Language Learning Efficacy in Adults is Predicted by the Electrophysiological Markers of Native-Language Processing

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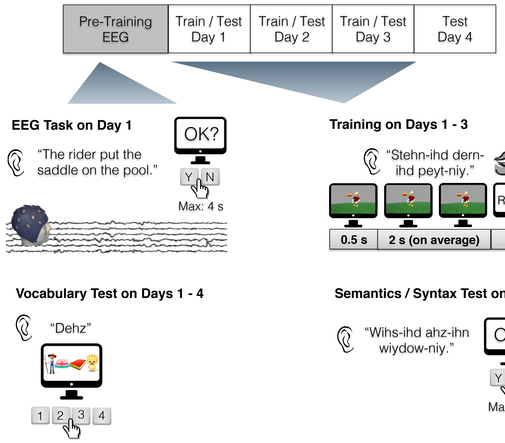
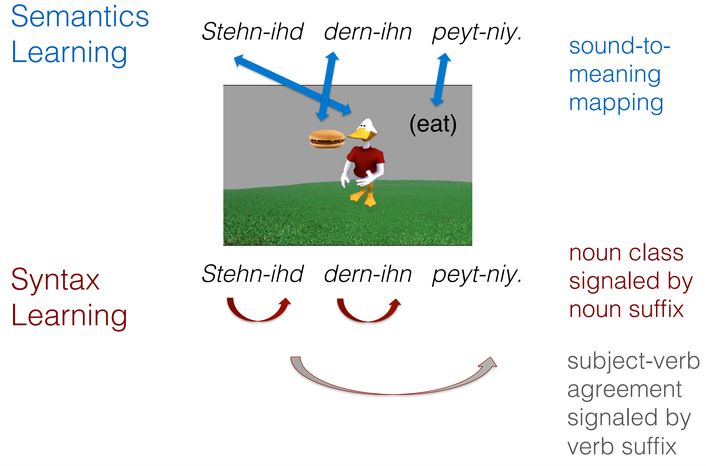
- Language-learning outcomes in adulthood vary markedly across individuals.
- Behaviorally, native-language skills have been shown to form the basis of learning aptitude [1].
- Individual differences also manifest in the N400 and P600, the canonical neural indices of semantic and syntactic processing, respectively [2,3].
- Given that there are distinct neural signatures of semantic and syntactic processing, we asked whether the native-language N400 and P600 predict adults' ability to learn the vocabulary and grammar of a novel language.
- We found a double dissociation such that the N400 predicts vocabulary learning and the P600 predicts grammar learning.

Study Design

N = 38 typical young adults



Miniature Artificial Language Learning



Native-Language Markers

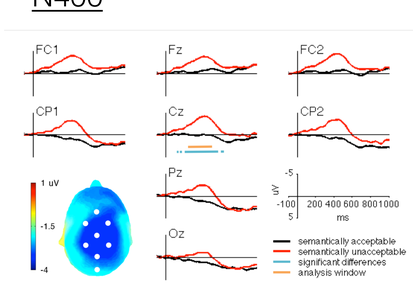
Semantic Processing

The rider put the saddle on the pool (horse).

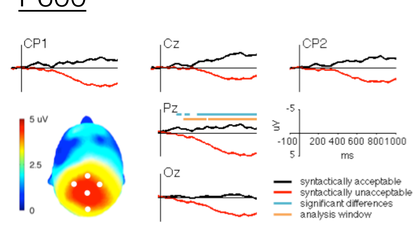
Syntactic Processing

Ken's uncle sells we (us) his old cars.

N400

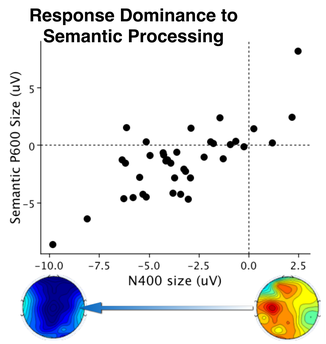


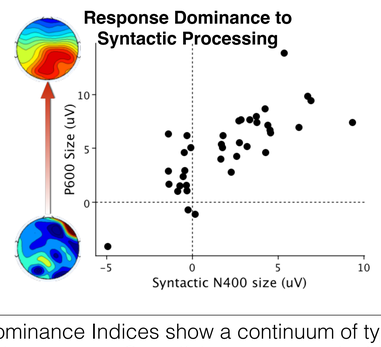
P600



Individuals' N400 and P600 effect magnitudes are not significantly correlated (p's > 0.288).

Individual Differences in ERPs





Response Dominance Indices show a continuum of typical to less-typical responses. Quantifying responses in this way leads to the same pattern of brain-behavior correlations as are obtained with N400 and P600 effects.

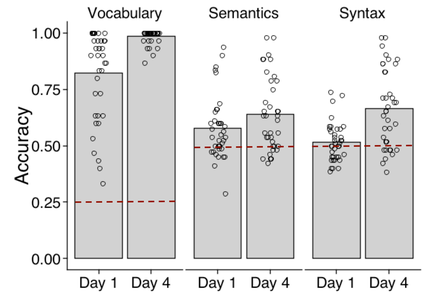
References

[1] Carroll JB, Sapon SM, Reed DJ, Stansfield CW (2010). Modern Language Aptitude Test. Second Language Testing Foundation, Rockville, MD.

[2] Osterhout L (1997). On the brain response to syntactic anomalies: manipulations of word position and word class reveal individual differences. Brain and Language, 59(3), 494–522.

[3] Tanner D, Van Hell JG (2014). ERPs reveal individual differences in morphosyntactic processing. Neuropsychologia, 1–13.

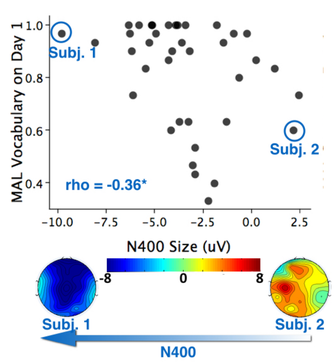
Miniature Artificial Language Outcomes

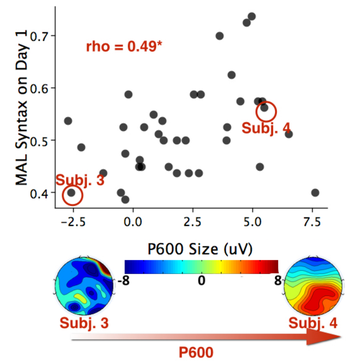


Vocabulary is positively correlated with Semantics and Syntax (p's < 0.028).

Controlling for Vocabulary, initial Semantics and Syntax learning are not correlated (p = 0.344).

Prediction Results





		English language predictors	
		N400 to semantics	P600 to syntax
Artificial language outcome	Vocabulary learning	✓	✗
	Syntax learning	✗	✓