

# The Effect of Long-Term Memory Knowledge on Rehearsal and Refreshing in Working Memory

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# Influence of long-term knowledge in short-term memory

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Evidences from ...

**Frequency effect:** high frequency words benefit from a facilitated access to long-term representations (*Hulme et al., 1991, 1999*).

**Lexicality effect:** words benefit from association to long-term knowledge compared to non-words (*Hulme et al., 1997*).

Effects mediated by more than one mechanism (*Thorn, Frankish, & Gathercole, 2009*).

Two mechanisms operate at separate stages of the memory process.

- (1) Activation levels at storage
- (2) Redintegration at retrieval

# Long-term knowledge and maintenance mechanisms in WM

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Do LTM effects occur during maintenance in working memory ?

Subvocal Rehearsal  
(Baddeley, 1986)

Attentional Refreshing  
(*Baddeley, 2000; Camos et al., 2009; Engle et al., 1999*)



If LTM effects occur at maintenance  
they should interact with variation of maintenance mechanisms.

# The present study

Aim: Investigate interaction of LTM effects with maintenance mechanisms in young adults.

## Exp 1:

Interaction of **frequency** with **refreshing**

Location judgment task  
(Barrouillet et al, 2007)

## Exp 2:

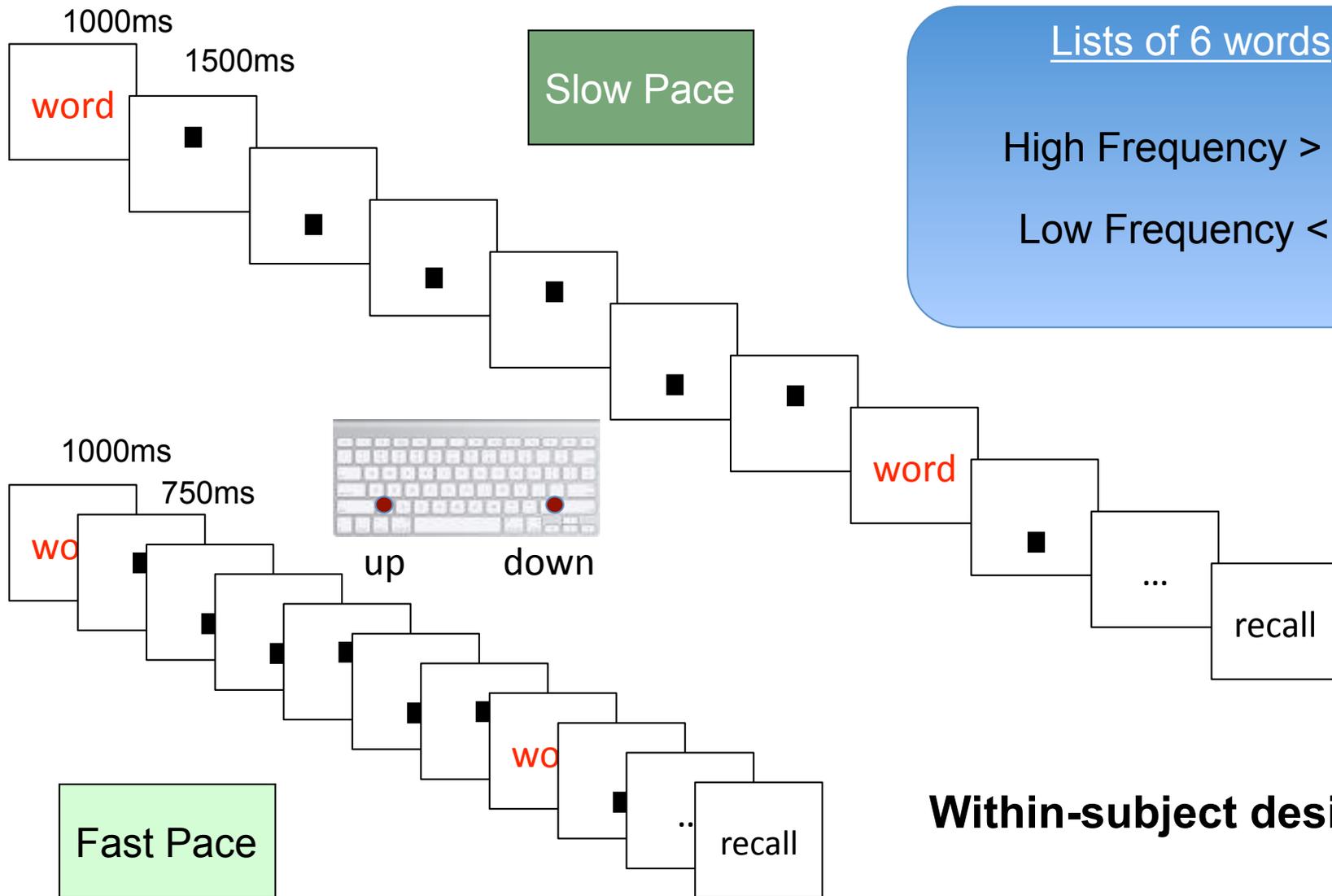
Interaction of **lexicity** with **refreshing** & **rehearsal**

