

## Introduction & aim

Verbal short-term memory (VSTM) and long-term memory (LTM) closely interact, with linguistically more-easy to process verbal items leading to higher VSTM span. These effects are explained by language-based models assuming fast and automatic interactions between VSTM and LTM (Martin, Saffran, & Dell, 1996; Majerus, 2013). However, direct evidence for automatic VSTM-LTM interactions is scant. The purpose of the present study was to test the degree of automaticity of VSTM-LTM interactions using fast running-span procedures minimizing the intervention of strategic processes during VSTM encoding and maintenance.

We manipulated, in 4 experiments, several psycholinguistic effects assessing access to phonological, lexical and/or semantic knowledge in automatic encoding VSTM tasks.

## Methods

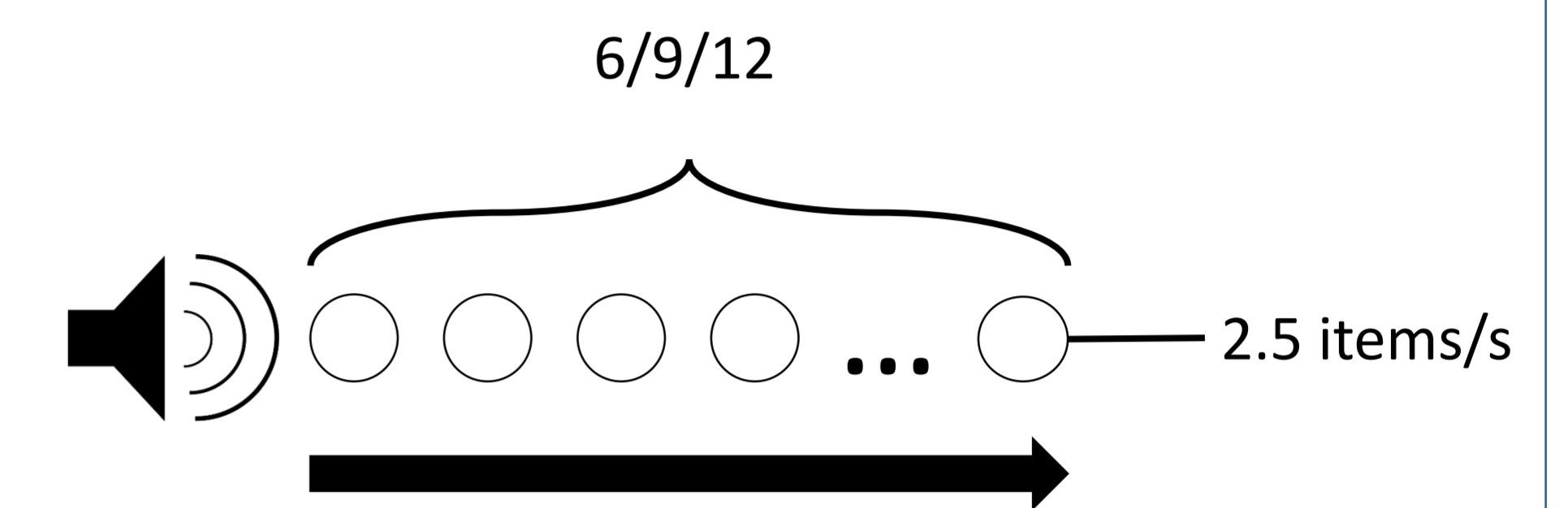
**Running-span procedure.** Participants had to encode and recall auditory lists of **unpredictable length** (6, 9 or 12), with verbal items being presented at a **very fast rate** (2.5 items/s) (Fig. 1). At the end of the list, participants were instructed to **recall in order any items they could remember, by starting from the end of the list**.

**Experiment 1.** Participants ( $N = 39$ ) recalled lists composed of either words or nonwords (**lexicity effect**). All stimuli were matched for phonotactic frequency and phonological length.

**Experiment 2.** Participants ( $N = 42$ ) recalled lists composed of high or low frequency words (**lexical frequency effect**). All stimuli were matched for imageability and phonological length.

**Experiment 3.** Participants ( $N = 47$ ) recalled lists of words drawn from similar or dissimilar semantic categories (**semantic similarity effect**).

