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Semantic and syntactic predictions in reading aloud and visuo-motor statistical learning: an fMRI study in dyslexic students

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► To cite this version:

Elisa Gavard, Valérie Chanoine, Franziska Geringswald, Jean-Luc Anton, Eddy Cavalli, et al.. Semantic and syntactic predictions in reading aloud and visuo-motor statistical learning: an fMRI study in dyslexic students. IMBES 2024, Jul 2024, Leuven, Belgium. hal-04621197

HAL Id: hal-04621197

<https://amu.hal.science/hal-04621197v1>

Submitted on 23 Jun 2024

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1 BACKGROUND

- The predictive brain has become a key concept in language research and a dominant theoretical framework for understanding how the brain works. Psycholinguistic and neuroimaging research highlights the importance of anticipatory mechanisms in language comprehension, language production, and reading.
- In addition, a growing number of studies have used statistical learning (SL) paradigms to investigate whether SL abilities can explain inter-individual differences in language processing and reading abilities.

OBJECTIVES

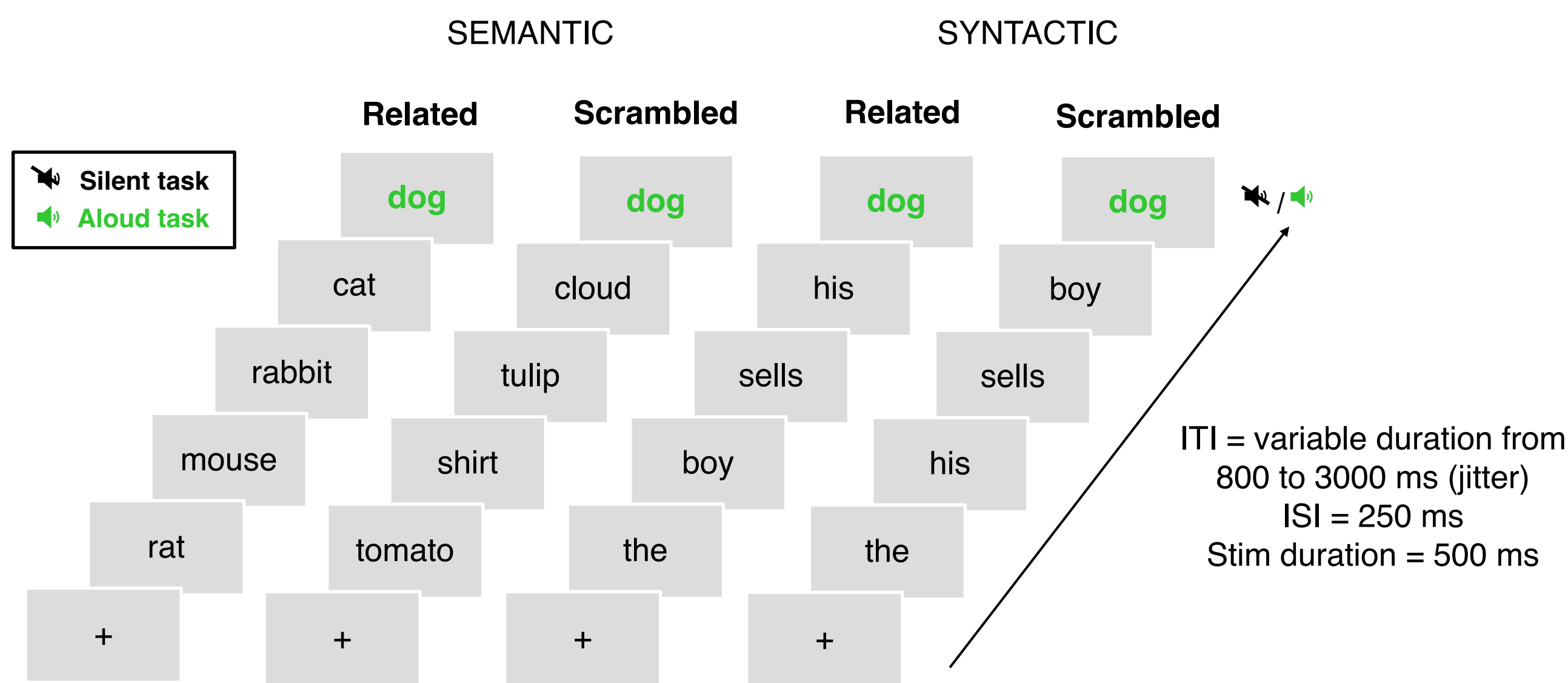
- To focus specifically on the neural network underlying semantic and syntactic predictive processing in reading
- To understand whether making semantic and syntactic predictions in reading relies on domain-general SL abilities AND whether people with reading impairments (dyslexia) show deficits in these domains.

