**Fluent Reading Acquisition Neurocognitively Decomposed: The Case of Dyslexia**

**Introduction**

Dyslexia is a disorder in the neural network for reading, with dysfluent reading as its most persistent symptom (Gabrieli, 2009). Individuals with dyslexia are at severe risk for adverse academic, economic, and psychosocial consequences, because of their inability to attain society's literacy demands.

Successful interventions in dyslexia show that reasonable levels of reading accuracy may be attainable (e.g., Tijms, 2007), but no effective cure for the lack of reading fluency is available yet.

It was further shown that automating letter-speech sound pairs takes years to develop in normal readers, despite the fact that they 'know' which letter goes with which sound (Froyen et al., 2009).

Two recent series of electrophysiological studies with normal and dyslexic readers revealed that different event related potential (ERP) components can be robustly related to the gradual tuning of the occipito-temporal cortex for print (Maurer et al., 2006; 2007) and the auditory and multisensory cortex for the audiovisual integration of orthographic and phonological units (Froyen et al., 2008; 2009).

**Goals**

Compare the effective functioning and potential interactions of 2 main components of the cortical reading network (visual word recognition & Letter-speech sound integration) of normal and dyslexic readers by means of ERP and behavioral measures.

Explore the plasticity of the network by means of intervention expressed in behavioral and ERP parameters.

Explore the network dynamics by analyzing the coherence (synchrony) within the reading network in the visual word recognition experiments pre and post intervention.

Correlate neural changes with reading-related cognitive and behavioral changes.

**Method**

**Measurements**

Cognitive / Behavioral

- Letter-speech sound identification (3DM)
- Letter-speech sound discrimination (3DM)
- Word reading (3DM)
- Spelling (3DM)
- Text reading (AVI)

**ERP**

- Letter-speech sound integration (mismatch negativity - MMN)
- Visual Word Recognition (VWR)

**Intervention**

17 weeks, 34 sessions, 1 on 1 training.

Training A: Reading intervention by training letter-speech sound mappings explicitly within the context of reading practice.

Training B: Reading intervention by training visual word recognition within the context of repeated reading.

**Expected ERP Results**

- Differences in MMN in auditory (black) and 2 audiovisual conditions (red and green) for beginner (upper left), advanced (control lower left, dyslexic, upper right) and adult readers (lower right) (Blomert)

**Innovation**

This is the first time that the recently established cross-modal deficit in a temporo-parietal network for multisensory integration in dyslexia is tested with the help of an intervention learning paradigm.

It is also the first time that the effects of explicit and implicit training paradigms of orthographic-phonological associations on word reading fluency will be analysed and compared on both neural and cognitive level.

Another innovation is explicit targeting of the neural network dynamics of a developing reading network in dyslexia by means of EEG coherence analysis.

**References**


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