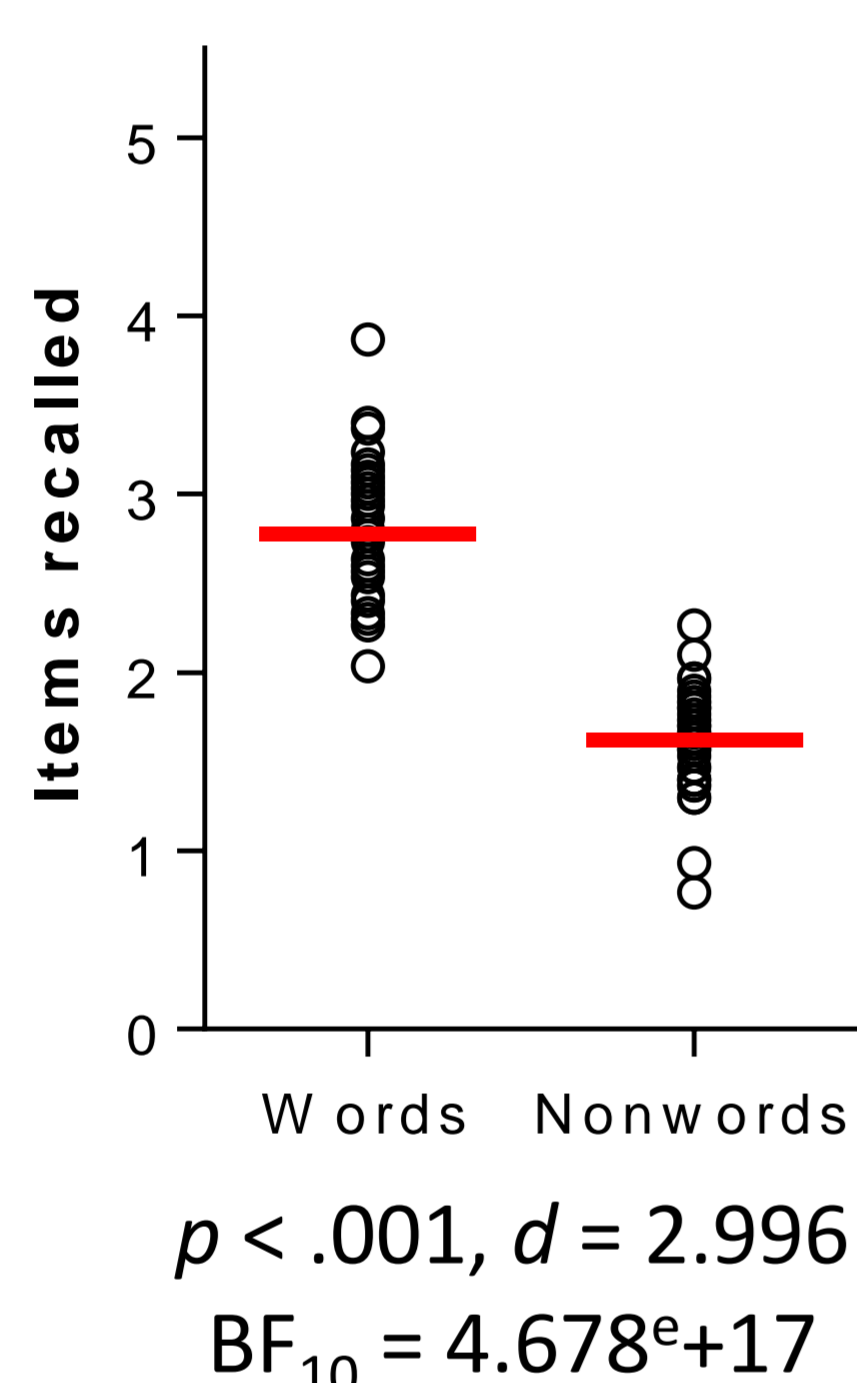
**Experiment 4.** Participants ( $N = 46$ ) recalled lists composed of high or low imageability words (**imageability effect**). All stimuli were matched for lexical frequency and phonological length.



