



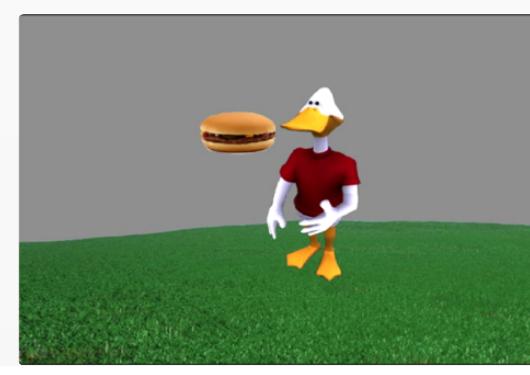
Temporal Dynamics of EEG Topographic Similarity during Successful Language Learning

Zhengan Qi, Amy Finn, Satra Ghosh, Jennifer Minas, Brian Chan, John Gabrieli
McGovern Institute for Brain Research, Massachusetts Institute of Technology

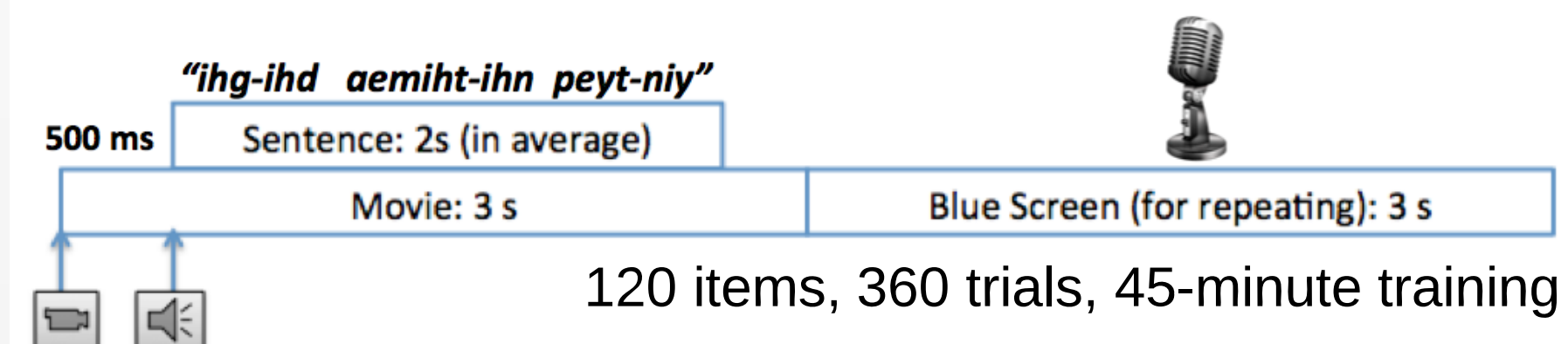
Introduction

- Adults vary widely in their language learning capability.
 - Successful and not so successful learners may use different learning strategies (Linck et al., 2013; Osterhout et al., 2008).
- Current Study:**
- EEG recording during the early stage of implicit learning of an artificial language.
 - Moment-to-moment EEG dynamics that contribute to successful learning.

Miniature Artificial Language Training



- 30 nouns and 4 verbs
- Verb agreement and gender agreement
- Subject-Object-Verb structure



