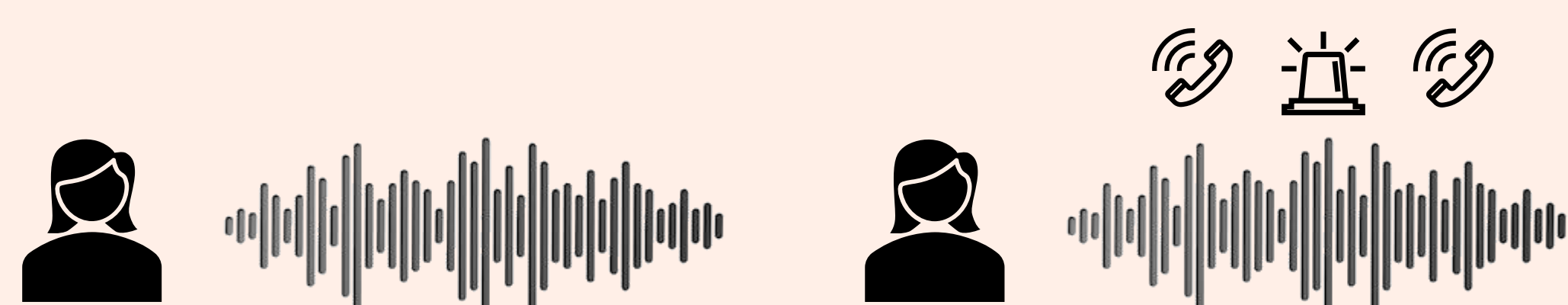
Personal Meetings

Two students in each session ● Hyper scanning
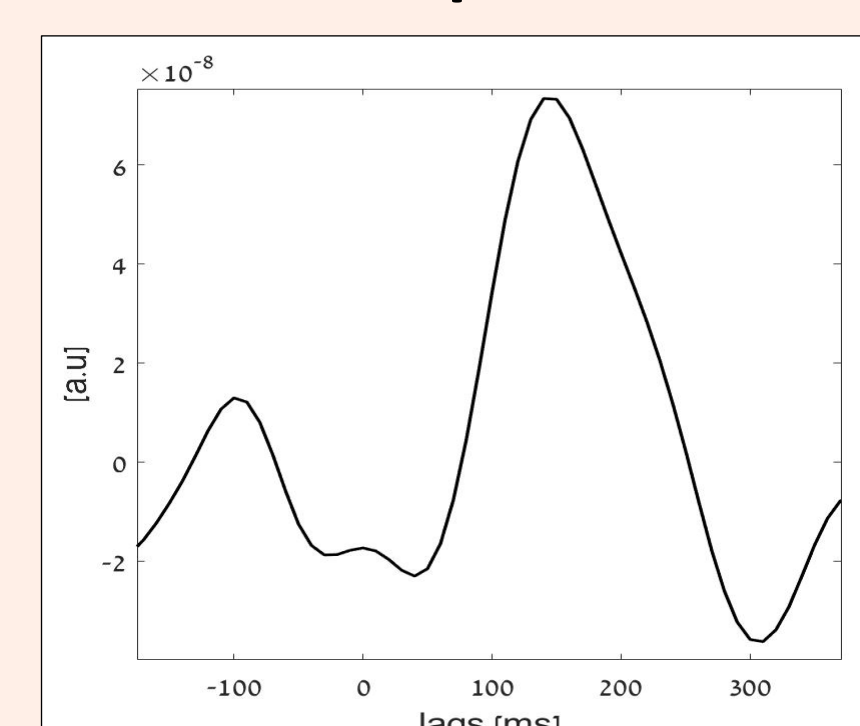Oddball (5-min) ● Speech-tracking design (25-min)
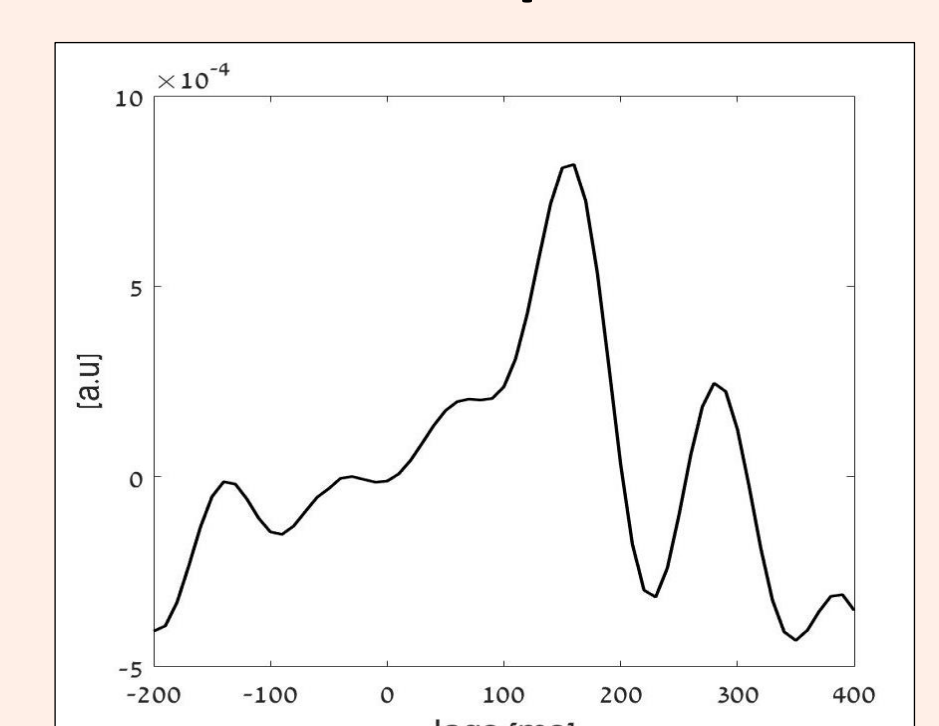
Natural speech W/O distractors (30 video clips)