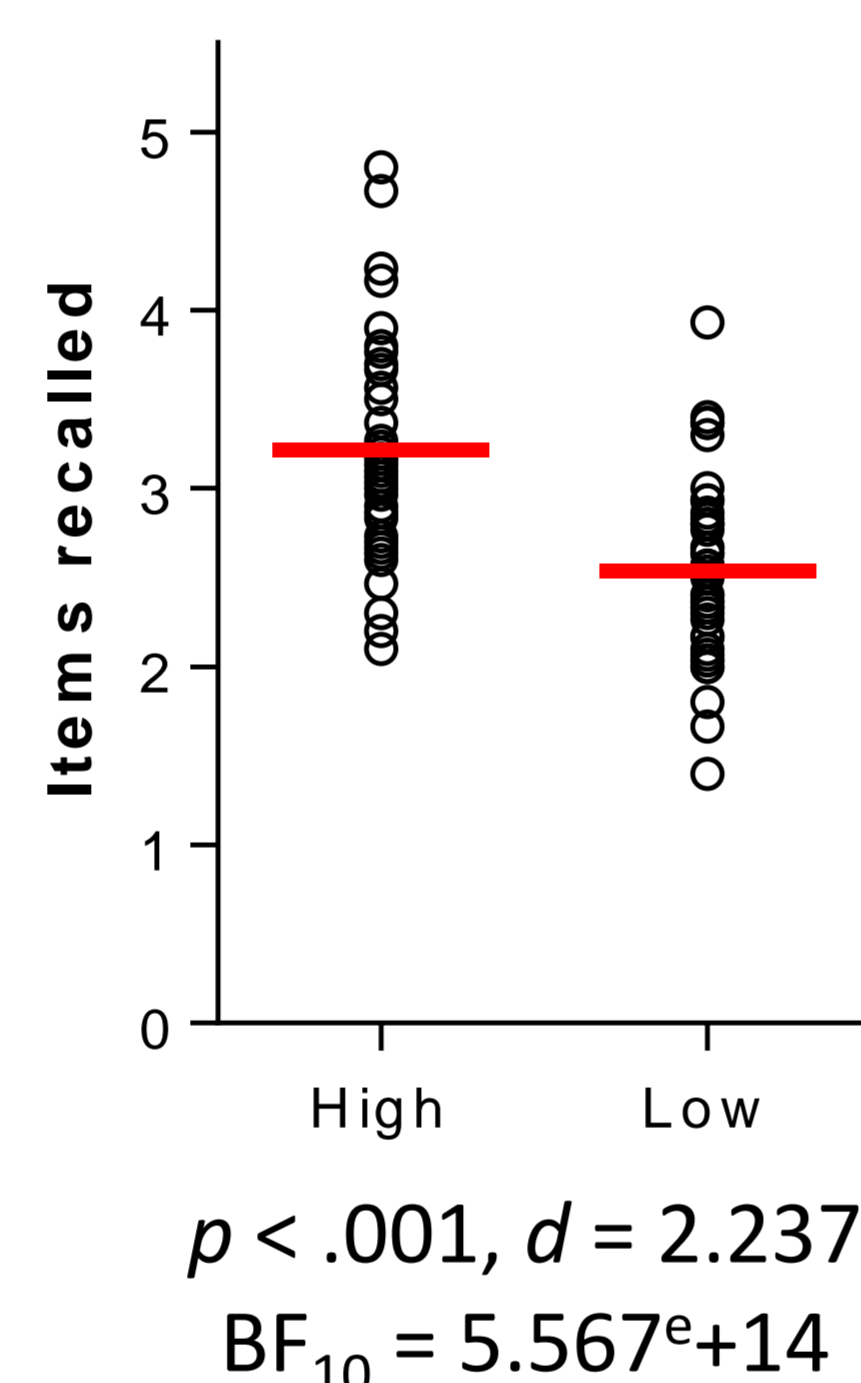
**Figure 1.** During the encoding phase of the running-span procedure, participants hear verbal items presented at a very fast rate. List length varied between 6, 9 and 12 items and was unpredictable for the participants.