2 METHODS

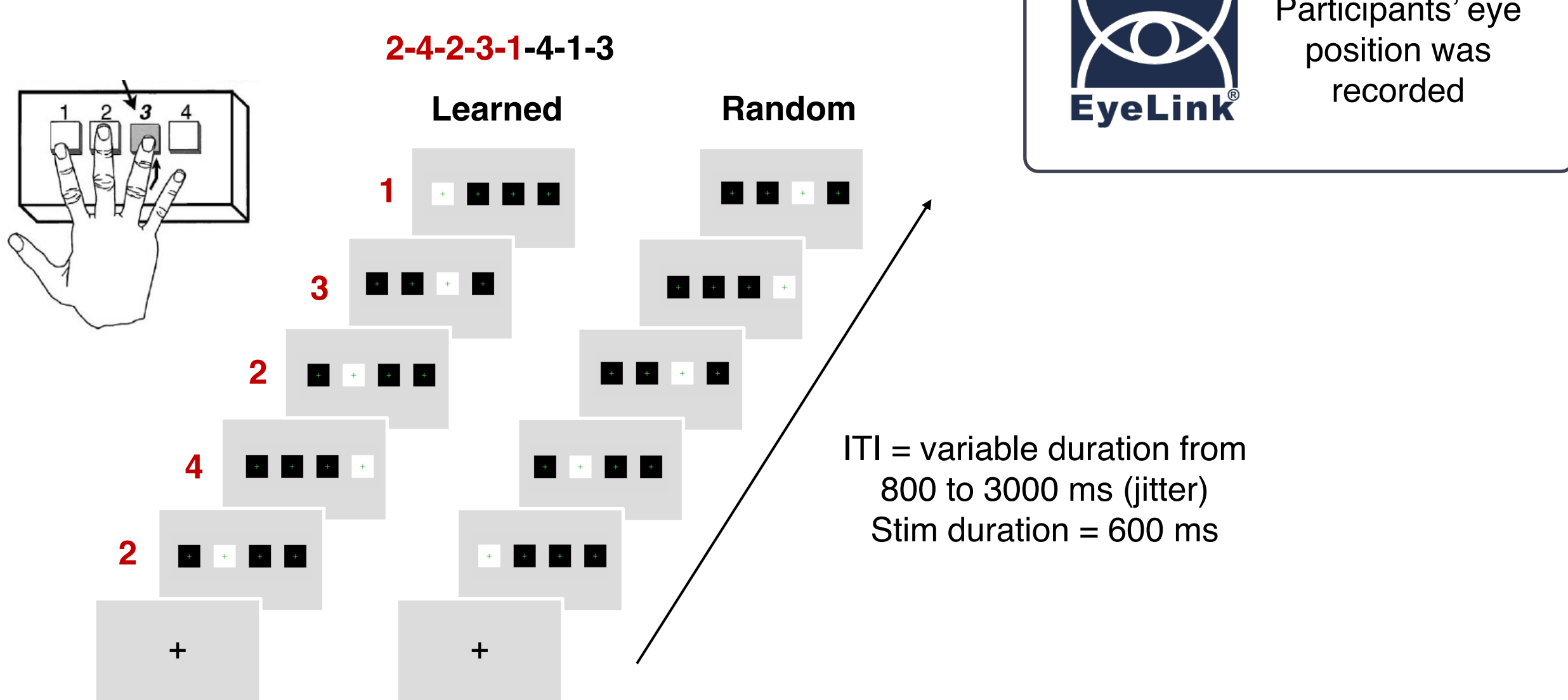
25 typical readers students (TR)
25 dyslexic students (DYS)