Results: Individual Subjects

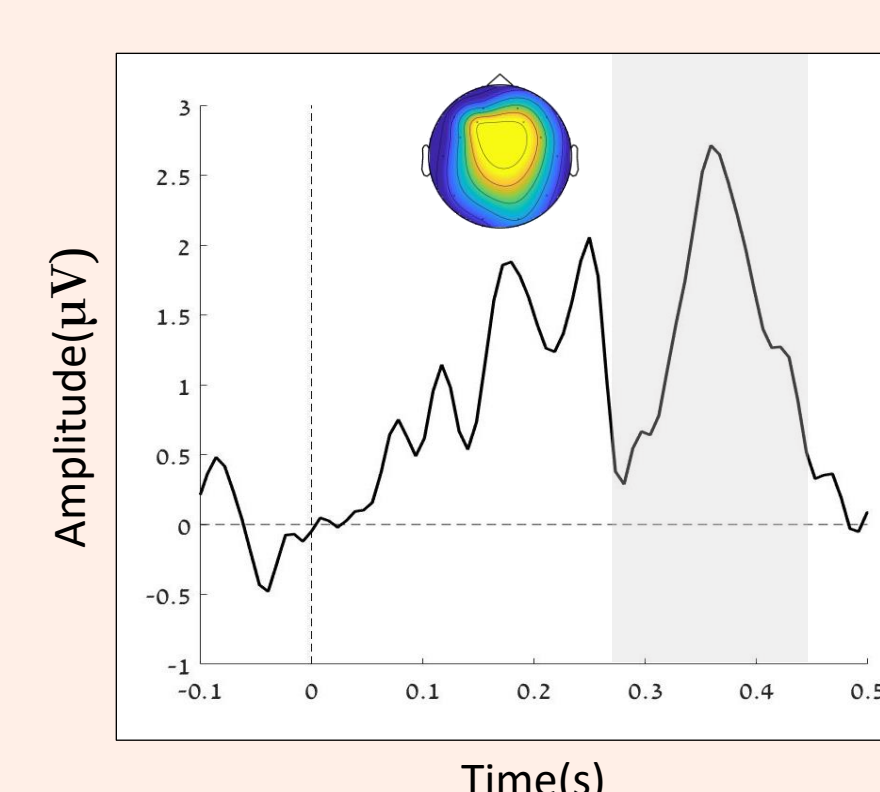**Speech tracking response**

Example 1
[a.u] ×10⁻⁸ ; lags (ms): -100, 0, 100, 200, 300

Example 2
[a.u] 10 ×10⁻⁴ ; lags (ms): -200, -100, 0, 100, 200, 300, 400

Neural response to distractors

Example 1
Amplitude (µV): 3, 2.5, 2, 1.5, 1, 0.5, 0
Time (s): -0.1, 0, 0.1, 0.2, 0.3, 0.4, 0.5

Example 2
Amplitude (µV): 3, 2, 1, 0, -1
Time (s): -0.1, 0, 0.1, 0.2, 0.3, 0.4, 0.5

Real-life distractors
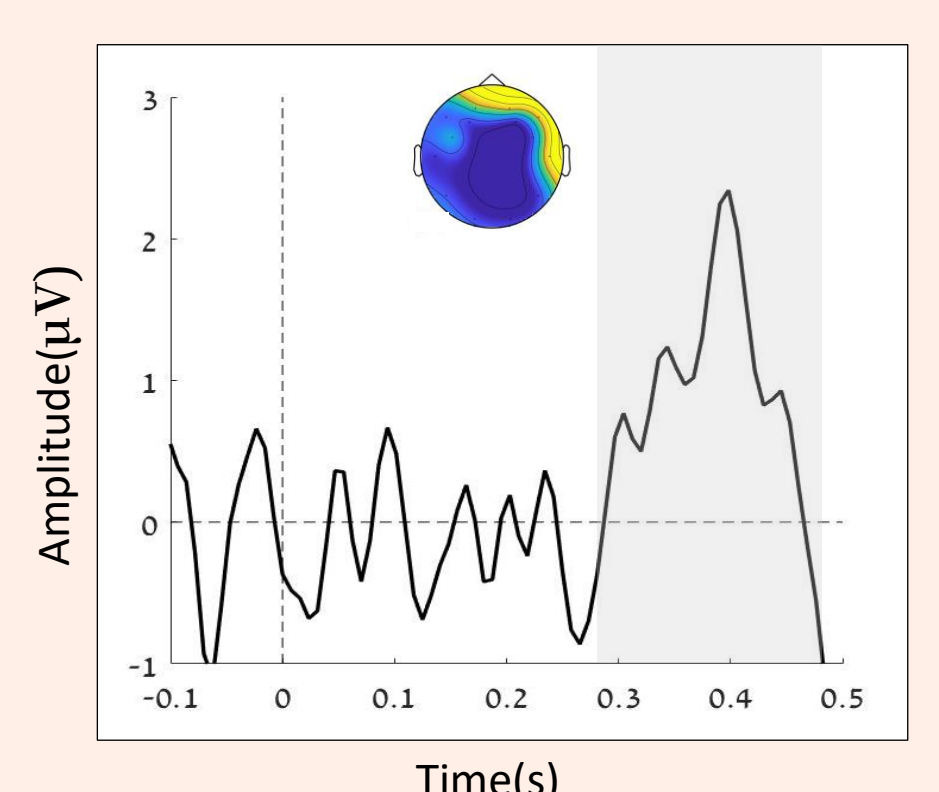
 # Natural Distracting Events (mean per session)

