

Background

- ❑ **Complementary Learning System Theory (CLS¹):** Novel words are initially encoded as episodic memory traces by the hippocampal system. After a subsequent period of consolidation, a shift towards more systematic, lexicalized coding of the memory representation in a distributed neocortical network occurs.
- ❑ **Shorter vs. longer term consolidation:** In two EEG studies^{2,3}, Dutch participants learned novel words (e.g., 'pamat') with printed novel definitions (e.g., a blue cat). ERP results suggested that the semantic integration process of novel words had started but was not completed, as indexed by N400 and LPC components. The time-frequency analysis revealed a theta power increase and beta power decrease in novel words after a period of offline consolidation, indicating that an offline consolidation period enables novel words to acquire lexically integrated, word-like neural representations.
- ❑ **Prior language learning experience:** The Dutch participants tested in^{2,3} are highly fluent in at least one foreign language, English. Prior research showed that experienced language learners acquire novel words faster^{4,5,6,7,8}.

Research Questions

- ❑ Do monolingual learners with little experience in learning foreign languages demonstrate similar or different neurophysiological patterns as the experienced language learners tested by^{1,2}?
- ❑ After a longer period of offline consolidation, can novel word forms elicit more word-like time-frequency representations (TFRs), as well as ERP responses in both the N400 and the LPC windows?

Methods

- ❑ **Participants:** 32 right-handed monolingual English-native speakers with limited prior knowledge of other languages.
- ❑ **Novel words:** Two lists of 20 non-derivational non-words created by⁹ (e.g., 'meglor')
 - ❑ Phonotactically legal in English and have zero orthographic neighbors
 - ❑ One list was learned on Day 1 (blue box in **Procedure** figure), and the other was learned on Day 2 (yellow box in **Procedure** figure).
- ❑ **Existing words:** two lists of 20 English words with comparable word lengths
- ❑ **Novel definitions:** Two lists of 20 novel definitions paired with novel words
 - ❑ Each consists of an existing object category (e.g., "a pair of scissors") paired with two features (e.g., "that is operated by two people/can cut rocks")
- ❑ **Prime words:** existing English words that were absent in the assigned definition
 - ❑ Using University of South Florida Free Association Norms¹⁰

