NEURAL SENSITIVITY TO SPEECH DISTRIBUTIONAL INFORMATION UNDERLIES STATISTICAL LEARNING

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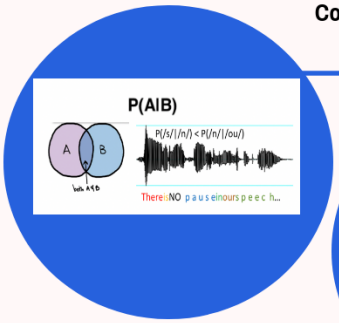
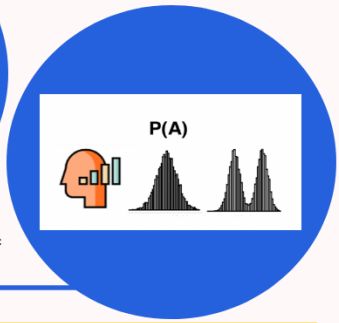
BACKGROUND

Human minds are apt to detect and extract statistical regularities from the environment (Saffran et al., 1996; Conway & Christiansen, 2005). The ability to rapidly learn and extract information embedded in the inputs, known as statistical learning (SL), is foundational for language development (Newport & Aslin, 2004). There are two types of information encoded by learners in numerous SL tasks:

Conditional = frequency of adjacent or non-adjacent elements co-occurring





Distributional = bare frequency of occurrence of exemplars

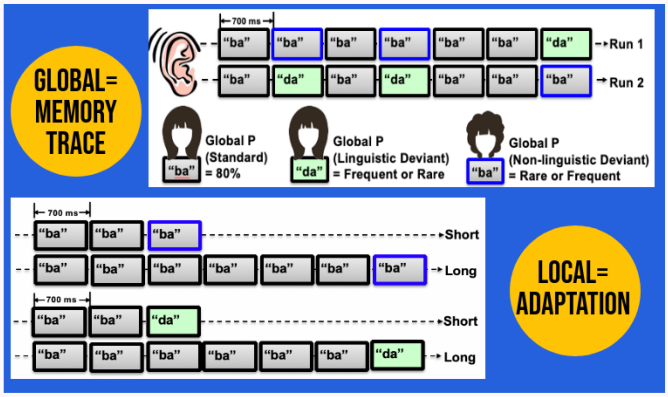
The current study seeks to understand the neural processes underlying speech distributional information and how it relates to the online learning of conditional SL.

METHODS

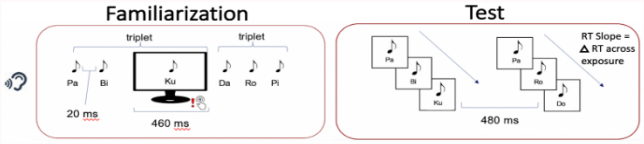
PARTICIPANTS. Twenty-seven right-handed, native English-speaking adults (*Mage*=20.70, *SD*=2.99, range [18.1—34.6], 8 males)

FIND THESE ROBOTS IN THE MOVIE!

Neural processes supporting Distributional Information



Online learning of Conditional Speech Syllable SL



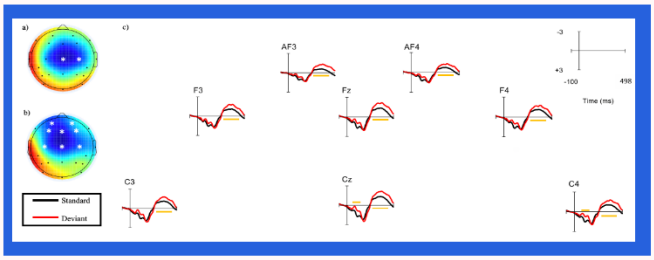
EEG ANALYSIS

RECORDING 24-channel mobile EEG system (SMARTING, mBrainTrain, Belgrade, Serbia) at a sampling rate of 500 Hz.

PRE-PROCESSING high-pass filtered at 0.1 Hz, low-pass filtered at 30 Hz, and re-referenced to the mastoids. ICA was used to remove eye/muscle movement components.

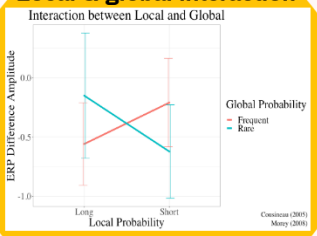
STATISTICS
- cluster-based permutation test within the Mass Univariate Toolbox
- linear slope of the reaction time (RT) across trials was calculated, where negative RT slope indicates acceleration of response

EEG RESULTS



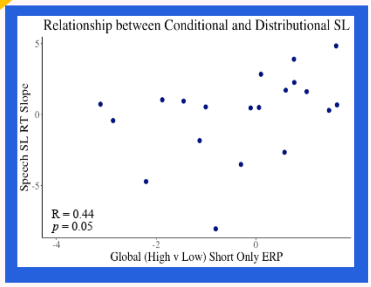
Deviants vs. Standards: a) early (22-180 ms) & b) late negativity (324-500 ms)

Local & global interaction



if global (p) = frequent then long > short
if local (p) = short, then rare > frequent

Behavioral correlation
Greater sensitivity to global (p) correlated with faster RT slope across conditional SL task



CONCLUSIONS

Least frequent deviants = too salient overall

Global and local probabilistic information masks each other when stimuli are perceived as very rare oddballs (e.g. long and rare)

Conditional SL is associated with sensitivity to global (p)

May be related to an individual's ability to maintain or update memory trace

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