



# A METABOLIC IMAGING STUDY OF READING IN ALZHEIMER'S DISEASE

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1

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# INTRODUCTION

Patients with Alzheimer's Disease (AD) become progressively unable to read (Ripamonti et al., 2017).

**BUT** the loci of neurodegeneration underpinning reading deficits in AD are still unclear.

# DRC MODEL (Coltheart et al. 2001)

Lexical route:  
Regular and irregular  
words

Regular and irregular  
words

Letter units

Sublexical route:  
Nonwords

Orthographic  
lexicon

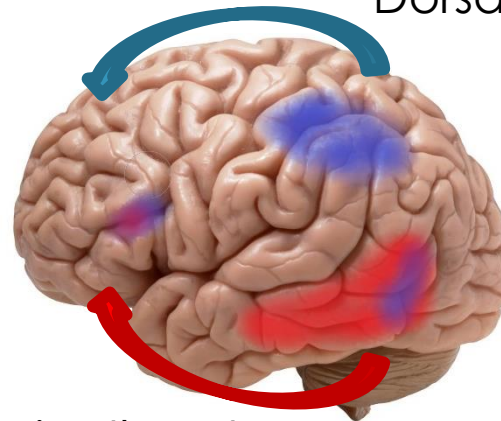
Grapheme-  
Phoneme rule  
system

Semantic  
system

Phonological  
lexicon

Phoneme  
system

Dorsal (sub-lexical) route



Ventral (lexical) route

# AIMS OF STUDY

- ✓ Reading in AD patients (DRC model)
- ✓ Metabolic abnormalities (on FDG-PET) associated with dyslexia

# MATERIALS AND METHOD

Study sample:

- 45 patients with mild-to-moderate AD, 25 healthy elderly.

Reading task:

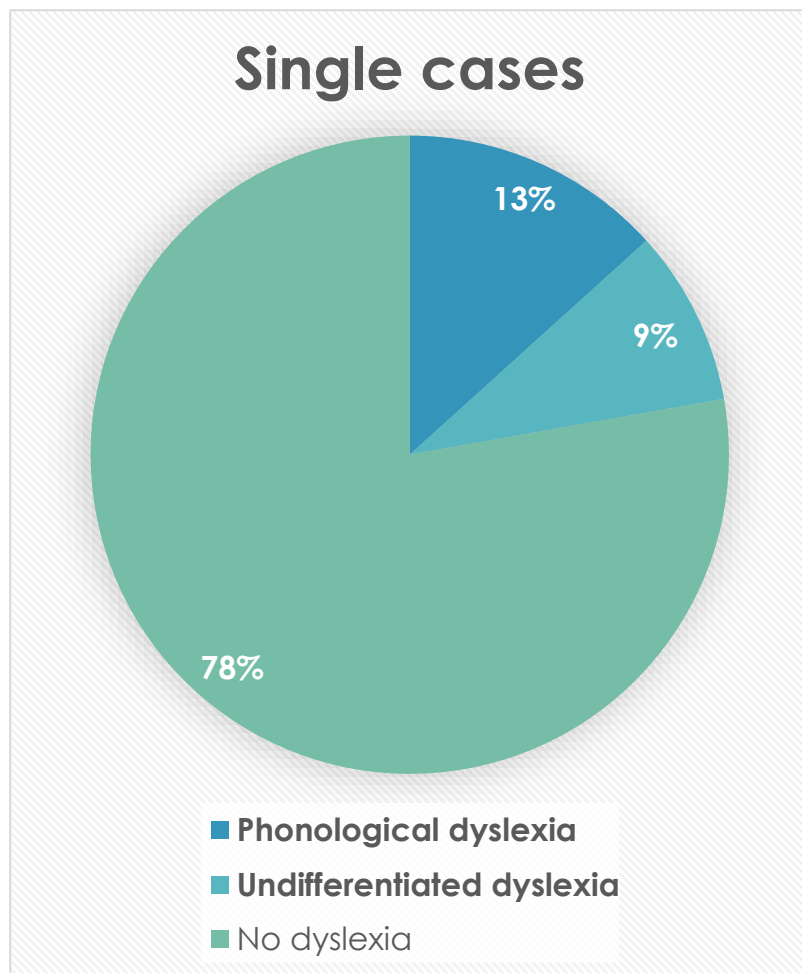
- Reading aloud of written stimuli presented on a pc screen.

FDG-PET protocol:

- Reading scores were correlated with FDG uptake.