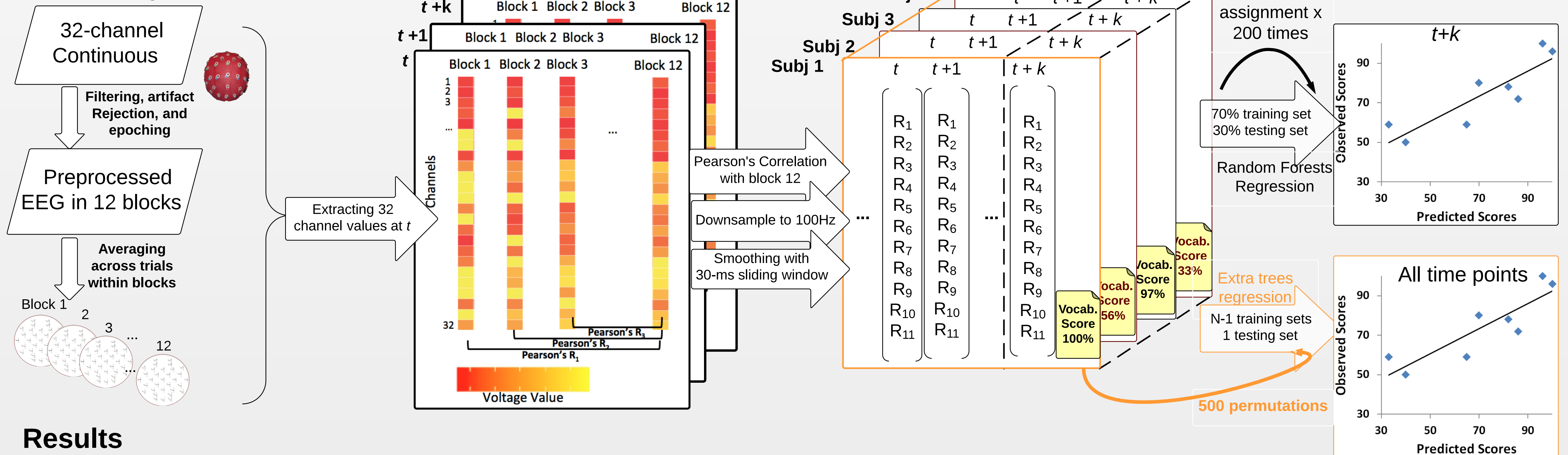
Participants:

34 right-handed native English speakers (21 F, 13 M); Mean age: 23.1; Mean IQ: 118.8

Vocabulary Test:

Four-forced choice Task
Mean: 57%
Range: 33% - 100%

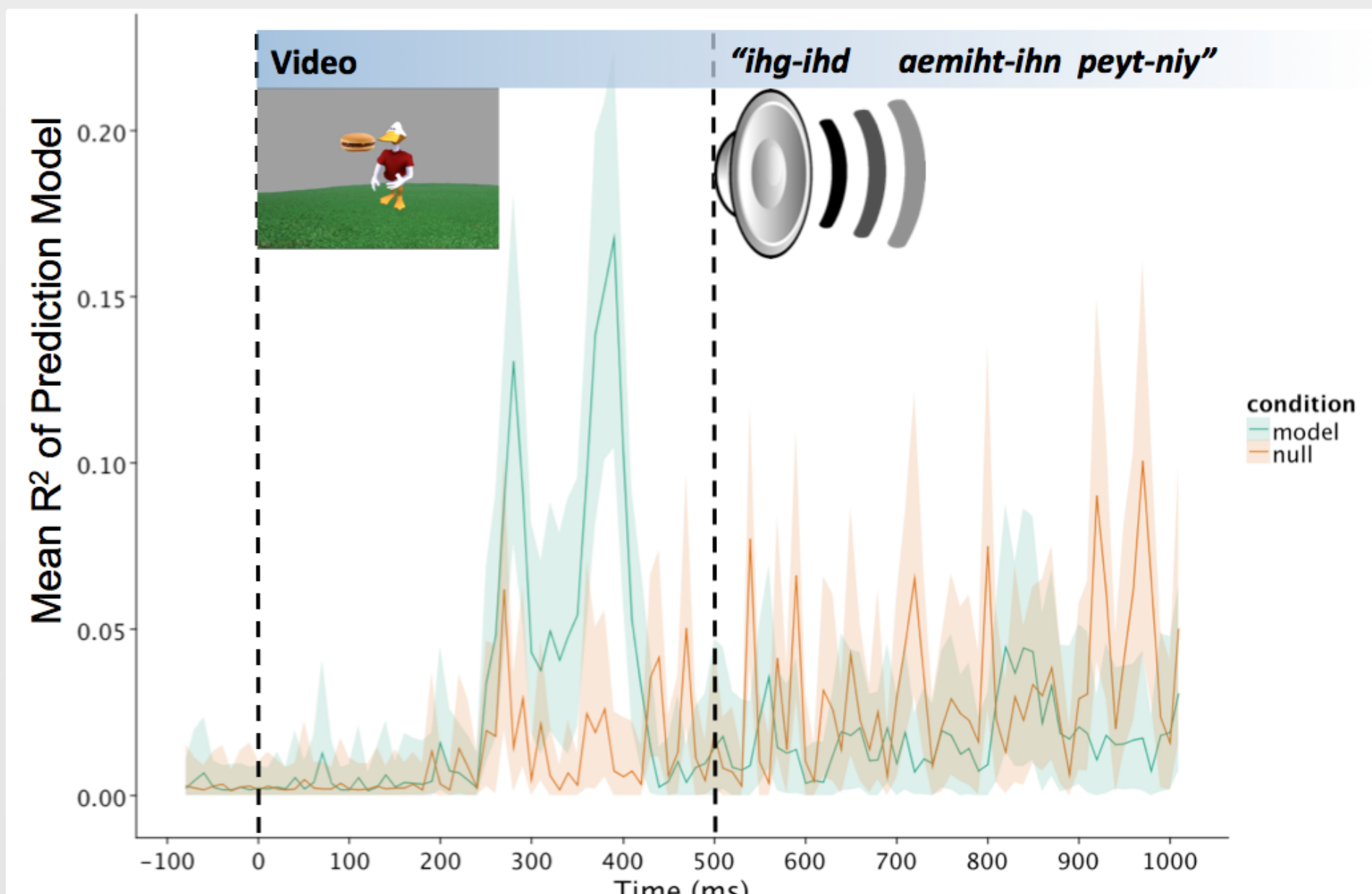
EEG Analysis Methods



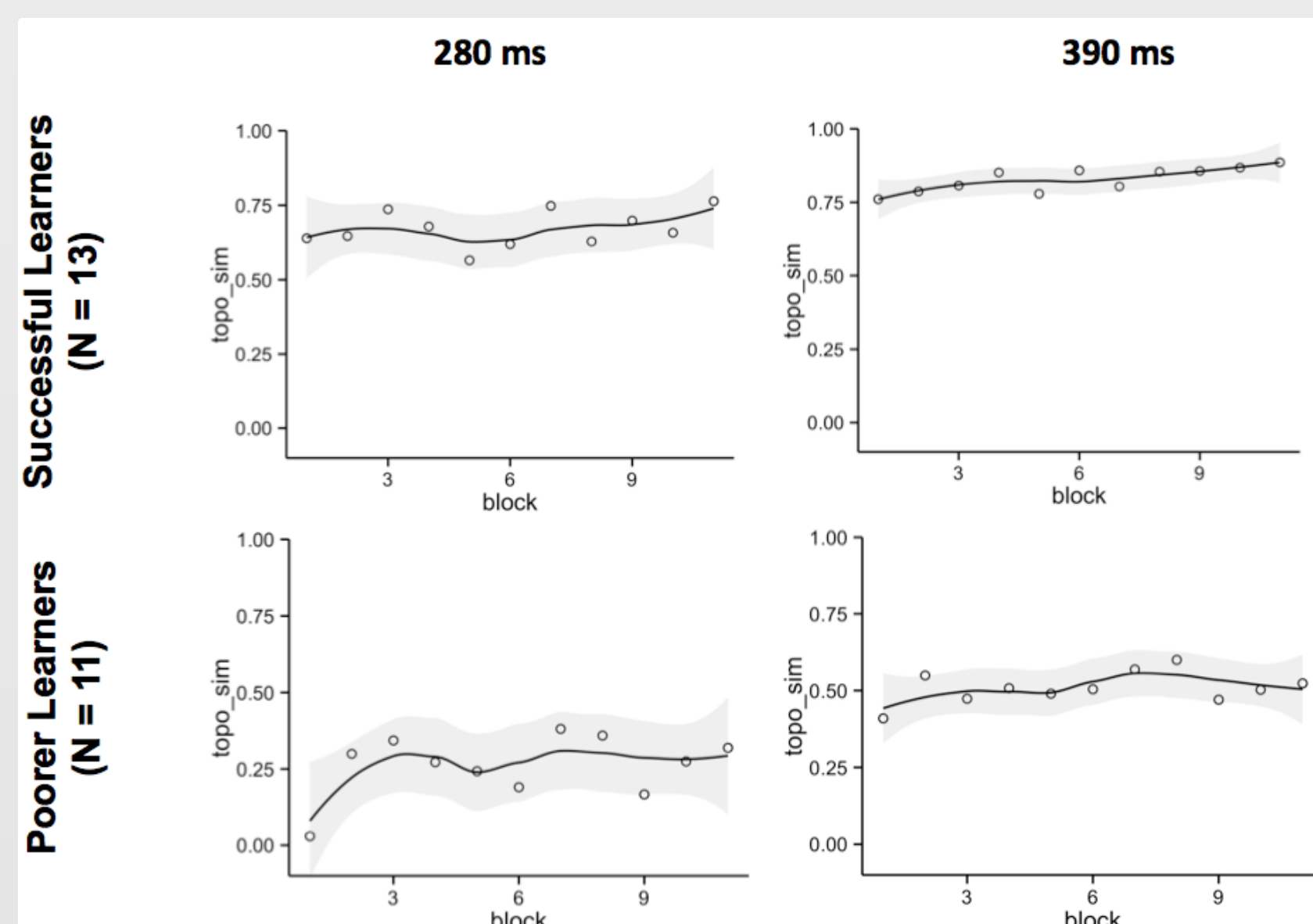
Results

