THE DEVELOPMENT OF PHONOLOGICAL NEURAL NETWORKS IN CHILDREN WITH READING DIFFICULTIES

1 Laboratory of Language Neurobiology, Nencki Institute of Experimental Biology, Warsaw, Poland; 2Faculty of Psychology, University of Warsaw, Poland;
* a.debska@nencki.edu.pl

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

Methods

Study design & Participants

<table>
<thead>
<tr>
<th>Study</th>
<th>Group Description</th>
<th>Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>TP1</td>
<td>12 months (75 FHD)</td>
<td>118 children</td>
</tr>
<tr>
<td>TP2</td>
<td>12 months</td>
<td>118 children</td>
</tr>
<tr>
<td>TP3</td>
<td>12 months</td>
<td>92 children</td>
</tr>
<tr>
<td>TOTAL</td>
<td>120 children (75 FHD+)</td>
<td>118 children</td>
</tr>
<tr>
<td>STUDY 1</td>
<td>grade (72, 45 FHD+) &amp; kindergarten (30, 17 FHD+)</td>
<td></td>
</tr>
</tbody>
</table>

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

Conclusions 1

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

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 TR 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.

✓ FAMILIAL 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 PROCESSING FROM DORSAL TO VENTRAL NETWORK WITH THE READING INSTRUCTION.
✓ DEVELOPMENT OF PBN IS DELAYED IN CHILDREN WITH DYSLEXIA AND ALTERED IN CHILDREN WITH FAMILIAL RISK.