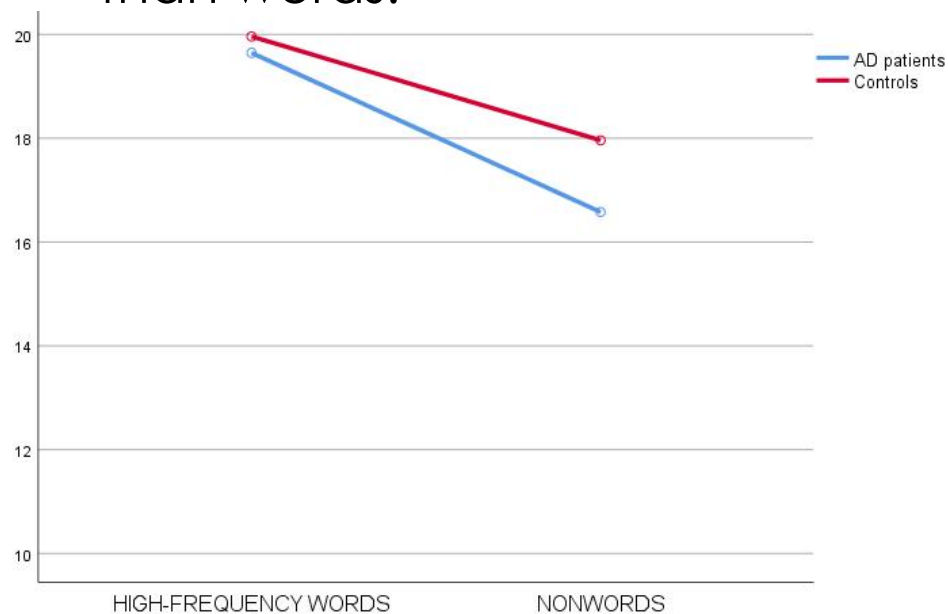
Item types	N.	Effect / comparison
High-frequency concrete nouns	20	Baseline
Low-frequency concrete nouns	20	Frequency effect
High-frequency abstract nouns	20	Imageability effect
High-frequency function words	20	Word-class effect
Legal nonwords	20	Sublexical processing
Three-syllable words with unpredictable penultimate vs antepenultimate stress assignment	40	Lexical effect

# RESULTS: READING PERFORMANCE



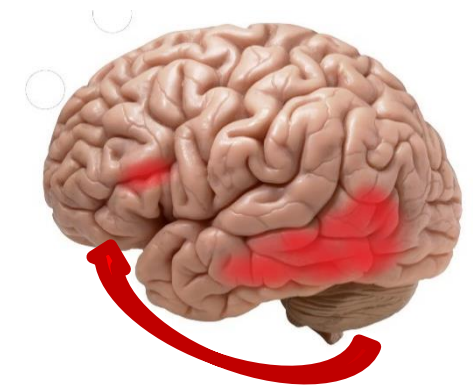
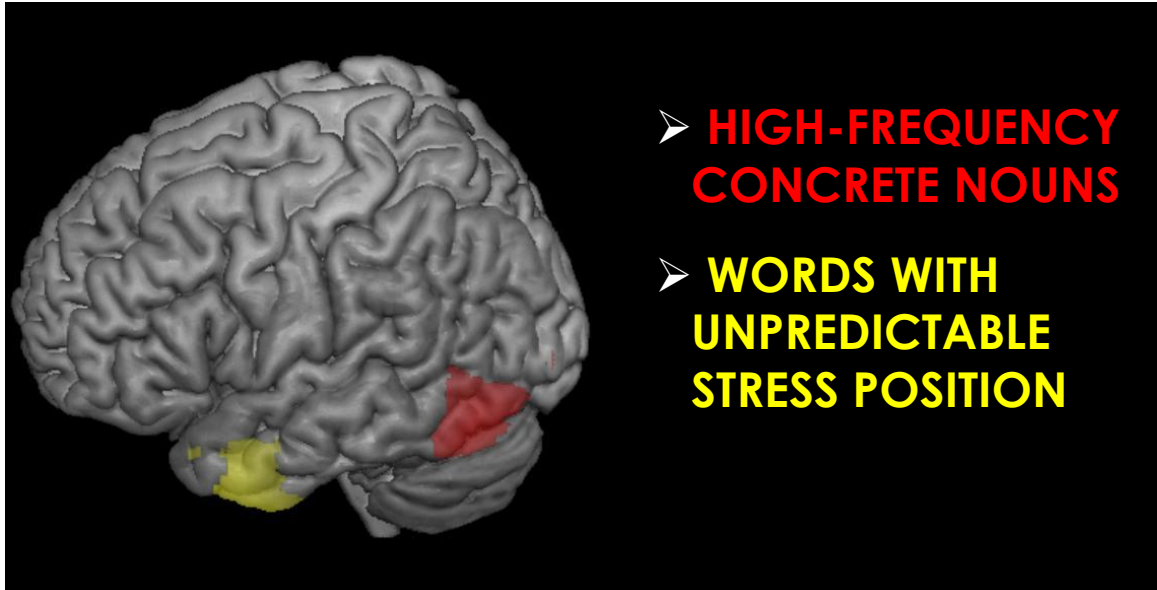
## AD group vs Controls:

- Poorer reading of nonwords than words:



- Lexicality, frequency and grammatical class effects are similar extent (no concreteness effect for either group).

