THE DEVELOPMENT OF PHONOLOGICAL NEURAL NETWORKS IN CHILDREN WITH READING DIFFICULTIES

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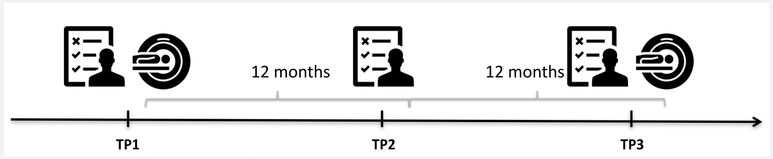
WHAT IS THE BIDIRECTIONAL LINK BETWEEN THE DEVELOPMENT OF PHONOLOGICAL BRAIN NETWORK (PBN) AND POOR READING THROUGHOUT THE LITERACY INSTRUCTION?

Methods

Study design & Participants



TOTAL = 120 children (**75 FHD+**) 118 children **STUDY2 =92 children**

STUDY 1=1st grade (**72, 45 FHD+)** & kindergarten (**30, 17 FHD+)**

Effect of dyslexia: **20 DR** (11 M, 15 FHD+) | **72 TR** (26 M, 40 FHD+)

Effect of risk: **37 FHD-** (13 M, 5 DR) | **55 FHD+** (24 M, 15 DR)

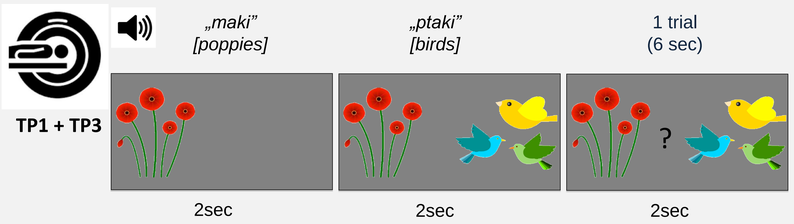
Familial Risk (FHD+): first-degree relative with a clinical diagnosis of dyslexia or a parent who scored ≥40 points in the ARHQ.

TR and **DR** as well as **FHD-** and **FHD+ groups** do not differ in age, gender, SES and IQ.

Behavioral & fMRI tasks

TP1 + TP2 + TP3: a battery of tests measuring phonological skills, letter knowledge, reading words and pseudowords, rapid automatized naming and orthographic awareness.

TP3: a battery for dyslexia diagnosis.

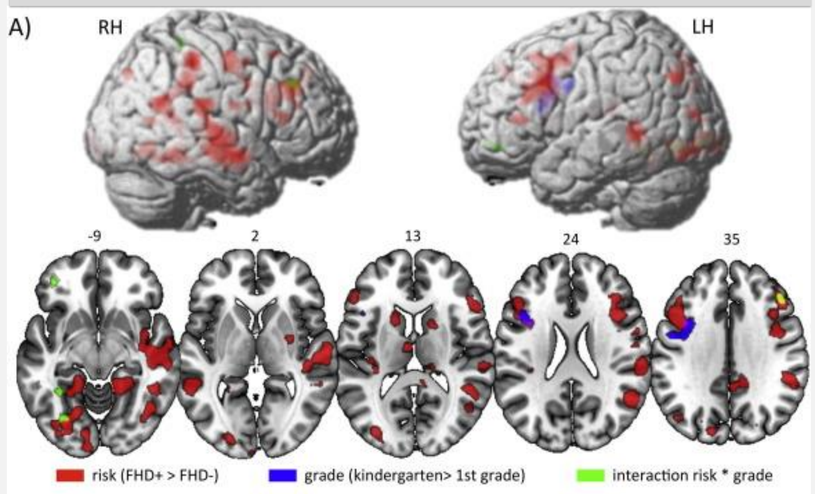


→ **Rhyme judgment task**

→ **Control experiment** (the same stimuli + assessment whether the words were spoken by speakers of the same gender or not; **Voice task**, Raschle et al. 2012).