- Ecological — 4.8
- Doors — 6.4
- Vehicles — 4.8
- Students — 1
- Constructions — 8.4
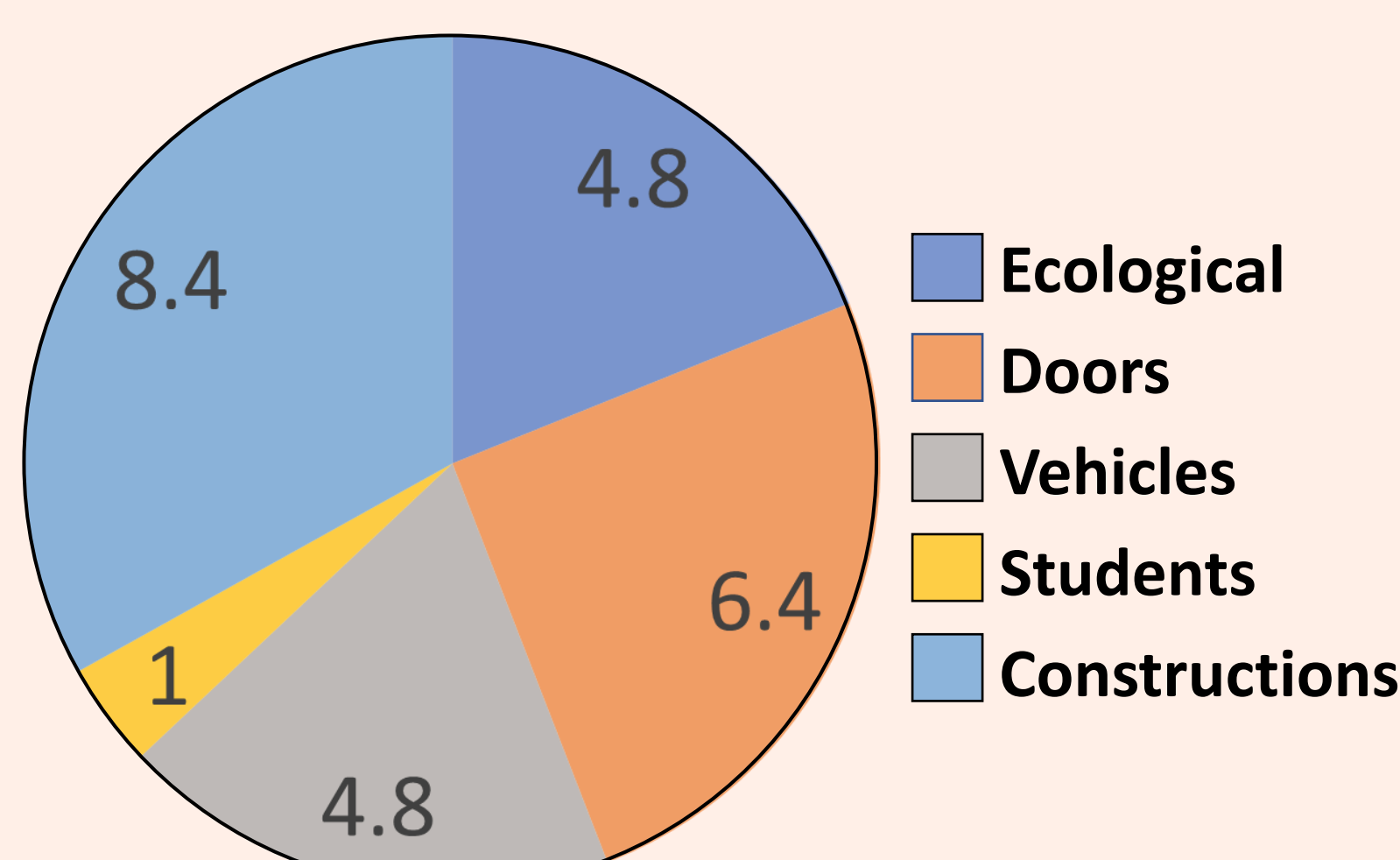
What's Next?

- Finish data collection - Semester B
- Improve experiment setup and design according to current conclusions
- Establish analyzing pipeline
- Individual-level analysis