Location judgment task

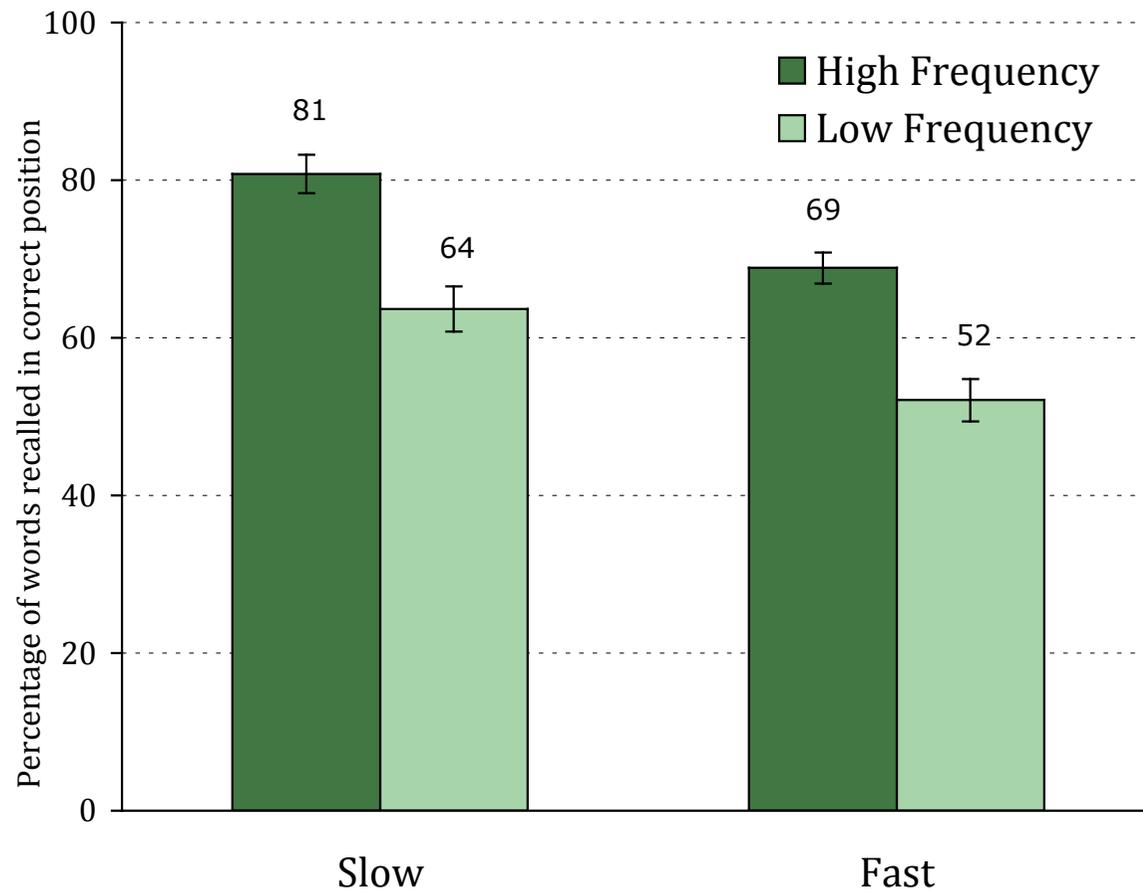
Articulatory suppression task  
(Baddeley, 1986)