RESULTS 1

BEGINNING OF THE FORMAL LITERACY INSTRUCTION

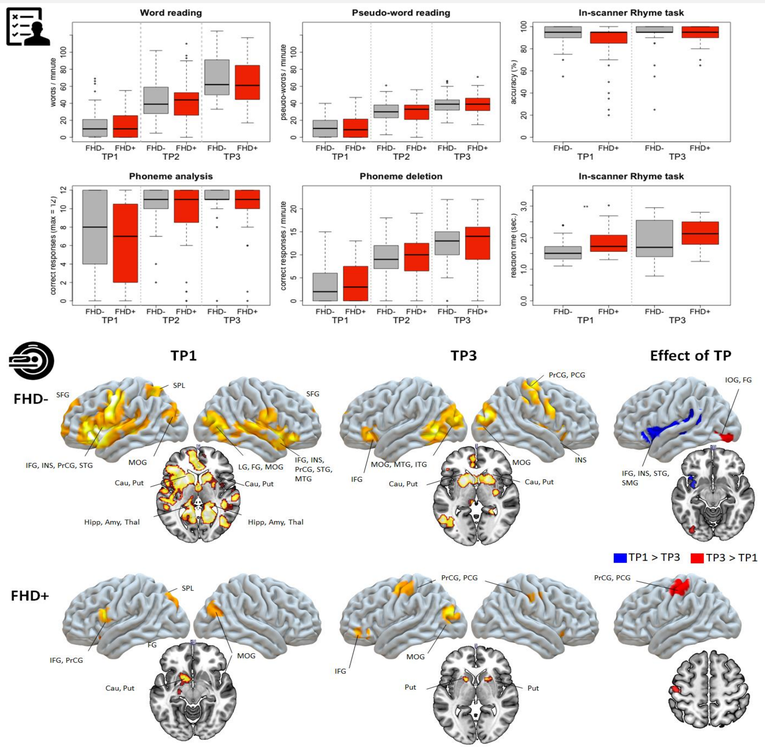


Conclusions 1

- Children with and without familial risk don't differ in behavioral, reading-related skills
- The effect of risk was seen in bilateral temporal, tempo-parietal, and inferior temporal–occipital regions, as well as bilateral inferior and middle frontal gyri. Subcortically: bilateral thalami, caudate, and the right putamen.
- The effect of grade was restricted to one cluster in the left inferior frontal and precentral gyri. The interaction between risk and grade was found in right PcG and in the left VOTc.

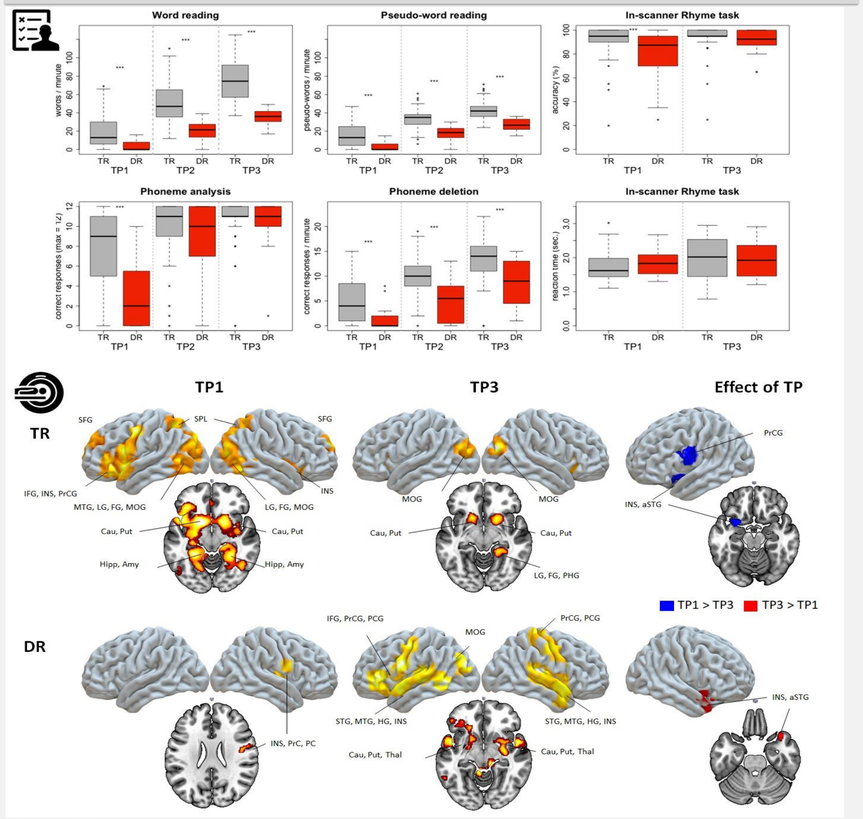
RESULTS 2

RETREOSPECTIVE ANALYSIS: FAMILIAL RISK EFFECTS



RESULTS 2 cd

RETREOSPECTIVE ANALYSIS: DYSLEXIA EFFECTS



Conclusions 2

- Children with familial risk showed typical reading and phonological awareness skills
- Children with dyslexia show decreased reading and phonological awareness skills compared to TR group even at the beginning of formal reading instruction.
- Literacy acquisition reduced brain activation to phonological awareness in TR children in left dorsal structures, whereas in DR it increased activation in RH.
- As beginning readers FHD+ children despite typical phonological skills show extensive hypoactivation in the speech processing cortex compared to FHD- group.

✓ FAMILILA RISK OF DYSLEXIA INFLUENCE THE DEVELOPMENT OF PBN FROM THE BEGINNING OF FORMAL LITERACY INSTRUCTIONS

✓ TYPICAL DEVELOPMENT IS RELATED TO THE SHIFT IN AUDITORY WORDS RPOCESSING FROM DROSAL TO VENTRAL NETWORK WITH THE READING INSTRUCTION.

✓ DEVELOPMENT OF PBN IS DELAYED IN CHILDREN WITH DYSLEXIA AND ALTERED IN CHILDREN WITH FAMILIAL RISK.