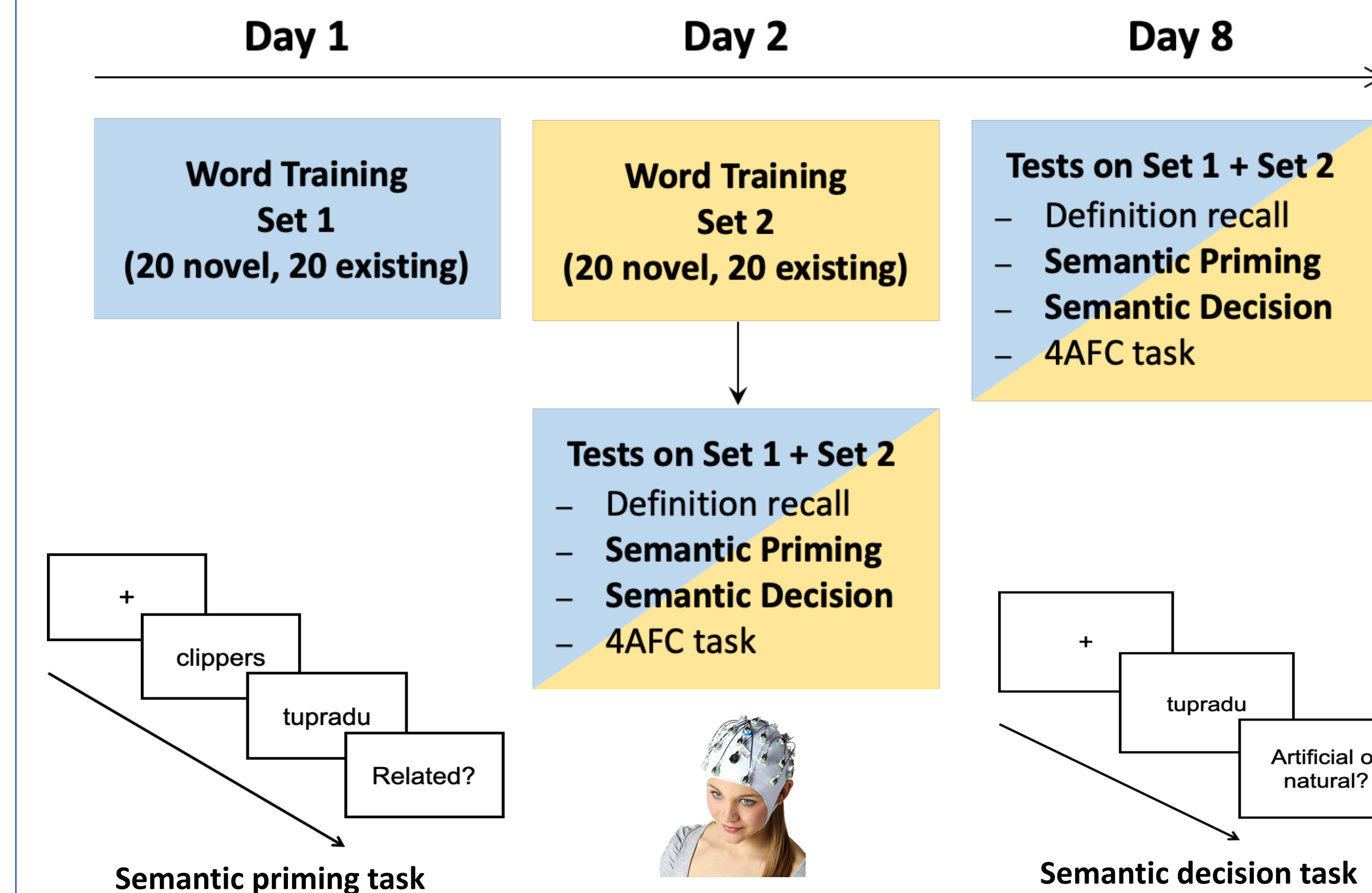
Procedure

Training phase

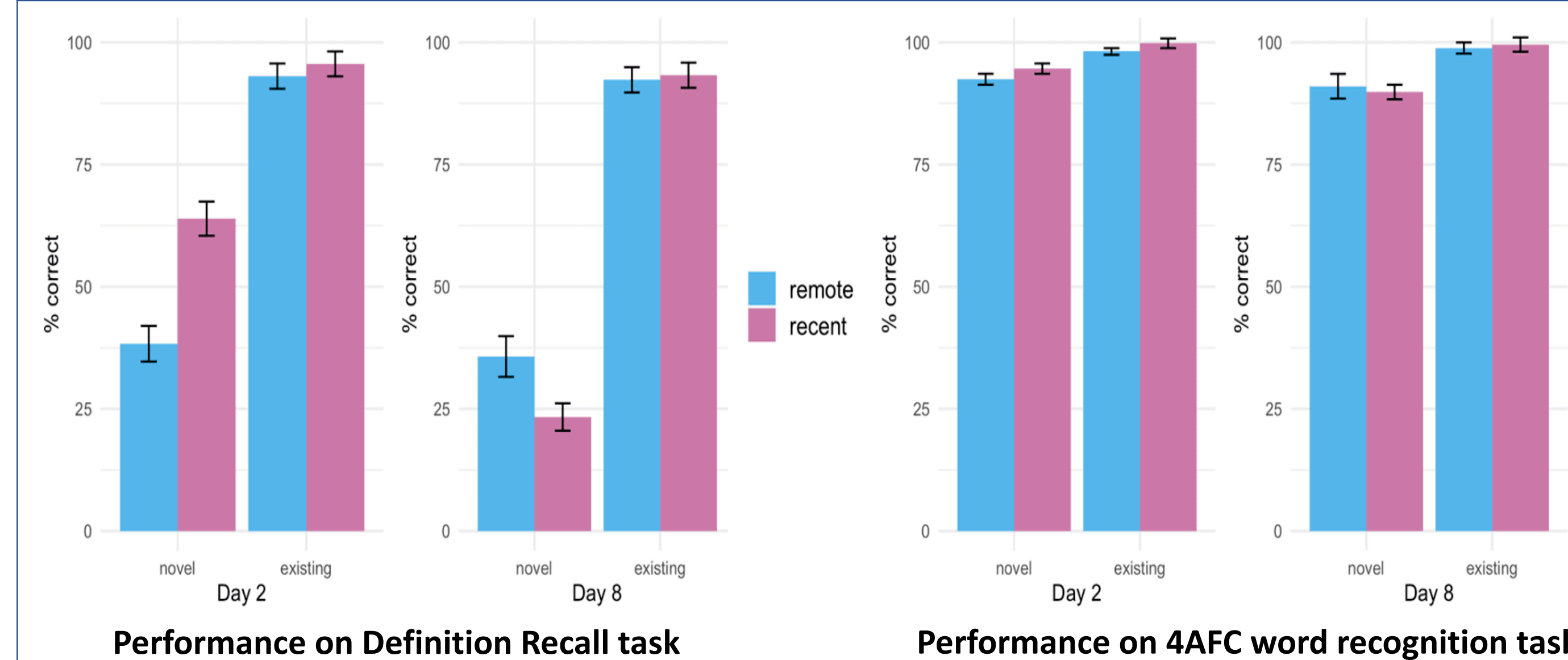
- ❑ A round of 5-s visual presentations for each of the 20 novel and 20 existing words with their definitions
- ❑ A series of four training tasks: two-alternative-forced-choice (2AFC) word-definition matching task (definitions are the cues), 2AFC word-definition matching task (words are the cues), word recall task cued by definitions, and definition recall task cued by words