# Exp. 1: Frequency × Refreshing

## Complex span paradigm



# Exp. 1: Frequency × Refreshing



**Frequency effect**  
 $F(1,18) = 40.54, p < .001$

**Pace effect**  
 $F(1,18) = 34.72, p < .001$

**Frequency x Pace**  
 $F < 1$

## Exp. 1: Frequency × Refreshing

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Frequency effect is not mediated by attentional refreshing at maintenance.

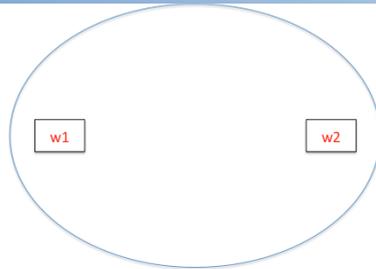
However, rehearsal could account for persistence of the frequency effect



Exp. 2

Rehearsal and refreshing were orthogonally manipulated

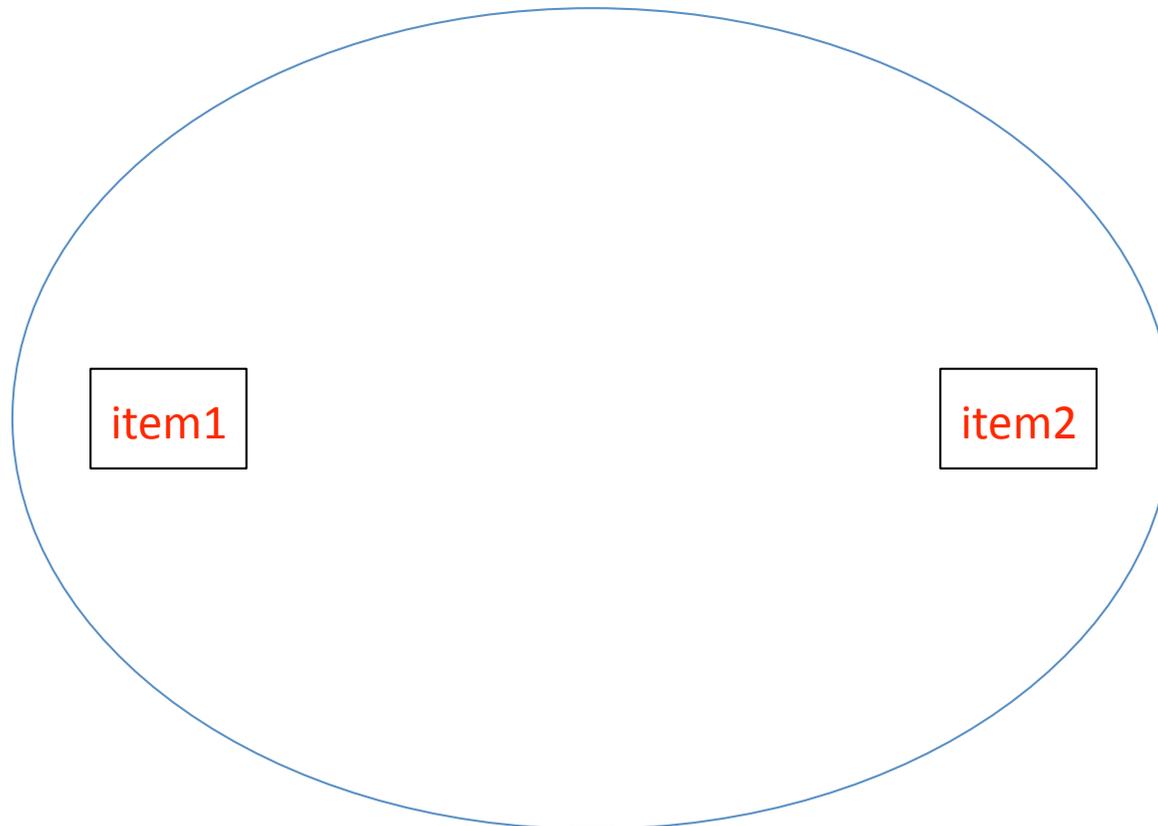
# Exp. 2: Lexicality × Refreshing × Rehearsal