## Results

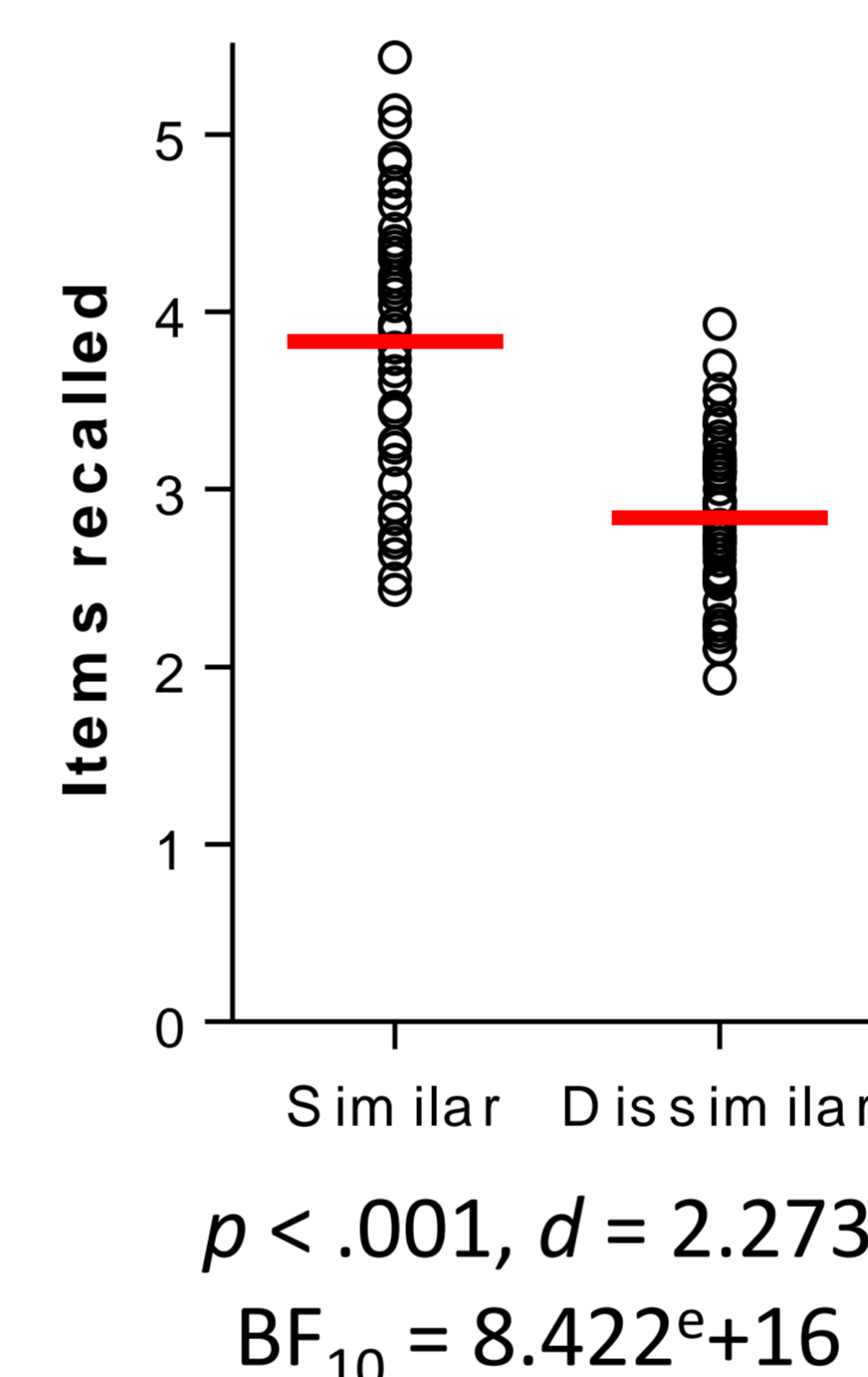
### Lexicity effect



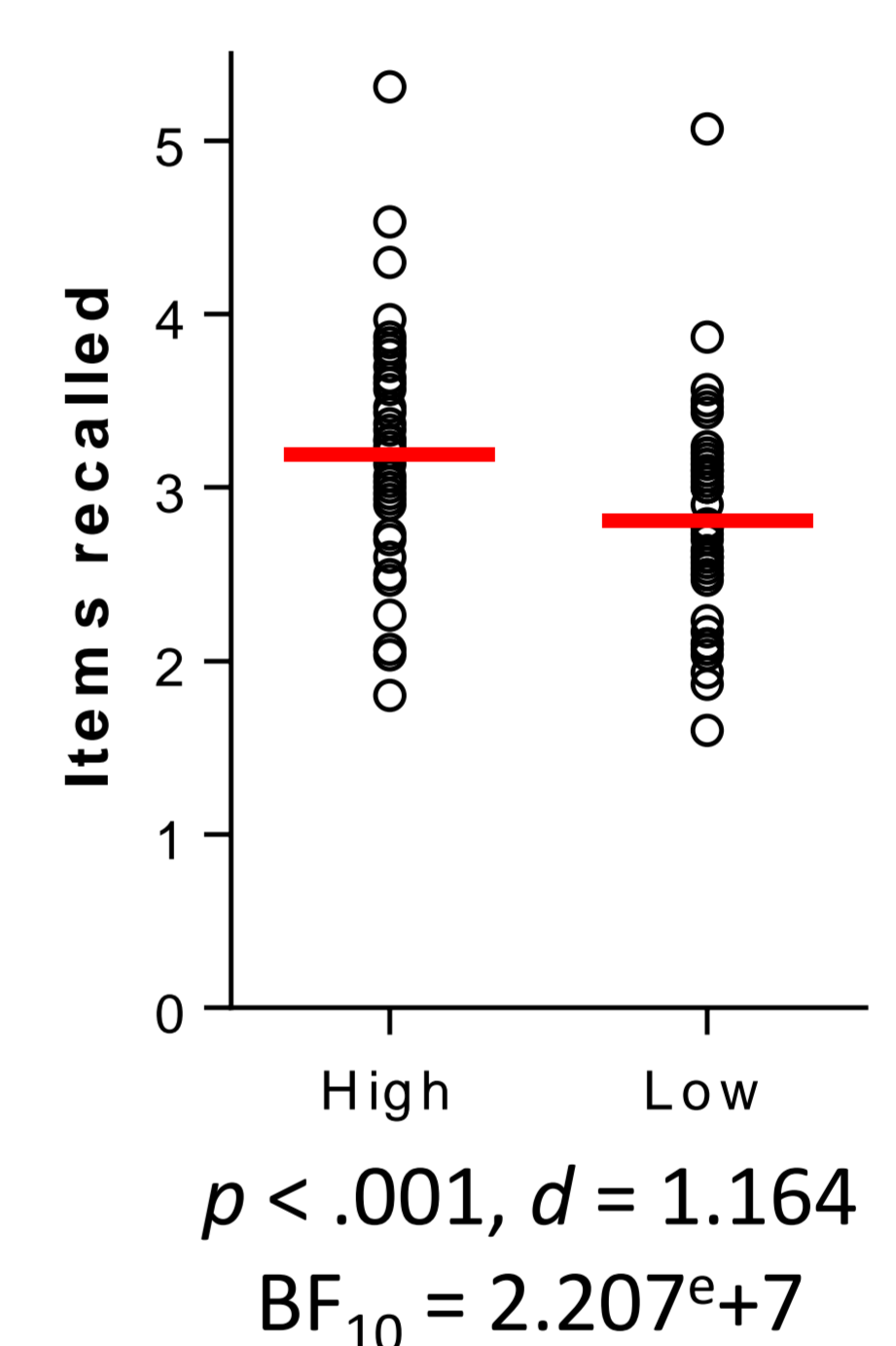
### Lexical frequency effect



### Semantic similarity effect

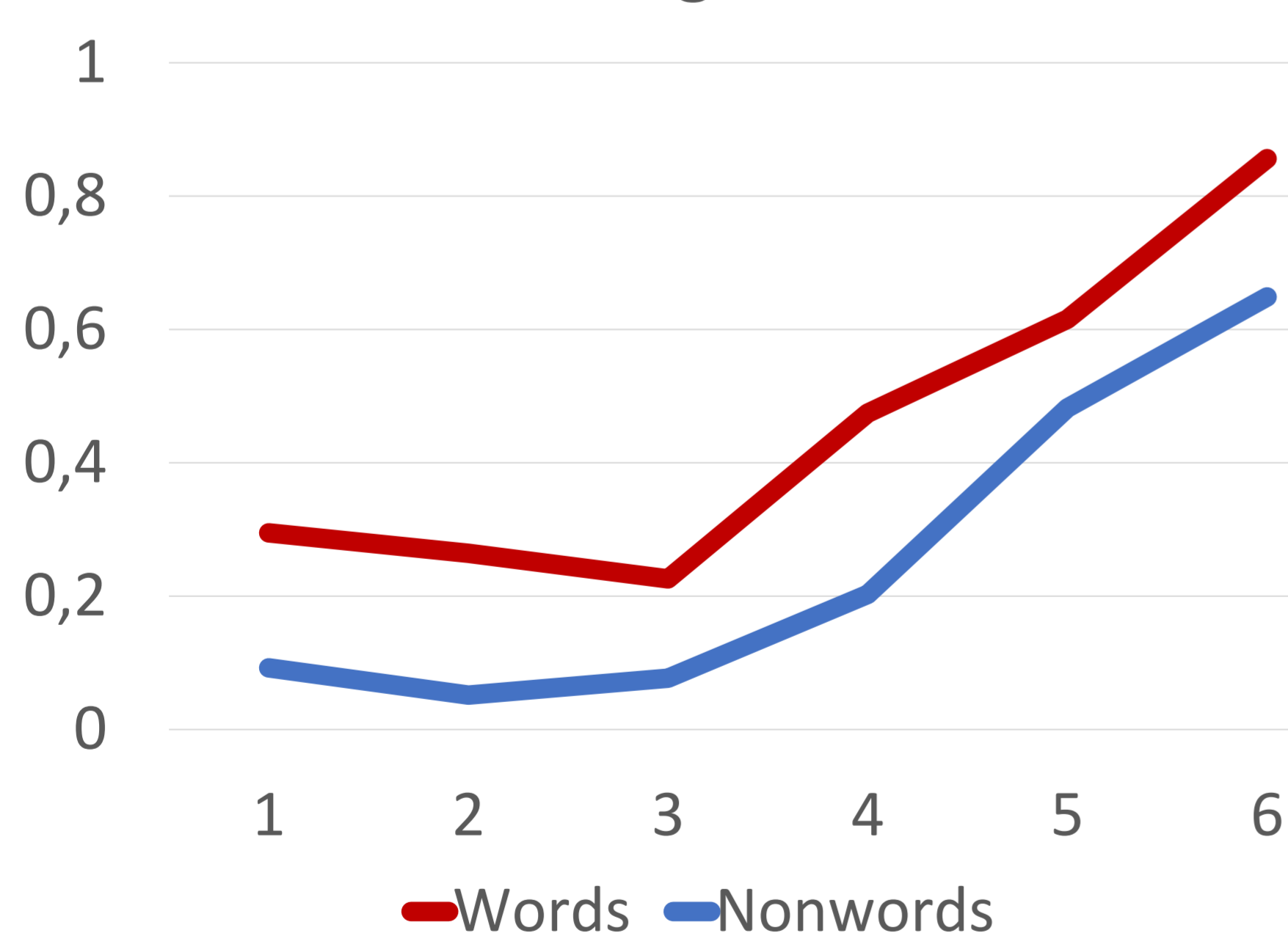


### Imageability effect

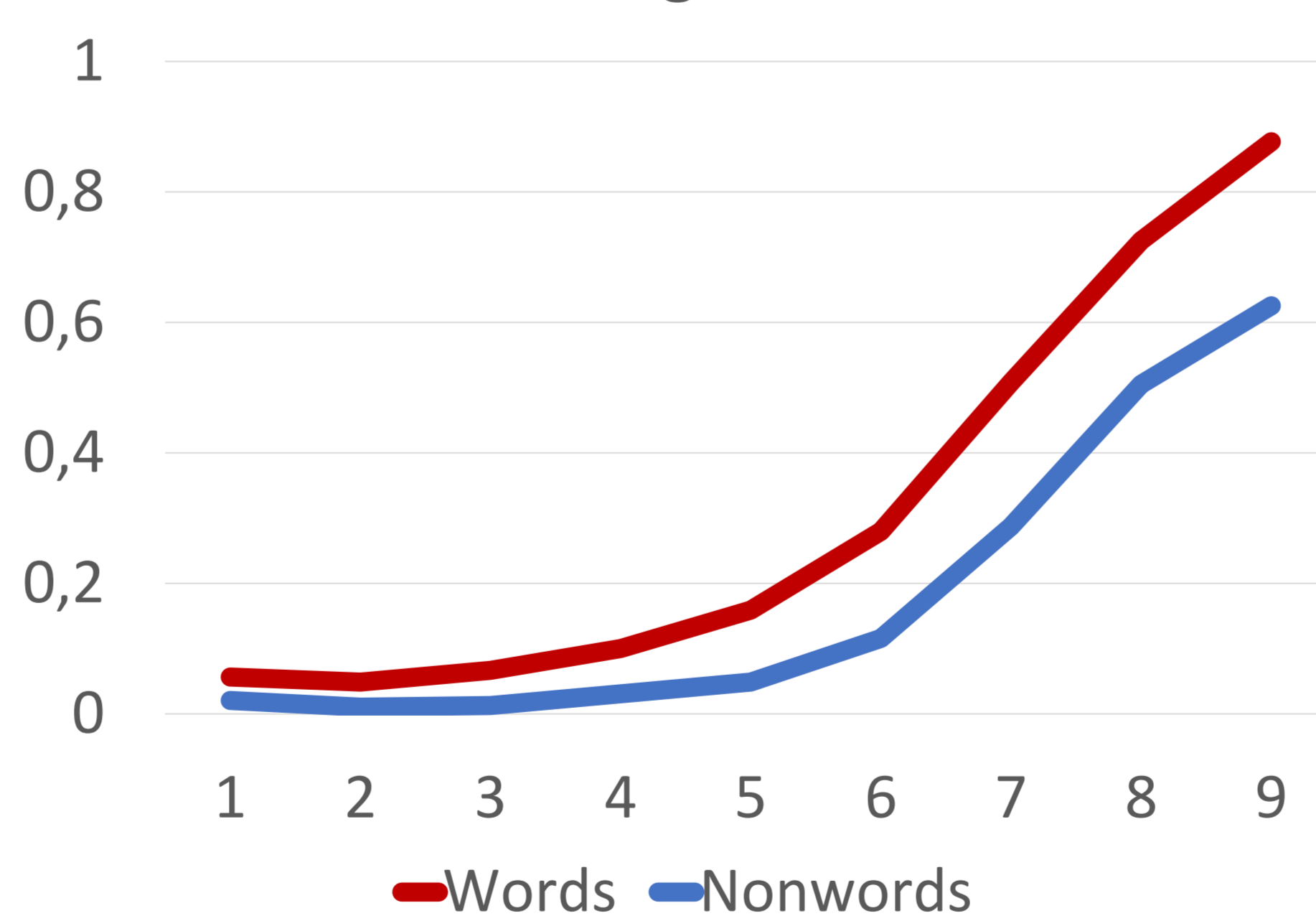