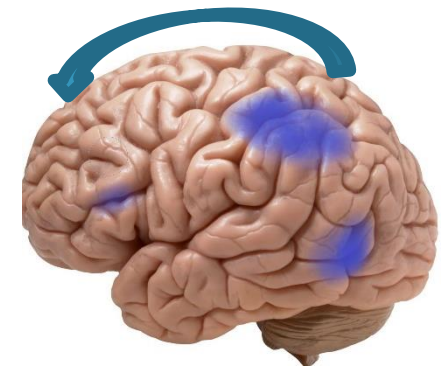
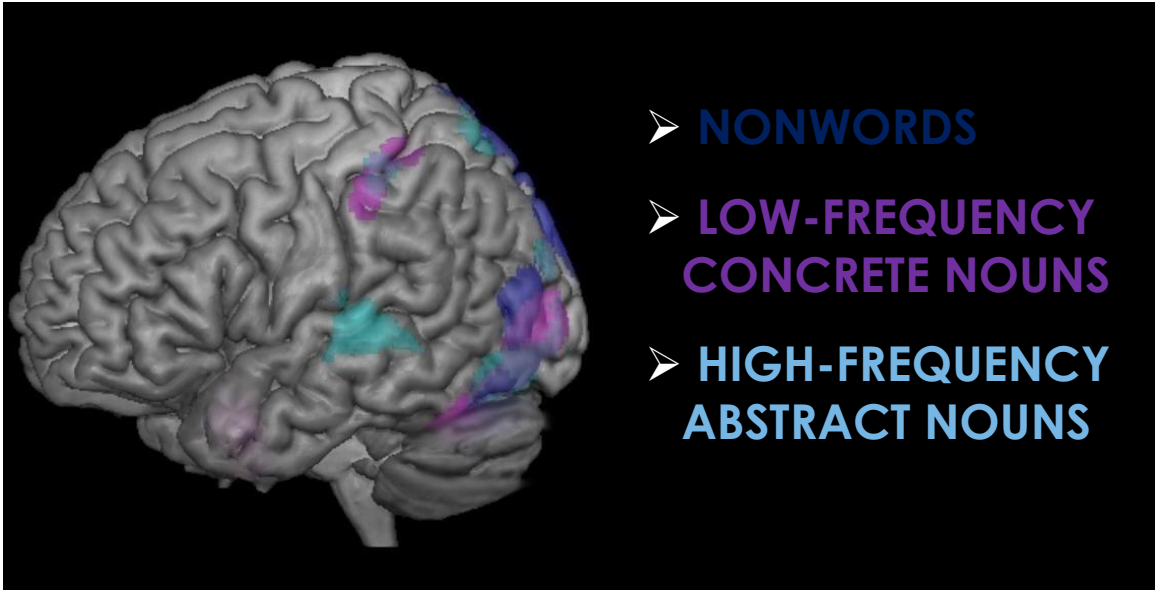
# METABOLIC CORRELATES



*Ventral route*

Hypometabolic clusters associated with reading ability  
( $p < 0.001$  uncorrected, minimum cluster size: 100 voxels)

# METABOLIC CORRELATES



*Dorsal route*

Hypometabolic clusters associated with reading ability  
( $p < 0.001$  uncorrected, minimum cluster size: 100 voxels)



# DISCUSSION

Dyslexia in AD patients:

1. Deficit in predictioning stress position depends on damage ⇒ **Ventral pathway**
2. Deficit in low-frequency and low-imageability nouns is apparently due to damage ⇒ **Dorsal pathway**

# CONCLUSION

- AD patients data → DRC model of reading ✓
- Future studies → to include a greater number of patients and different variants of AD.

# REFERENCES

- Ripamonti, E., Lucchelli, F., Lazzati, G., Martini, E., & Luzzatti, C. (2017). Reading impairment in neurodegenerative diseases: A multiple single-case study. *Aphasiology*, 31, 519–541.
- Coltheart, M., Rastle, K., Perry, C., Langdon, R., & Ziegler, J. (2001). DRC: a dual route cascaded model of visual word recognition and reading aloud. *Psychological review*, 108(1), 204.
- Taylor, J.S.H., Rastle, K., & Davis, M.H. (2013). Can cognitive models explain brain activation during word and pseudoword reading? A meta-analysis of 36 neuroimaging studies. *Psychological Bulletin*, 139, 766–791.