Data from single time points as predictors:

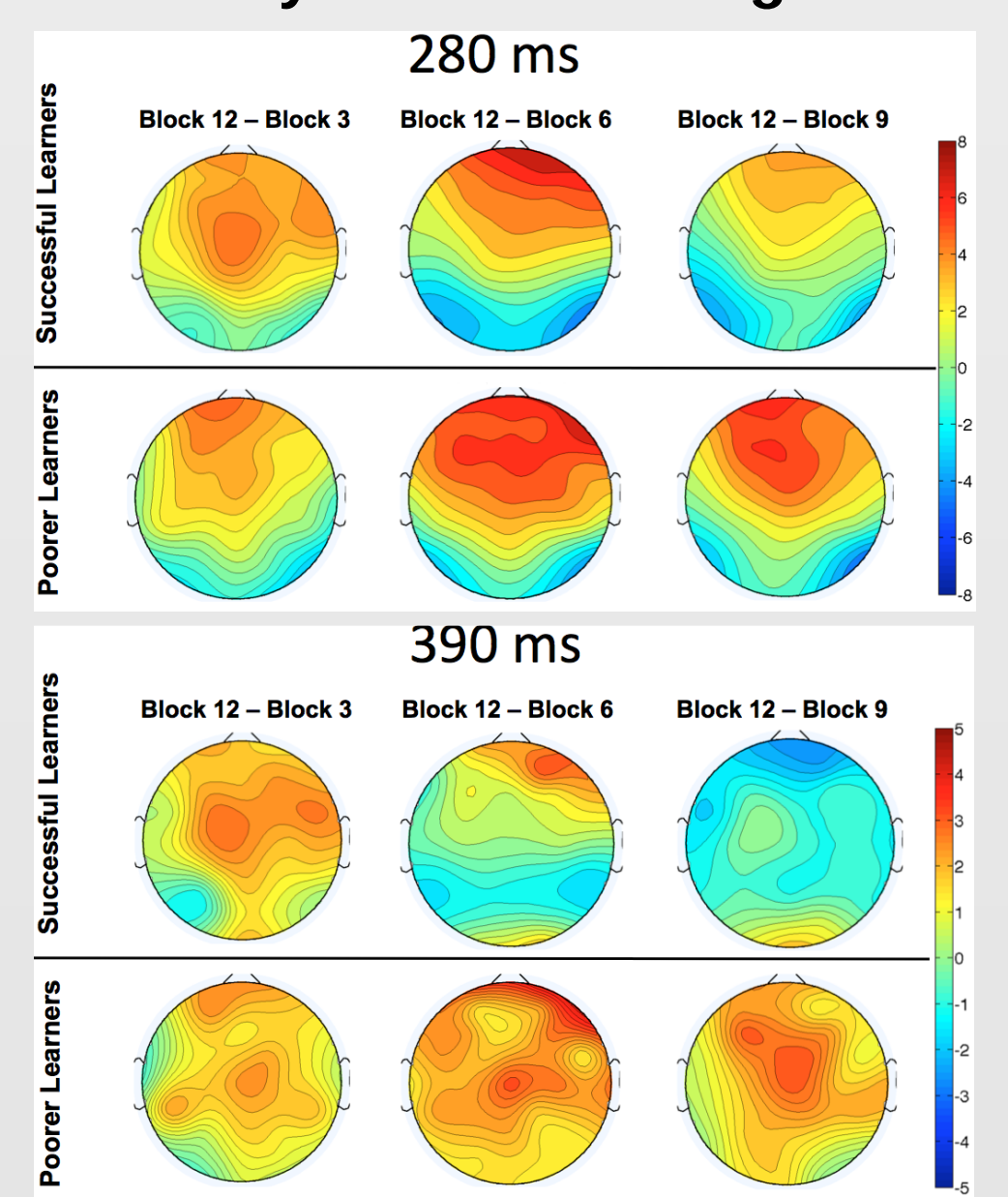
1. Prediction performance peaked at 280 ms and 390 ms after the video onset.