MRI Scanner 3T Tesla
Centre IRM-INT@CERIMED, Marseille

Predictive reading task



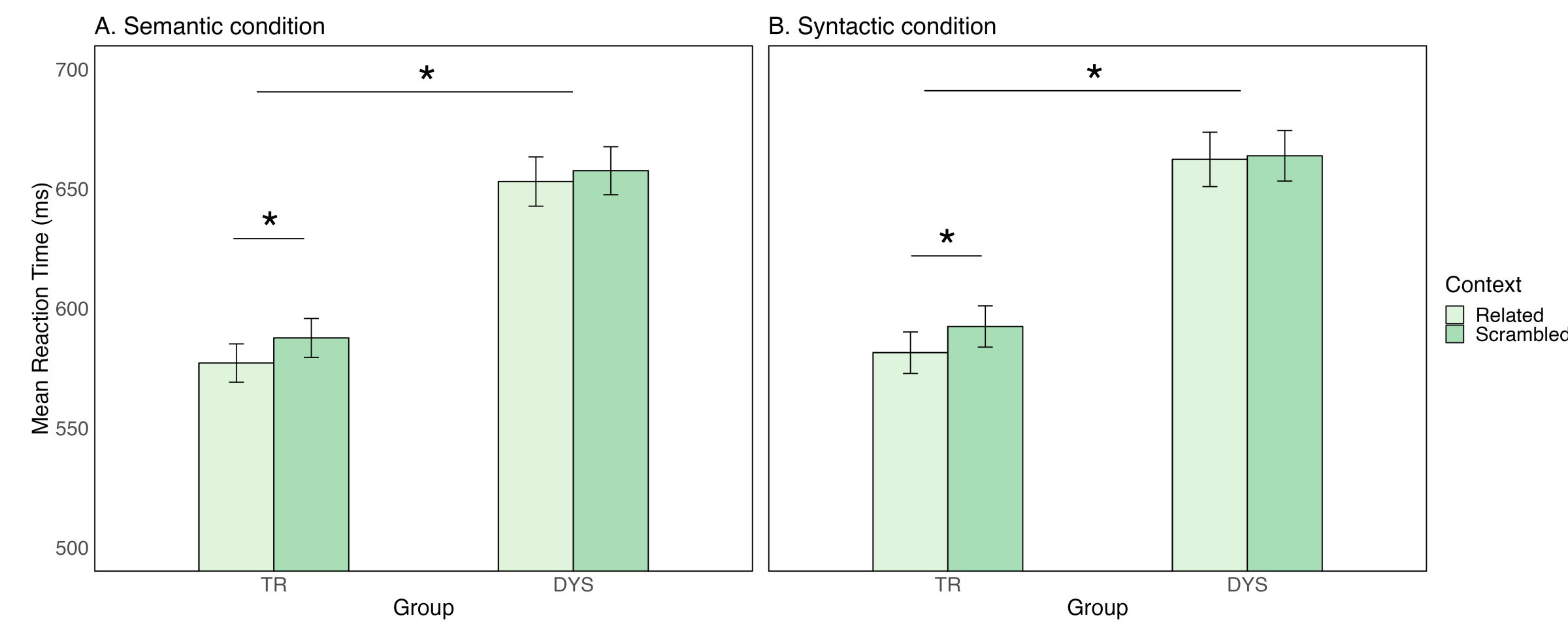
Serial reaction time task



