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Auditory intervention improves basic auditory processing in children at cognitive risk for dyslexia

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Dyslexia

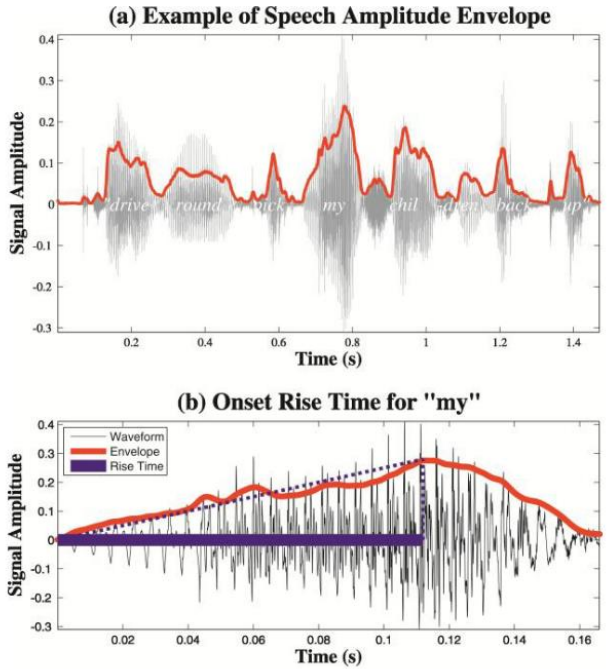
Developmental dyslexia

- prevalence: 3-7%



- Core deficit: auditory temporal processing (Boets et al., 2011; Farmer, & Klein, 1995)
  - auditory processing of temporal information (i.e. changes over time)

Auditory temporal processing



(Goswami & Leong, 2013)

Temporal information features

- envelope, periodicity, fine structure

Speech envelope

- 4 Hz: syllables
- 20 Hz: phonemes
- reduced sensitivity to temporal cues in speech envelope in children and adults with dyslexia, e.g. rise times (Goswami et al., 2002; Poelmans et al., 2011)

Current study

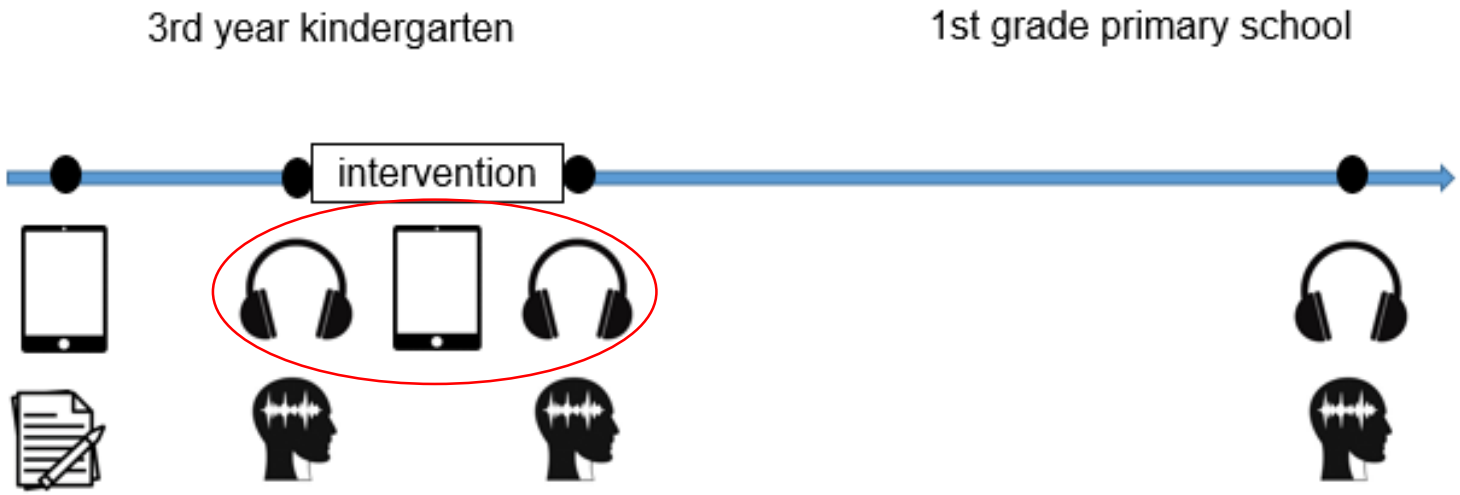
Dyslexia paradox: dyslexia is only diagnosed after the most effective period for intervention (Ozernov-Palchik, & Gaab, 2006)

Readers with dyslexia do not reach the level of typical readers despite interventions

- preventive interventions
- reduced sensitivity to temporal cues speech envelope

Preventive intervention in kindergarteners at cognitive risk for dyslexia
→ auditory temporal processing: rise time discrimination