Testing phase

- ❑ Two EEG tasks: Semantic priming task and semantic decision task
- ❑ Two behavioral memory tasks: Definition recall task and a 4AFC word recognition task



Behavioral Results



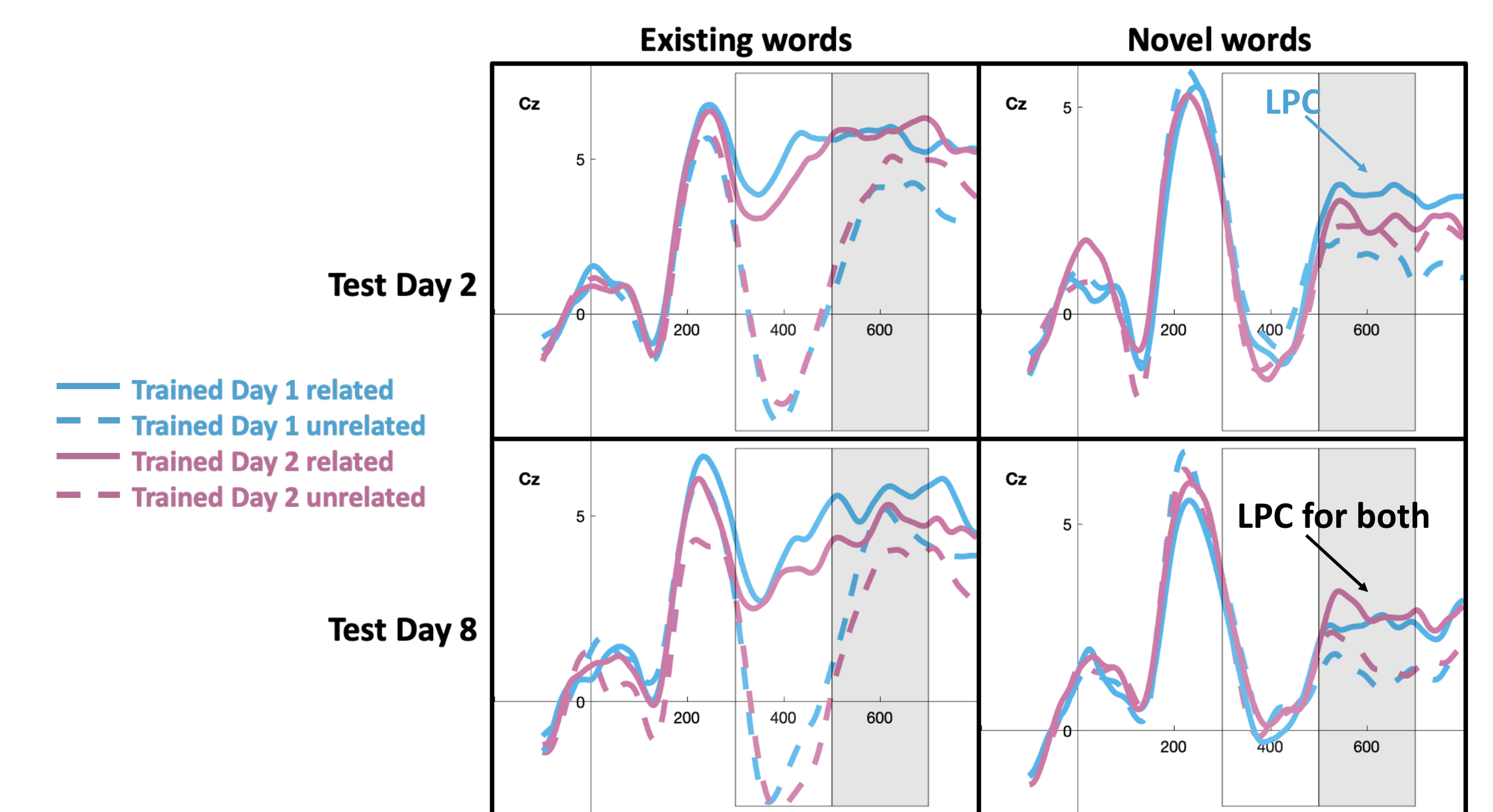
Contact & Acknowledgement

Contact: Yushuang Liu yzl67@psu.edu
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 Part of this work is now in press: Liu & Van Hell (in press; *Language Learning*, DOI: 10.1111/lang.12403)

