#### DOES SPEECH PERCEPTION TRAINING ON TOP OF PHONICS-BASED INSTRUCTION BOOSTS READING-RELATED SKILLS IN AT-RISK PRE-READERS?

Femke Vanden Bempt<sup>1</sup>, Shauni Van Herck<sup>2</sup>, Maria Economou<sup>2</sup>, Jolijn Vanderauwera<sup>3</sup>, Maaike Vandermosten<sup>2</sup>, Jan Wouters<sup>2</sup>,

#### Pol Ghesquière<sup>1</sup>

1: Research group of Parenting and Special Education, Faculty of Psychology and Educational Sciences, KU Leuven, Belgium - 2: ExpORL, Department of Neurosciences, KU Leuven, Belgium - 3: Institute of Neuroscience, Université Catholique de Louvain, 1348 Louvain-la-Neuve, Belgium

### INTRODUCTION

• Amplitude rise times (RT) in the acoustic speech signal provide important cues for

successful speech perception and in turn, the development of phonological awareness:

- RTs facilitate the speech parsing process [1]
- RTs are important for perceiving certain phonetic contrasts [1]



# PROBLEM STATEMENT

• As GG heavily assumes intact speech perception, an **atypical RT sensitivity**,

presumably experienced by a subsample of children at risk for dyslexia, might limit an optimal GG-driven intervention response.

• A recent study showed a behavioral boosting effect on RT detection of a game-

based auditory RT-based speech perception training (i.e., envelope

- Atypical RT detection might cause speech perception and in turn phonological processing problems, possibly resulting in an atypical reading development.
- Indeed, RT detection deficits have been widely discovered in adults and children with dyslexia [2] and in pre-readers at risk for dyslexia [3]
- Dyslexia interventions are usually most effective when they are preventive (in the prereading stage) and phonics-based (e.g. GraphoGame/GG) [4]

#### METHOD

- Participants: 119 pre-reading kindergartners at cognitive risk for dyslexia
- 12-week intervention: 4 groups (~30 participants per group)
  based on whether they played GraphoGame (GG) with/without
  envelope enhancement training (EE). The active control group
  (AC) played Lego-games and no EE-training (NE).



\* The EE/NE training comprised listening to stories with/without envelope enhancement (EE/NE) respectively



enhancement/EE training) on top of GG [5].

- Objective of current study: to investigate the presence of a boosting effect of the EE training on top of GG on speech in noise (SPIN), phonological awareness and letter knowledge (LK)
  - Assessment procedure to investigate the boosting effect
    - Before and after intervention: at school
      - Speech perception in noise (SPIN)
      - Beginning reading skills: productive letter knowledge (LK)
    - Intermediately during the intervention period: at home
      - Tablet-based assessment of phonemic awareness (PA) and receptive LK via the Diesel-X game [6]





Pre- and post-intervention assessments at school (p-values on the graphs represent the overall Group\*Time interaction)



\* **Post-hoc consecutive contrasts** for SPIN show significant growth differences between the **no intervention and AC-NE group (p=.007),** but not between **the AC-NE and GG-NE (p=.318)** and between **the GG-NE and GG-EE group (p=.301)** 

## TAKE HOME

Significant SPIN growth difference

between **AC-NE** and the **no** 

- intervention group suggests:
- Active-control game driven effect?
- Effect of story listening?
- Optimized study design needed to draw more solid conclusions

 Despite the short-term effect of GG on LK and reading [4] and a boosting effect of EE on RT detection [5], we found no benefit of GG nor EE-training regarding short-term SPIN improvement
 No establishment of a short-term





**boosting effect** of EE-training on top of GG regarding **LK and PA** 

EE-training was provided too late in

development to yield boosting effect?

Thomson, J. M., Leong, V., & Goswami, U. (2013). Auditory processing interventions and developmental dyslexia: a comparison of phonemic and rhythmic approaches. *Reading and Writing*, *26*(2), 139–161. https://doi.org/10.1007/s11145-012-9359-6
 Hämäläinen, J. A., Salminen, H. K., & Leppänen, P. (2012). Basic auditory processing deficits in dyslexia: Systematic review of the behavioral and event-related potential/ Field evidence. *Journal of Learning Disabilities*, *46*(5), 413–427. https://doi.org/10.1177/0022219411436213
 Law, J. M., Vandermosten, M., Ghesquière, P., & Wouters, J. (2017). Predicting future reading problems based on pre-reading auditory measures: A longitudinal study of children with a familial risk of dyslexia. *Frontiers in Psychology*, *8*(124), 1–13. https://doi.org/10.3389/fpsyg.2017.00124
 Vanden Bempt, F., Van Herck, S., Economou, M., Vanderauwera, J., Glatz, T., Vandermosten, M., Ghesquière, P. (2021). Digital game-based phonics instruction promotes print knowledge in pre-readers at cognitive risk for dyslexia. *Frontiers in Psychology*, *12*, 720548. https://doi.org/10.3389/fpsyg.2021.720548
 Van Herck, S., Vanden Bempt, F., Economou, M., Vanderauwera, J., Glatz, T., Dieudonné, B., Vandermosten, M., Ghesquière, P., & Wouters, J. (2021). Ahead of maturation: Enhanced speech envelope training boosts rise time discrimination in pre-readers at cognitive risk for dyslexia. *Developmental Science*, *1*–12. https://doi.org/10.1111/desc.13186
 Geurts, L., Vanden Abeele, V., Celis, V., Husson, J., Van den Audenaeren, L., Loyez, L., Goeleven, A., Wouters, J., & Ghesquière, P. (2015). Diesel-X: A Game-Based Tool for Early Risk Detection of Dyslexia in Preschoolers. In *Describing and studying Domain-Specific Serious Games* (pp. 93–114). Springer International Publishing. https://doi.org/10.1007/978-3-319-20276-1\_7