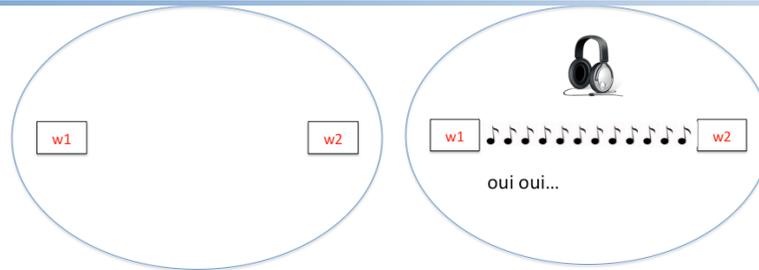
Rehearsal	✓
Refreshing	✓

6 items to remember

**Complex span paradigm**



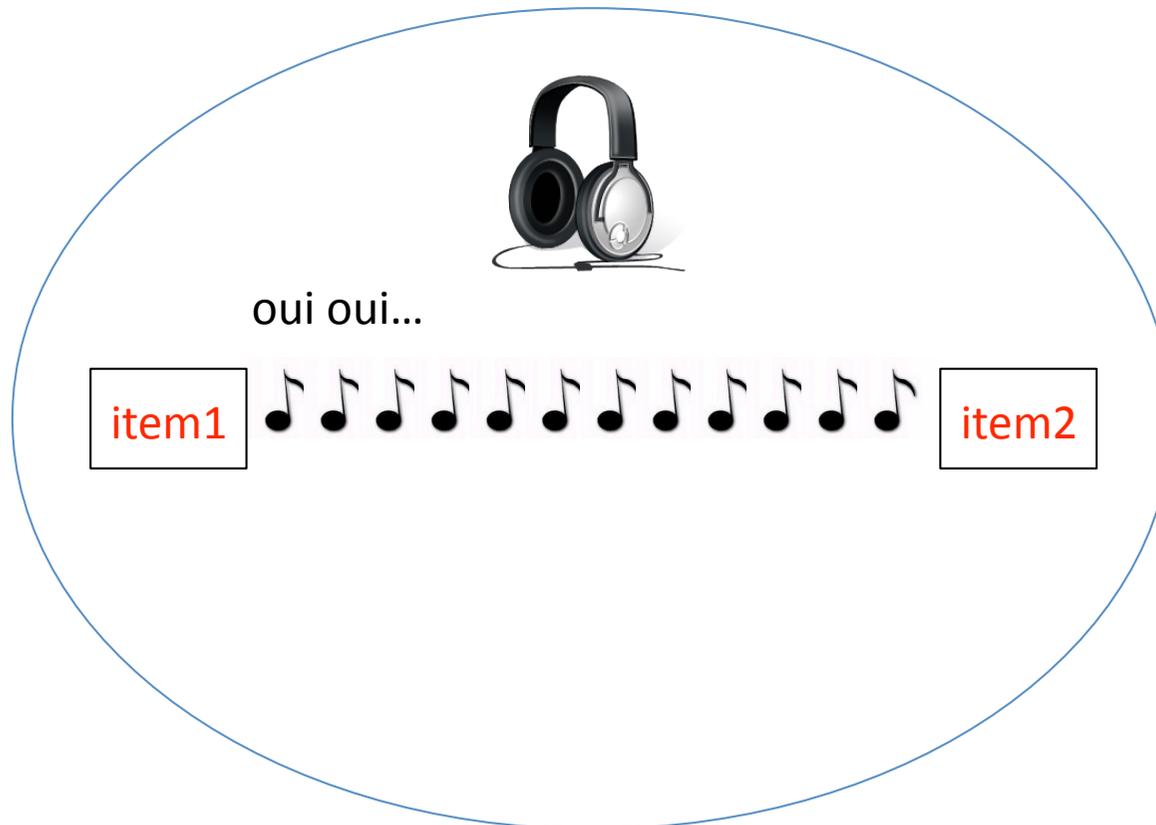
# Exp. 2: Lexicality × Refreshing × Rehearsal