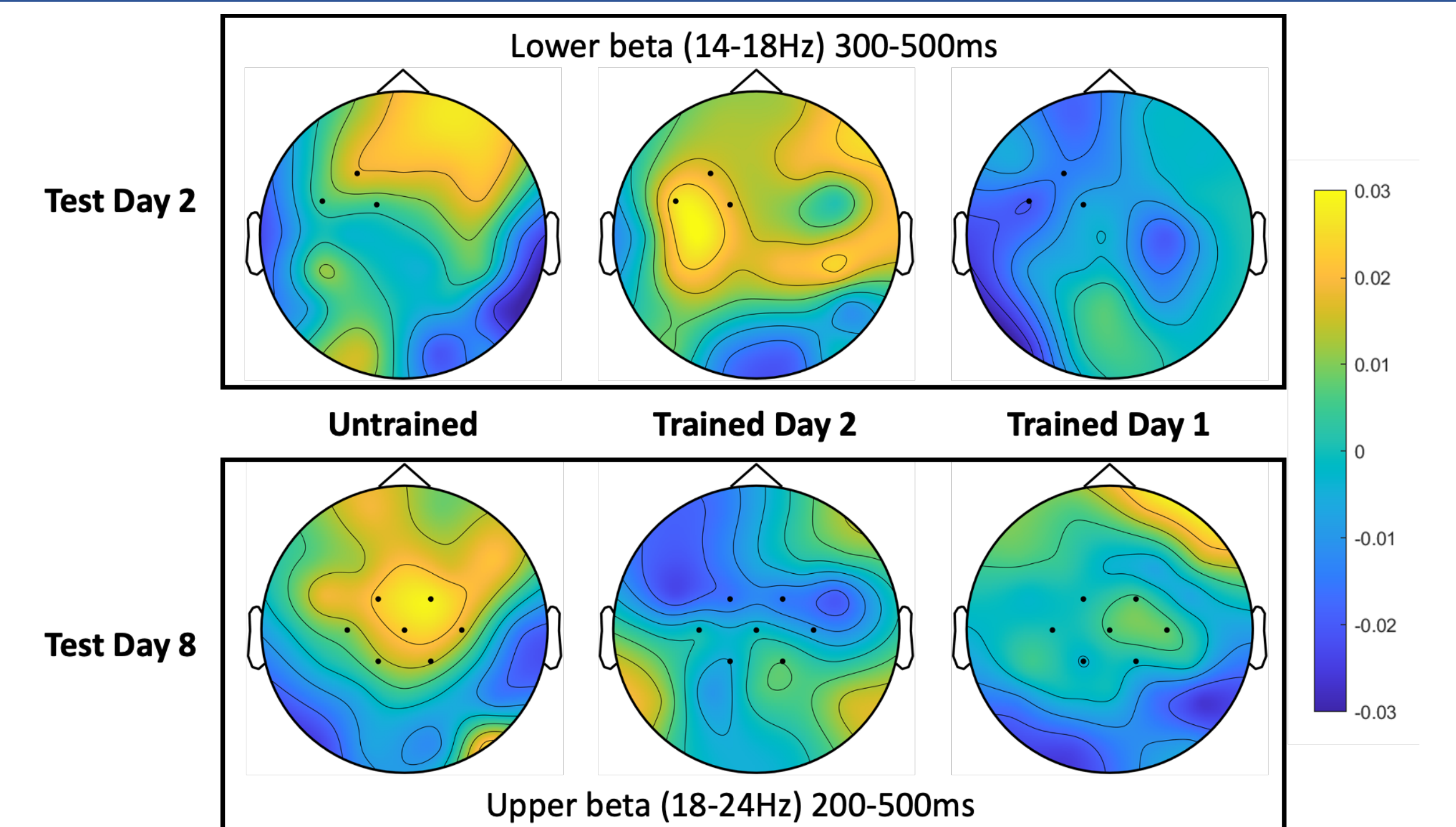
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ERP results: Semantic priming task



TFR results: Semantic decision task



Discussion

- ❑ ERP: evidence for more controlled retrieval for novel words after 24 hours of consolidation (indexed by LPC). This pattern parallels that in experienced foreign language learners 1. One week after word learning, LPC priming effect was detected for both sets of novel words. However, no evidence of more automatic semantic access (i.e., N400) was obtained on either days in novel words.
- ❑ TFR: evidence for offline consolidation in beta band (linked to semantic memory retrieval). Tested on Day 2, novel words learned on Day 1 did not differ from existing words, whereas words that were just learned elicited weaker beta desynchronization, as untrained words did. Tested on Day 8, both sets of trained words did not differ from existing words, whereas untrained words elicited weaker beta desynchronization. However, no evidence of offline consolidation was obtained in the theta band (linked to lexical-semantic access, as was observed in 1).
- ❑ Together, these results suggest that novel word meaning lexicalization is gradual, and that prior language learning experience expedites the process.