2. More successful learners (vocabulary scores > 96.7%) show greater topographic similarity than poorer learners (vocabulary scores < 65%).

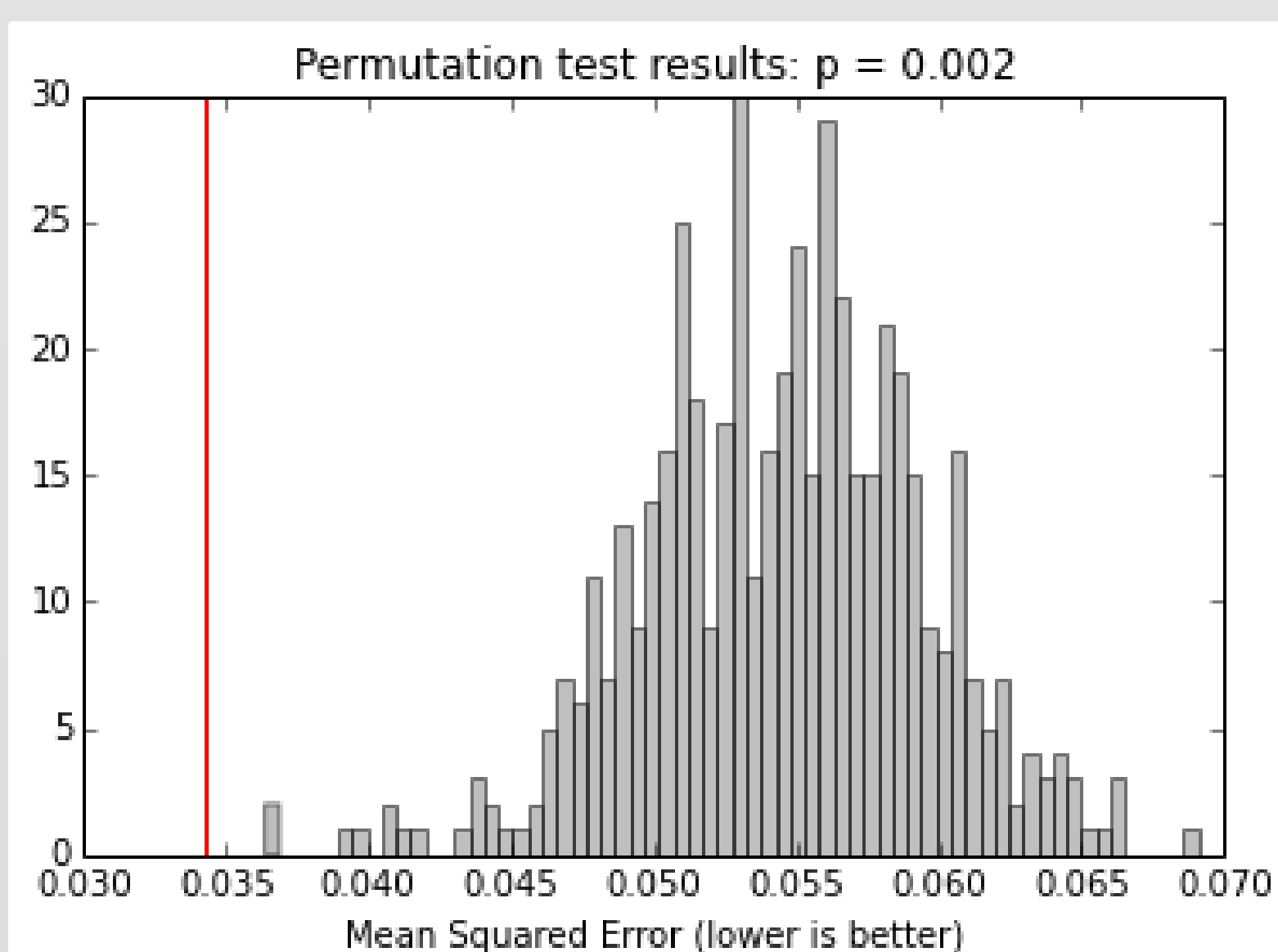


3. More successful learners show increasing topographic similarity across learning blocks.

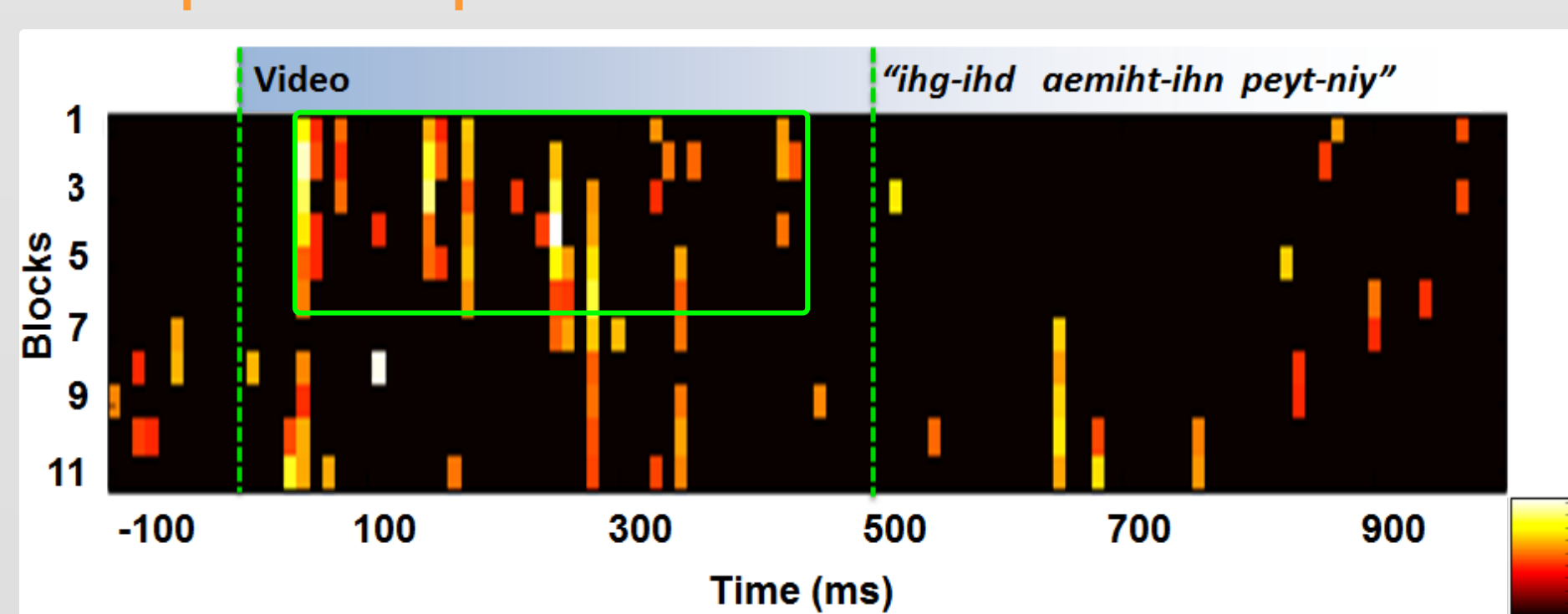


Data from all time points as predictors:

1. Model performance score: null explained variance 25% Significantly better than null model by permutation tests



2. The topographic similarity between 50 - 400 ms during the earlier blocks contributed greatly to model's prediction performance.



Conclusion

- The topographic similarity of EEG in relative to the final stage of learning reflects the amount of acquired knowledge.
- The dynamic change of EEG during video watching before language inputs carries predictive information of successful word learning.
- Data-driven approaches might reveal important temporal windows for audio-visual integration in language learning.

Either Notes or Acknowledgment in this section.