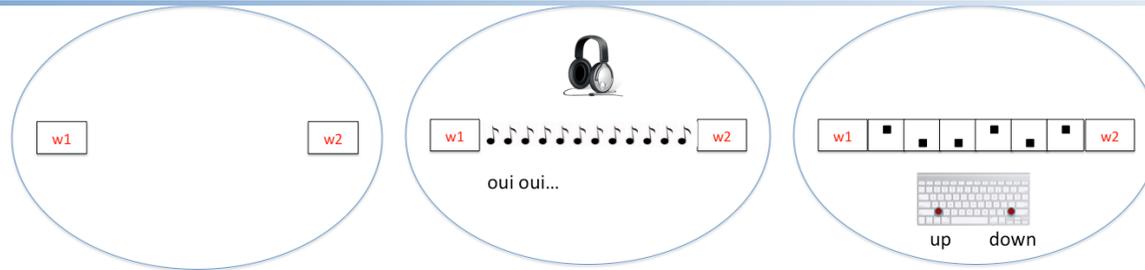
Rehearsal	✓	✗
Refreshing	✓	✓

6 items to remember

**Complex span paradigm**



# Exp. 2: Lexicality × Refreshing × Rehearsal



Rehearsal	✓	✗	✓
Refreshing	✓	✓	✗

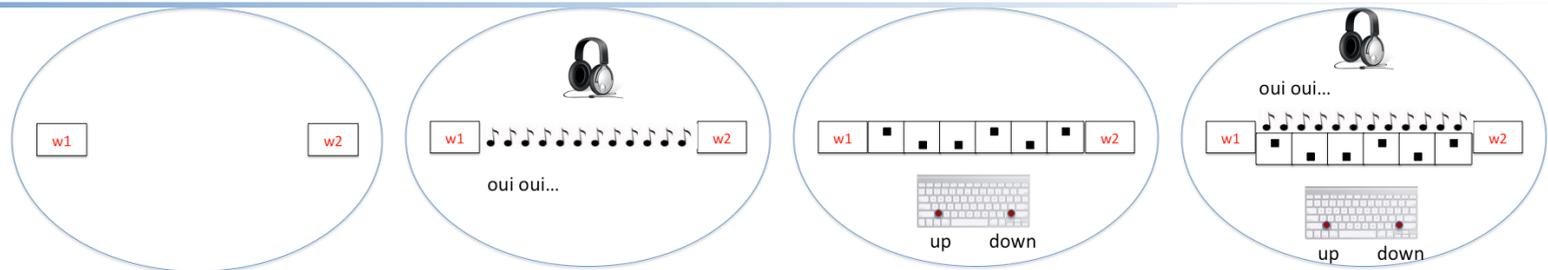
6 items to remember

Complex span paradigm



up down

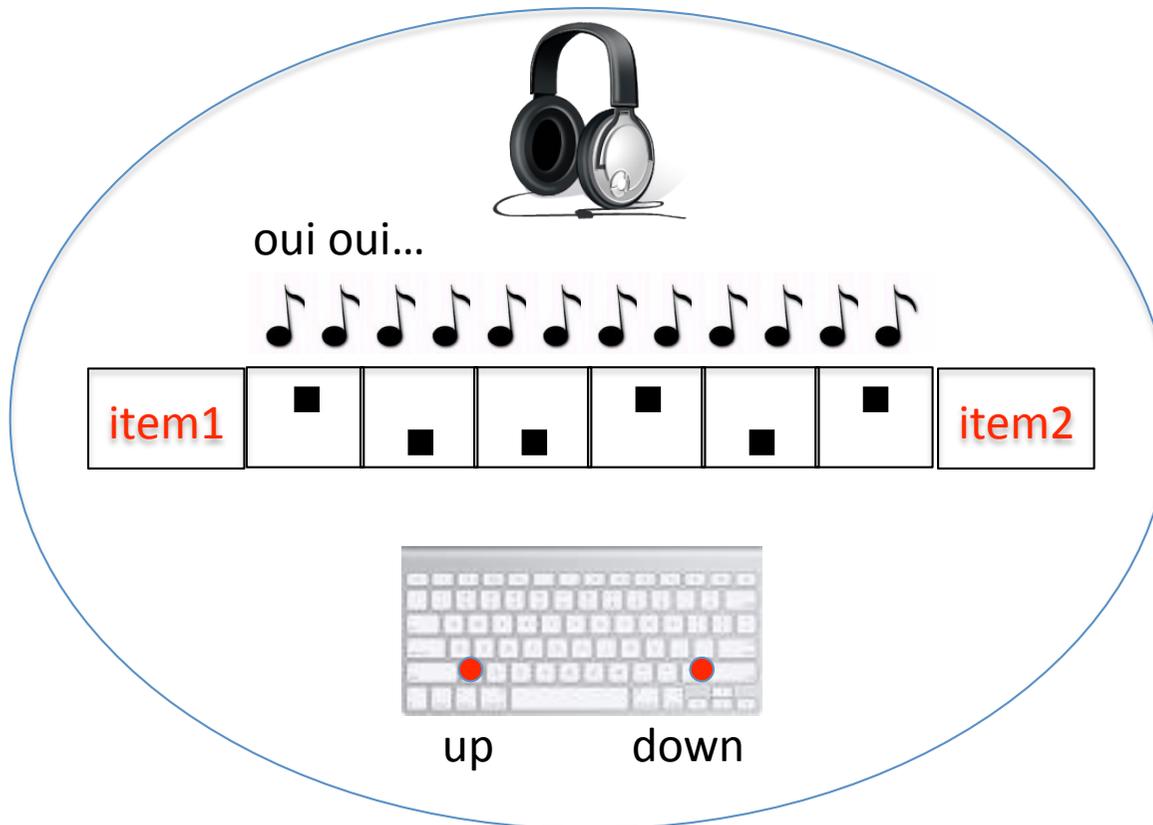
# Exp. 2: Lexicality × Refreshing × Rehearsal