### Serial position curves – Lexicity effect

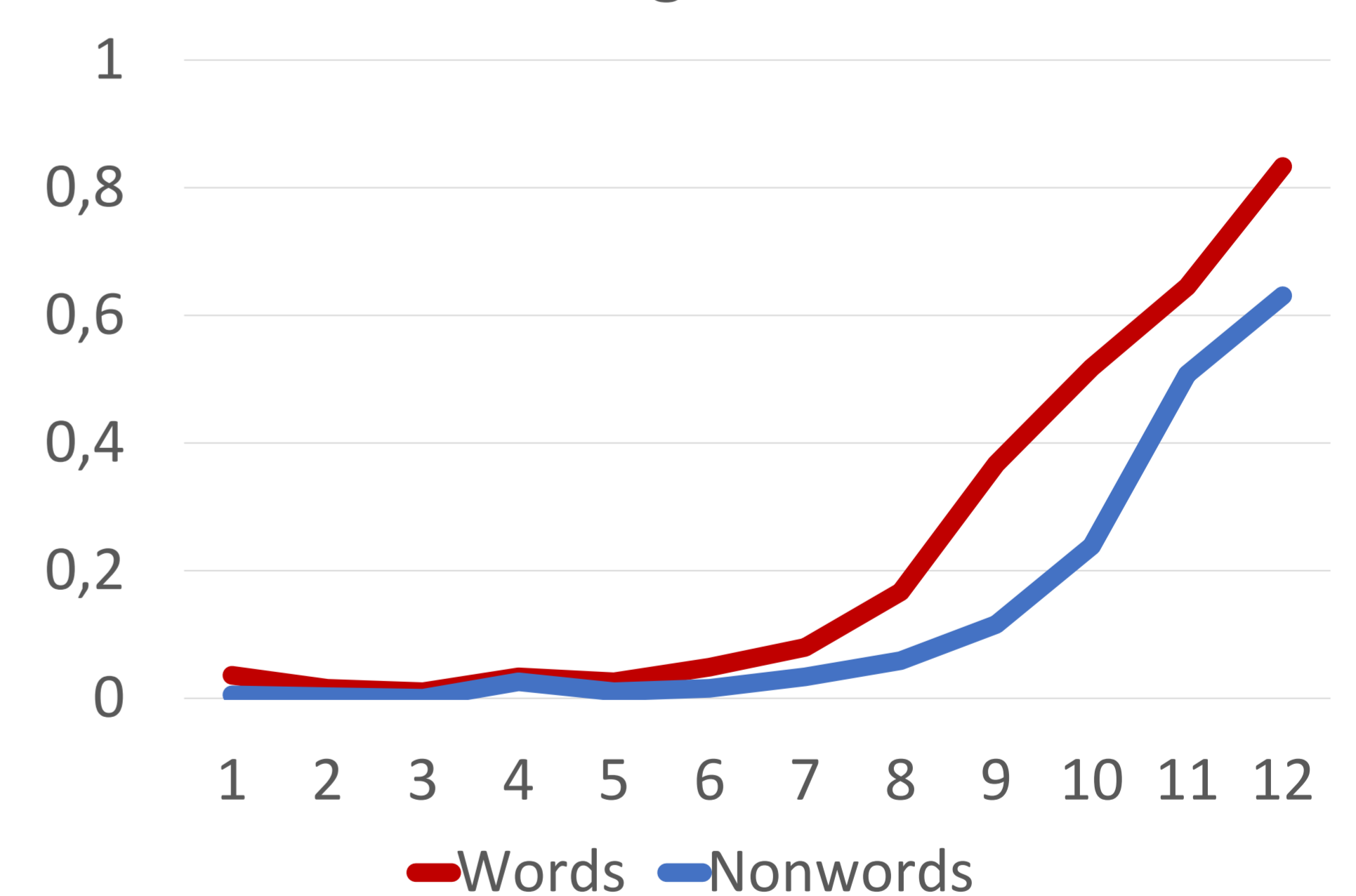
#### Length 6



#### Length 9



#### Length 12



## Discussion & conclusion

Robust LTM effects were observed during all automatic encoding VSTM tasks. VSTM span was higher for:

- Words vs. nonwords
- High vs. low frequency words
- Semantically related vs. unrelated words
- High vs. low imageability words

The very strong recency effects and the zero primacy effect confirm automatic encoding during the running-span task.

This study provides strong and novel evidence for the grounding of VSTM in linguistic LTM, by demonstrating the existence of very fast and non-strategic interactions between VSTM and the properties of linguistic LTM.

## References

- Martin, N., Saffran, E. M., & Dell, G. S., N. (1996). Recovery in deep dysphasia: Evidence for a relation between auditory-verbal STM capacity and lexical errors in repetition. *Brain and Language*, 52(1), 83–113.
- Majerus, S. (2013). Language repetition and short-term memory: an integrative framework. *Frontiers in human neuroscience*, 7.

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