Stellar Learning

Learning second language vocabulary with a mobile application: what role for working memory and rhythm production?

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Background

- Serial order working memory, compared to item working memory, is a strong predictor of L1 vocabulary development in children (Leclercq & Majerus, 2010)
- Phonological knowledge and serial order working memory predict independently the learning of L1-L2 paired associates in adults (Majerus et al., 2008)
- Language acquisition relies on phonological development that is related to temporal processing skills (Goswami, 2011)
- People with dyslexia that experienced difficulties in phonological processing have poorer rhythmic skills (Thomson et al., 2006)

Methods

PHASE 1 (pre-intervention measures)

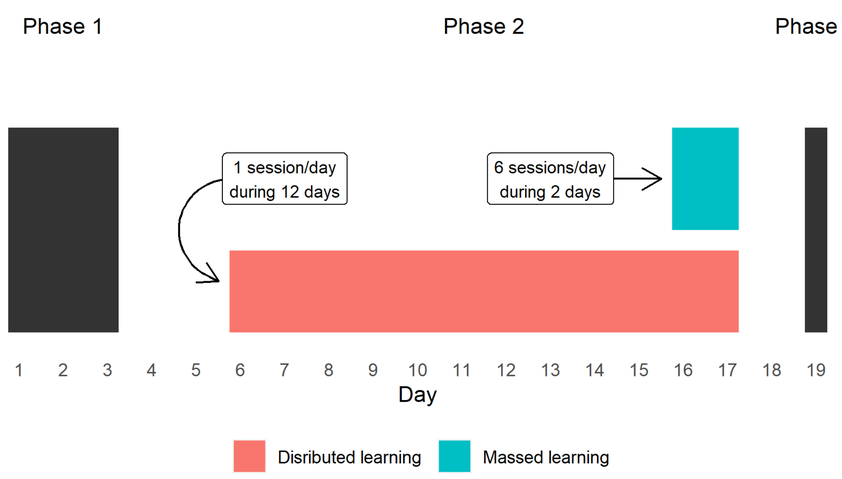
- Assessment of French to Finnish translation knowledge for the 48 words to be learned
- Item working memory (unknown Finnish words recognition task)
- Order working memory (serial reconstruction task for digit lists)
- Rhythm production (tapping continuation task at different frequencies: 2 Hz, 1 Hz, and 0.67 Hz)

PHASE 2

- Learning of the 48 Finnish-French translations using a dedicated app (stellar-learning.app)
- Two groups of participants (learning schedule):
  - Distributed (1 session/day during 12 days – 96 participants)
  - Massed (6 sessions/day during 2 days – 88 participants)

PHASE 3 (post-intervention measure)

- Assessment of French to Finnish translation knowledge for the 48 pairs learned



Hypothesis

Item and order STM independently predict L2 word learning:

- Item ➔ important for maintaining phonological information of a word
- Order ➔ important for maintaining phoneme order of a word