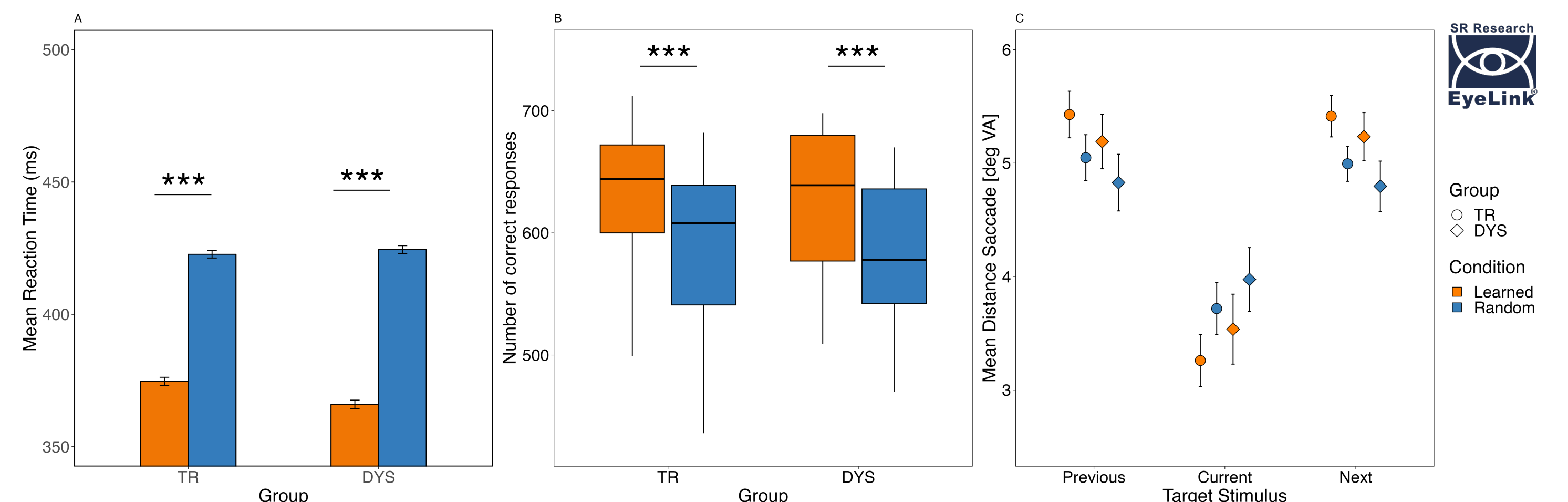
3 RESULTS

Behavioral results

Predictive reading task



Serial reaction time task

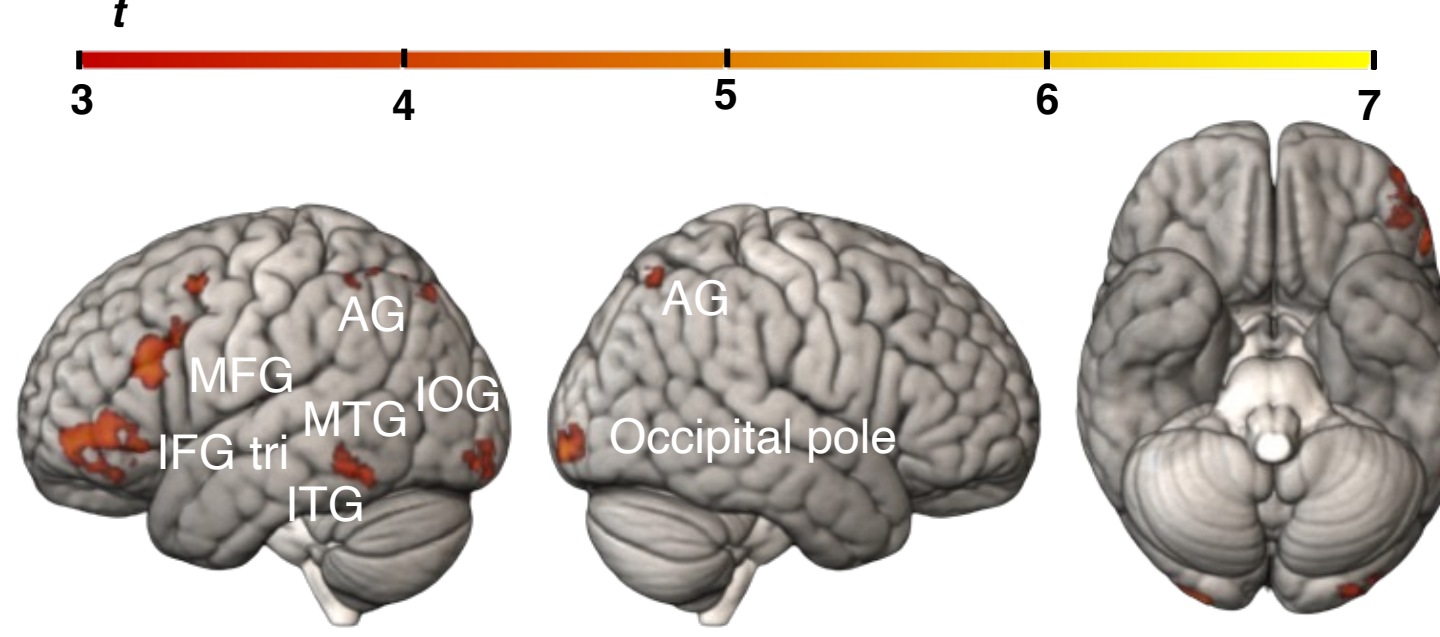


Dyslexic