Rehearsal	✓	✗	✓	✗
Refreshing	✓	✓	✗	✗

6 items to remember

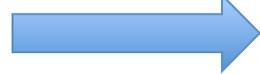
Complex span paradigm



# Exp. 2: Lexicality × Refreshing × Rehearsal

Rehearsal	✓	✗	✓	✗
Refreshing	✓	✓	✗	✗

6 items to remember



Words  
3 phonemes nouns

*chef*  
*cube*



Non-Words  
Differed from words on 1 phoneme

*chif*  
*cude*

**Within-subject design**

# Exp. 2: Lexicality × Refreshing × Rehearsal

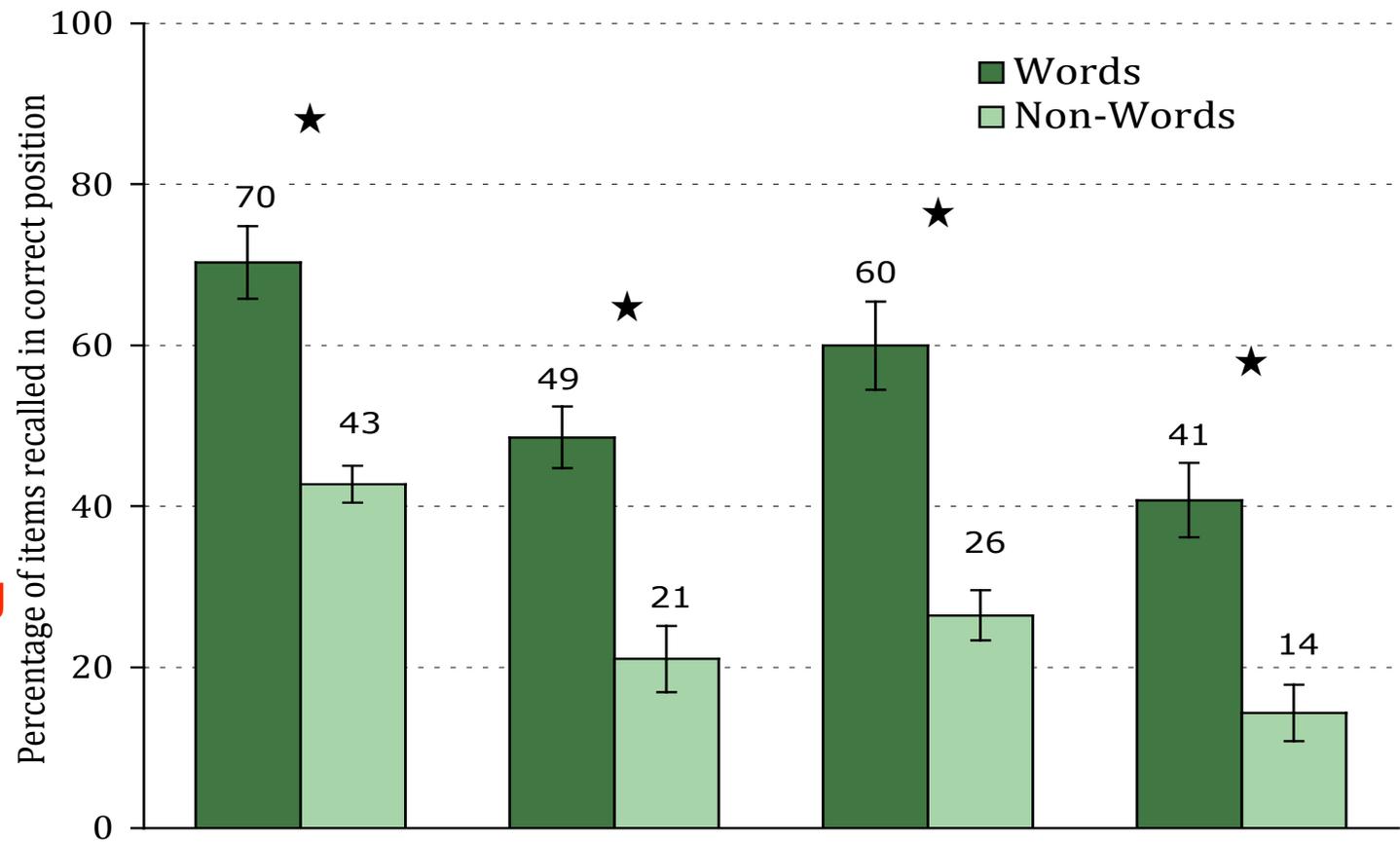
**Lexicality**  
 $F(1,22) = 120.93, p < .001$

**Refreshing**  
 $F(1,22) = 18.50, p < .001$

**Rehearsal**  
 $F(1,22) = 84.76, p < .001$

**Lexicality × Refreshing**  
 $F < 1$

**Lexicality × Rehearsal**  
 $F(1,22) = 1.23, p = .279,$   
 $\eta^2_p = .05$



Rehearsal	✓	✗	✓	✗
Refreshing	✓	✓	✗	✗

★  $p < .001$

**Lexicality × Refreshing × Rehearsal**

$F(1,22) = 1.89, p = .183, \eta^2_p = .08$

## General Conclusion

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Exp. 1: Frequency affected recall whatever the pace of the concurrent processing.  Frequency effect is not mediated by attentional refreshing.

Exp. 2: Lexicality affected recall whatever rehearsal and/or refreshing were impeded.  Lexicality effect is not mediated by:  
(1) attentional refreshing  
(2) subvocal rehearsal

- **Frequency and lexicality effects seem to be mediated by other processes than those occurring at maintenance.**  
→ **Building of representations or Activation level at encoding or redintegration at recall** (Thorn et al., 2009).

Thank you for your attention