



Cognitive Brain
Research Unit

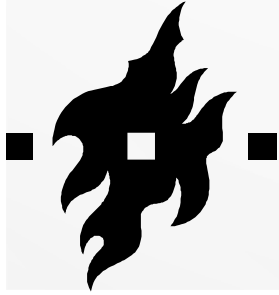


UNIVERSITY OF HELSINKI

ASSOCIATIONS BETWEEN NEURAL SPEECH PROCESSING AND PRELINGUISTIC SKILLS IN INFANTS AT RISK OF DYSLLEXIA

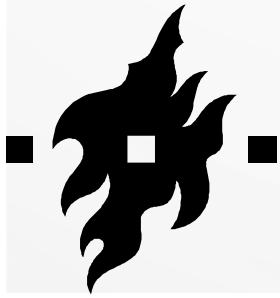


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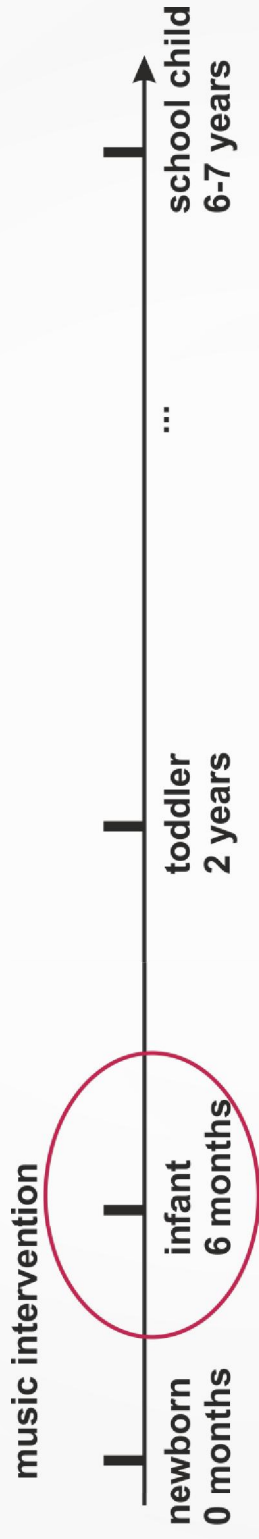


INTRODUCTION

- Knowing the early developmental mechanisms of dyslexia could lead to better intervention practices.
- Auditory processing and language skills may predict dyslexia
 - Diminished MMNs to consonant duration changes in infants at-risk of dyslexia (Leppänen et al., 2002).
 - Infant ERPs correlated with later language skills (Cantiani et al., 2016).
- Causal and interactional relations not yet known (Goswami, 2015; Snowling & Melby-Lervåg, 2016).

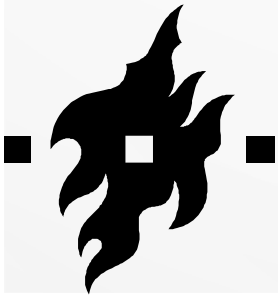


The Lukivauva -project

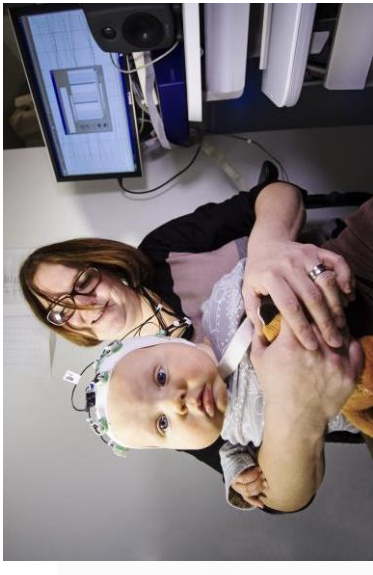


At-risk of dyslexia = at least one
dyslexic parent

- 50 at-risk, vocal interventional
- 50 at-risk, instrumental interventional
- 50 at-risk, no interventional**
- 50 healthy control infants**

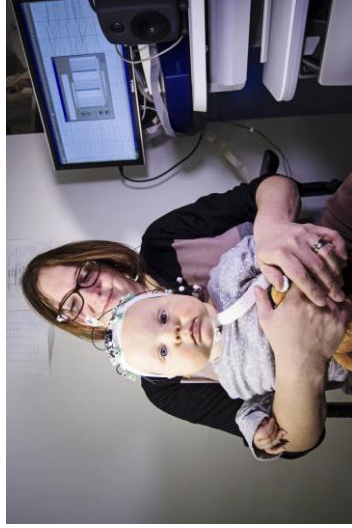


Aims



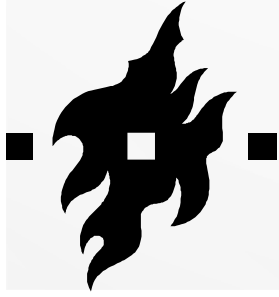
We aimed to determine

- If and how children at familial risk of dyslexia differ from their not-at-risk peers in terms of neural auditory processing
- How auditory processing skills and skills in prelinguistic communication are associated