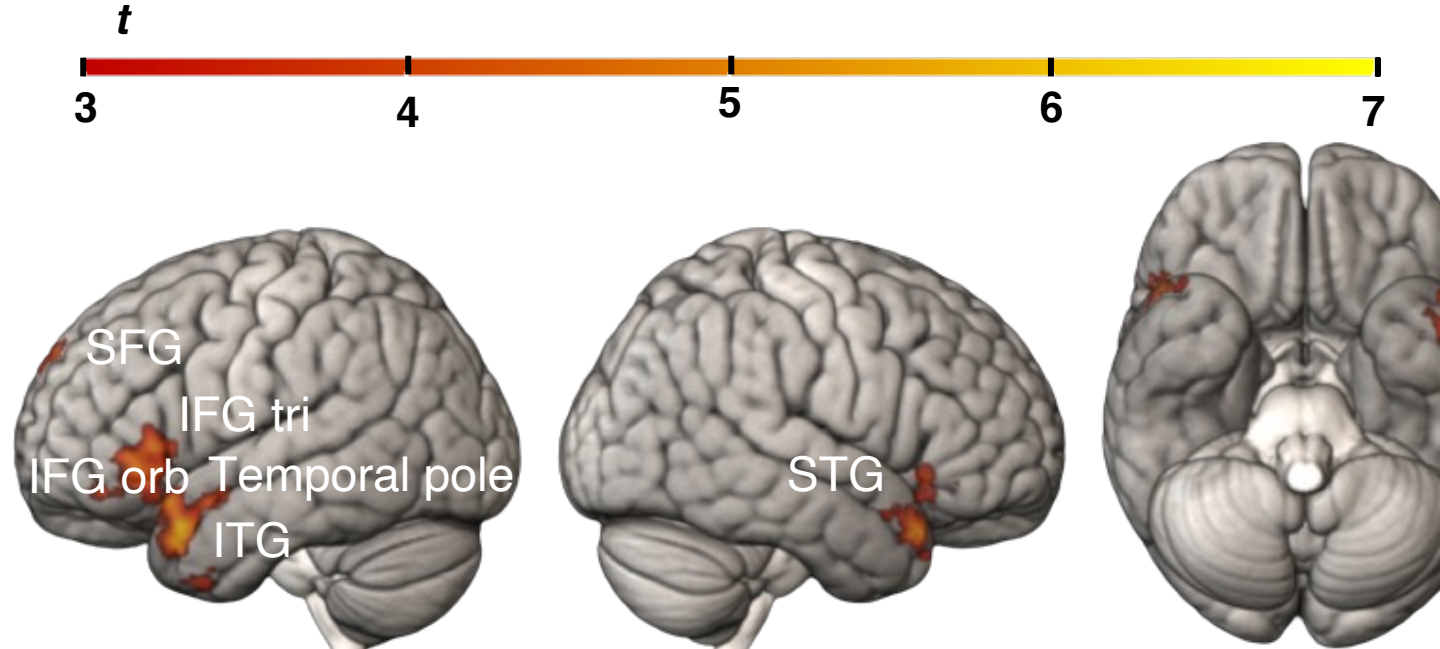
- ✓ Positive correlation between predictive reading or SL (SRT) and reading level.
- ✗ No correlation between predictive reading and SL (SRT).