Design



Tablet games

Paper-pencil test

Rise Time Discrimination

EEG: ASSR

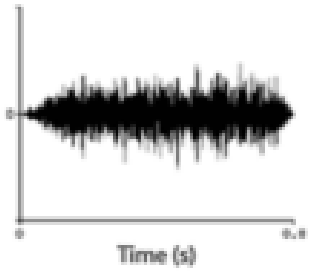
Tasks

Rise Time Discrimination (RTD)

Reference stimulus



Target stimulus



(Vanvooren et al., 2017)

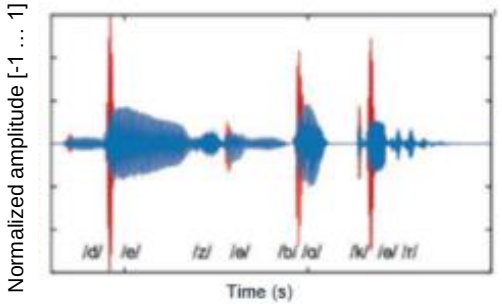
Intervention

1. GraphoGame (GG)

(Richardson, & Lyytinen, 2014)



2. Onset Enhanced Speech Envelope (EE) training



(Geurts, & Wouters, 1999,
Koning, & Wouters, 2012,
Van Hirtum, Moncada-Torres et al., 2019)

Participants

GG + EE

GG
15 min

Active EE listening
10 min

Pre Post
31 → 29

GG + non EE (NE)

GG
15 min

Active NE listening
10 min

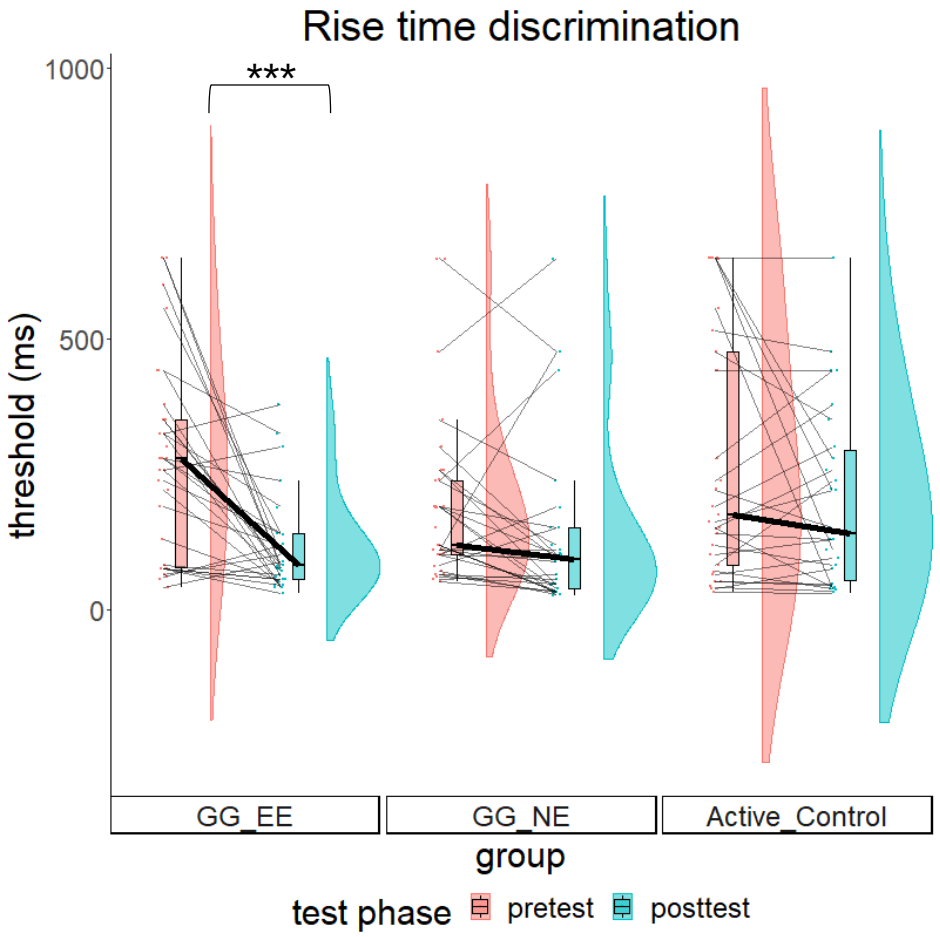
Pre Post
31 → 28

Active control

Control game
15 min

Active NE listening
10 min

Pre Post
29 → 26



Generalized estimating equations

Test phase *** (p<.001)
Group * test phase * (p=.01)

Interaction follow-up (holm corrected):
GG + EE pre vs post *** (p<.001)

Improved performance following EE intervention

General decrease in threshold over time, but only significant in GG+EE group

Positive impact of auditory intervention on rise time processing

Retention after one year of reading instruction and relation with behavioral reading-related measures? → consolidation test data

Take home

EE intervention improves rise time discrimination performance on the short term

Follow-up analyses will further elucidate impact on the long term and relation with actual reading

Effective intervention for dyslexia?

Thanks for your attention!

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