The relationship between visual functions and reading performance in children with reading difficulties

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Learning to read is a milestone during primary school, the foundation for lifelong learning and participation in society (OECD 2010). From a visual perspective reading is a very complex task and requires the effortless and rapid processing of fine visual details (Hyvärinen 2014, Trauzettel-Klosinski 2002). This study aims to explore how children with reading difficulties face reading demands and to assess their visual skills associated with reading.

Environmental factors:
Survey of beneficial and hindering environmental factors through a semi-structured oral interview.

Visual functions:
- Oculomotor functions:
  - eye alignment
  - motility / smooth pursuit
  - fixation / saccades / scanning
  - accommodation / vergence
  - fusion

- Sensory functions:
  - VA near single / line / crowded optotypes
  - VA distance
  - contrast sensitivity
  - grating acuity
  - line length / line direction / angles

Reading performance:
- text size
- line spacing
- letter spacing
- contrast

Performed on the eye-tracker (Tobii TX300)

Environmental factors: self-report
- letter size
  - “Before I choose a book, I look inside to see, how small the print is. The bigger, the better.”
  - “In the library I choose the books for the second grade, because the letters are bigger.”
  - “When I have to read small print, I need breaks because I get a headache.”
- contrast
  - inverted contrast preferred

Reading performance:
Dominik read most words letter-by-letter with many intra-word-fixations. He showed a more precise and efficient word-recognition when letter-spacing was increased.

The collected data (study still in progress) points to “VA crowded”, “grating acuity” and “contrast sensitivity” as significant functions in reading difficulties suggesting that these reading related functions need attention and analysis to better understand the children’s basic conditions for reading.

The data from children’s self-reports about their own reading preferences demonstrates that children, in most cases, know exactly what conditions they require to handle reading tasks. Their knowledge about beneficial conditions should be considered when establishing appropriate learning materials and aids for them.