Whole brain results

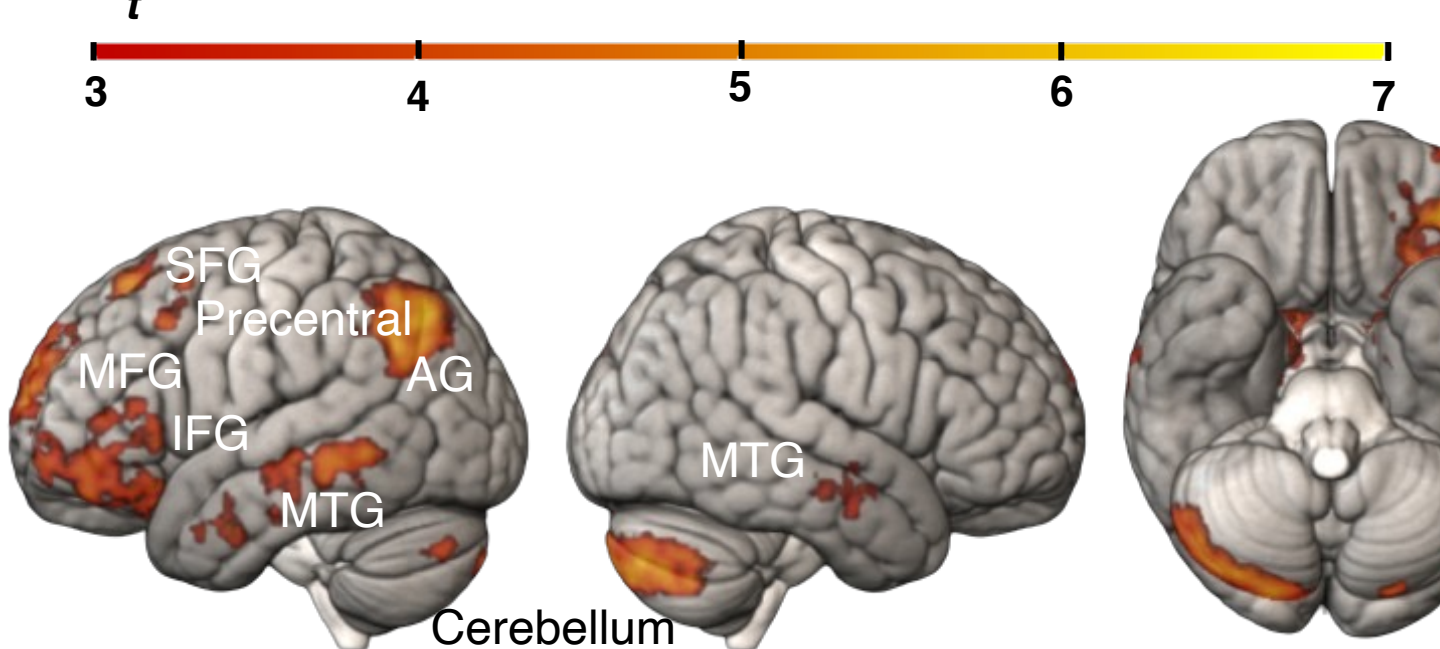
Semantic prediction (related-scrambled)



Syntactic prediction (related-scrambled)