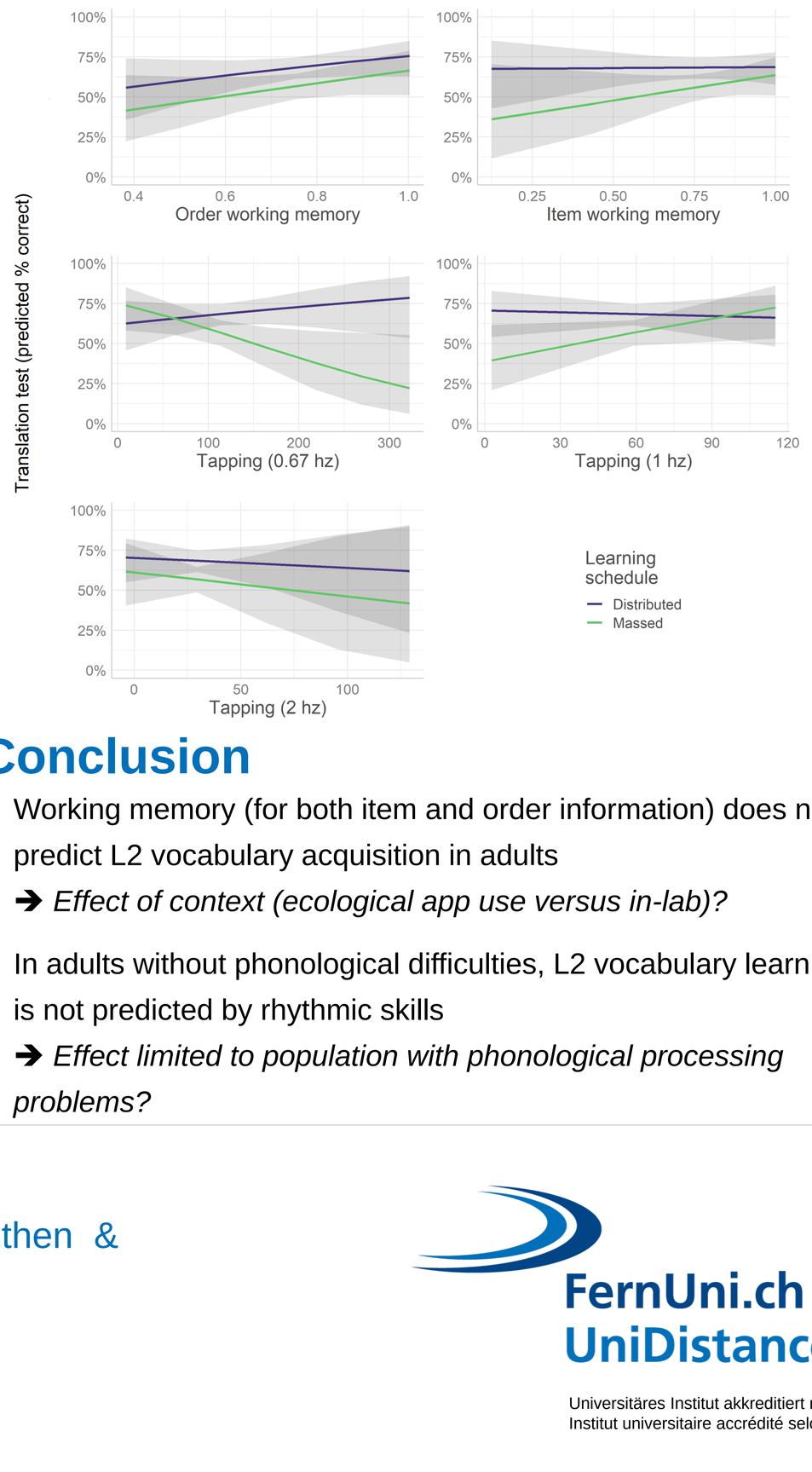
Rhythm production predicts acquisition of L2 vocabulary:

- Better temporal processing skills ➔ better phonological processing ➔ better learning of new L2 vocabulary

Results

- After controlling for other variables, item/order working memory and tapping skills appeared not to predict L2 vocabulary learning
- There was no interaction between the learning schedule (grouped or massed) and working memory or tapping abilities (all $BF_{10} < 0.15$)

Task	Estimate (adjusted)	Standard error	BF_{10}	Effect size (Cohen's *d*)
Item working memory	0.050	0.090	0.013	0.028
Order working memory	0.174	0.092	0.065	0.096
Tapping (2 Hz)	-0.102	0.092	0.020	0.056
Tapping (1 Hz)	0.164	0.110	0.033	0.090
Tapping (0.67 Hz)	-0.128	0.108	0.022	0.070



Conclusion

- Working memory (for both item and order information) does not predict L2 vocabulary acquisition in adults
  ➔ *Effect of context (ecological app use versus in-lab)?*
- In adults without phonological difficulties, L2 vocabulary learning is not predicted by rhythmic skills
  ➔ *Effect limited to population with phonological processing problems?*

References

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