

## Brain Activity Pattern of Dyslexic Readers Approaches the Pattern of Normal Readers Following Training With A Reading Acceleration Paradigm

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**Introduction:** A special training procedure, the acceleration reading training (ART) results in a persistent improvement of reading effectiveness of both normal readers and reading-impaired (dyslexic) readers. A recent fMRI study showed an increased similarity between patterns of brain activation in dyslexics and normal readers resulting from forcing faster than regular reading pace during the fMRI session(1).

**Purpose:** Our aim was to study the long term effect of ART on brain activation of dyslexics.

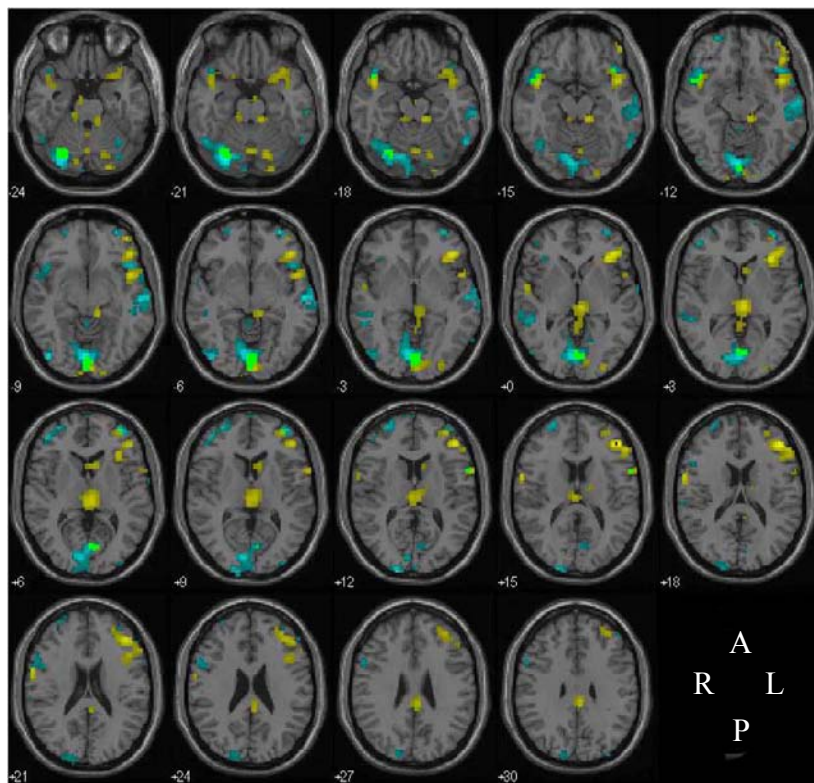
**Subjects and Methods:** We studied brain activation patterns induced by several reading tasks (lexical and semantic decision, fast and slow versions) in adult dyslexics (8 subjects, 49 tasks) and normal readers (12 subjects, 75 tasks). A subgroup of dyslexics (4 subjects 25 tasks) was scanned twice, before and after ART. The measurements were carried out on a 3 Tesla MRI system (GE) using a BOLD contrast, T2\* weighted gradient echo EPI sequence, TR/TE/FA 3000ms/25ms/90°, 36 slices, 3.4x3.4x3.4 mm<sup>3</sup> resolution. Individual and group statistical analysis was performed using the SPM2 toolbox of MATLAB.

**Results:** Dyslexics showed a significantly higher activation in the frontal language areas in the left hemisphere, as well as in the occipital visual areas bilaterally, than the normal readers (Figure 1, yellow). Similar regions showed reduced activation comparing pre- and post-training in the subgroup of dyslexics treated with ART. In this group, reduced activation in the temporal language area in the left hemisphere was also observed after ART (Figure 1, cyan).

**Conclusions:** These results suggest that improved reading following ART is accompanied by altered brain activation pattern in dyslexics that approaches the activation pattern evoked in normal readers. We propose, that ART may have resulted in the establishment of a more effective cortical network for reading in the dyslexic brain, more similar to the one employed by normal readers.

**Fig. 1:** Difference in brain activation patterns during reading is similar when comparing dyslexics and normal readers and when comparing dyslexics before and after acceleration training (ART).

Dyslexics > Normals      ■  
pre ART > post ART      ■  
Overlap                      ■



### References:

1) Karni A, Morocz I.A, Bitan T, Shaul S, Kushnir T, Breznitz Z. "An fMRI study of the differential effects of word presentation rates (reading acceleration) on dyslexic readers' brain activity patterns" J. Neuroling. (2005) 18(8):197-219.