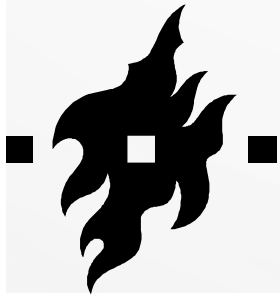
Research questions

1. Do at-risk infants and control infants differ
 - a. in neural responses (P1, N2) to a repeating pseudoword?
 - b. in neural responses (MMRs) to duration, frequency or vowel identity changes?
2. Are neural responses and prelinguistic skills (Esikko scores) associated?



METHODS

- **Participants:** Infants (6.01 mo) at-risk (n = 21) and not-at-risk (n = 18) of dyslexia.
- **Speech sound processing skills:** ERPs to natural speech sounds presented in a multifeature paradigm.
- **Prelinguistic communication skills:** Nonverbal communication and understanding measured with a parental questionnaire (CSBS-DP; Wetherby & Prizant // Esikko; Laakso, Eklund, & Poikkeus, 2011)



EEG recordings

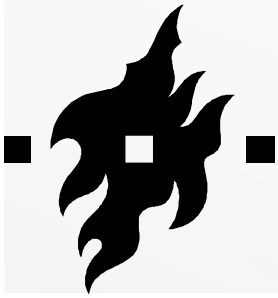
Multifeature oddball paradigm:

Frequent standard: Finnish pseudoword **/ta-ta/**

Infrequent deviants:

- duration change **/ta-ta:/**
- frequency change **/ta-ta/**
- vowel change **/ta-to/**

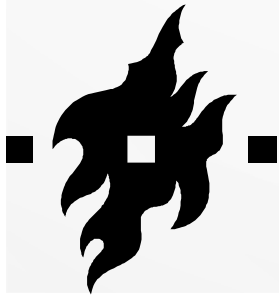




PRELIMINARY RESULTS

ERPs

- The standard stimulus elicited a similar P1–N2 complex in both groups
- The **MMR** to the duration deviant was **earlier** and **trending larger** in the at-risk vs. control group
- The late response to the vowel deviant was **trending smaller** in the at-risk vs. control group
- No group differences for the frequency deviant

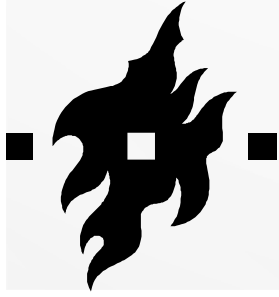


PRELIMINARY RESULTS

Prelinguistic skills

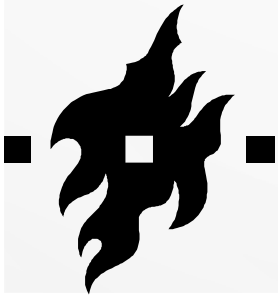
- No differences between groups in prelinguistic skills
- A **larger** MMR amplitude to the duration deviant predicted **poorer prelinguistic skills** even with relevant background variables controlled





DISCUSSION

- Earlier and trending larger MMR to the duration deviant in the at-risk group
 - This enhanced positive MMR may reflect **immature neural processing** (Trainor et al., 2005; Mueller et al., 2012).
- Trending smaller MMR to the vowel deviant in the at-risk group
 - Vowel change more complex than duration change?
- Large (positive) MMRs predicted **poor prelinguistic skills**
 - Supports the interpretation of positive MMR reflecting immature processing



CONCLUSIONS



- Children at risk of dyslexia differs from their not-at-risk peers in terms of auditory processing already at six months of age.
- There are association between auditory processing skills and prelinguistic skills
- The results are in line with what was seen in newborns
- The study increases understanding of language development and early neural markers of its delays.

Thank you:



**Prof.
Teija Kujala**



**Dr.
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**PhD student
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**Dr.
Eino Partanen**



<https://lukivauva.com/>

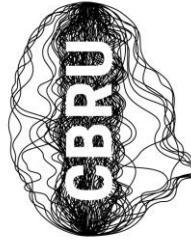


Lukivauva

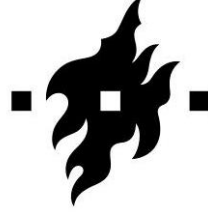


**Participating families, collaborators and
the Lukivauva team**

THANK YOU FOR LISTENING!



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Research Unit**



UNIVERSITY OF HELSINKI



**SUOMEN AKATEMIA
FINLANDS AKADEMI
ACADEMY OF FINLAND**



**JANE AND AATOS
ERKKO FOUNDATION**