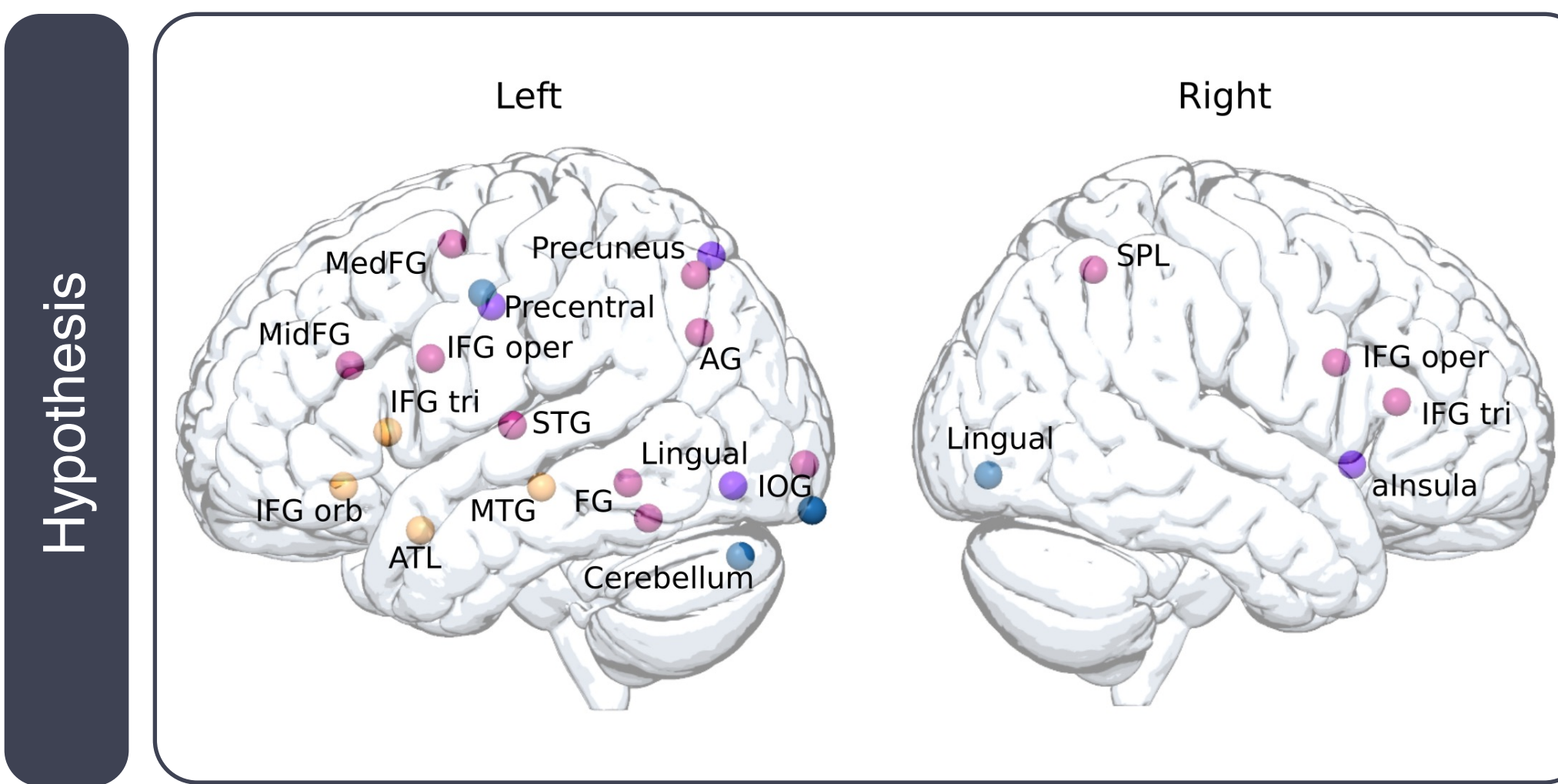
Serial reaction time task



No group differences

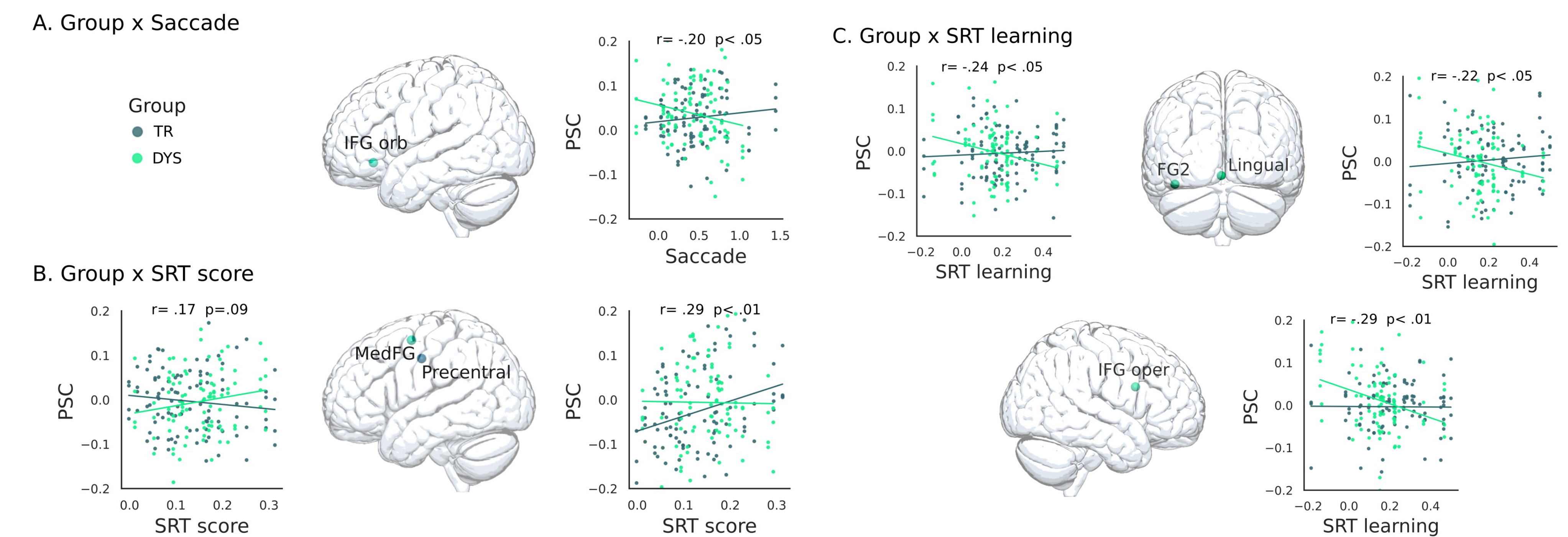
Region of interest results

Predictive reading task



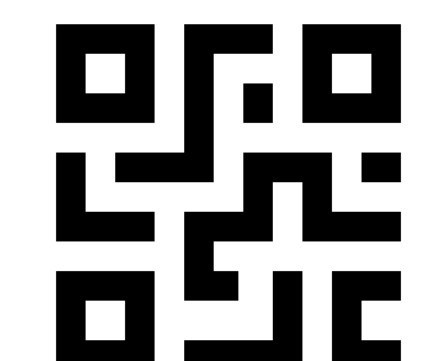
Carter et al. (2019) ; Murphy et al., (2019) ; Schuster et al. (2020)

The link between predictive reading and SL



4 TAKE HOME MESSAGE

- Students with dyslexia rely on brain structures involved in high-level linguistic prediction possibly to compensate for their low-level difficulties in single word perception and production, which is consistent with the compensatory hypothesis in dyslexia (Cavalli et al., 2024).
- Contrary to the literature, we did not find that students with dyslexia have problems with sequence learning and automatization (Ozernov-Palchik et al., 2023).
- Some brain areas activated during the SRT task seems to be also involved in our predictive reading task, especially for university students with dyslexia.



This research was supported by the French National Research Agency, Grant ANR-18-CE28-0006 DYSuccess (Pi: Cavalli, E), the Institute of Convergence ILCB (ANR-16-CONV-0002) and the Excellence Initiative of Aix-Marseille University A*MIDEX (ANR-11-IDEX-0001-02). The work that led to this poster was also supported by AMPIRIC, a center of excellence on research in education and teacher training.