

## Keynote 1

### Is the finger-voice span an indicator of reading proficiency?

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A simple and reliable strategy for supporting attention focus, directional movement and voice-print match in oral reading involves the use of the index finger to track each word as it is read aloud. In Pisa, we used an ordinary tablet as a reading book to measure the exquisite coordination of voice articulation and the movement of a reader's index finger across a text displayed on the tablet touch screen. These data were then compared with eye-tracking data of the same subjects reading the same texts aloud on a computer screen.

Analyses of the three time lines of voice articulation, eye fixations and finger-tracking revealed, unsurprisingly, that voice, finger and eye have different speeds, which are nonetheless tightly coordinated during oral reading. In particular, while the voice typically lags behind both the finger and the eye, eye and finger movements tend to slow down at the same text joints for their time distance to the voice to be kept relatively constant over multi-word text units.

Such an "elastic" dynamic of the finger-voice and the eye-voice spans in oral reading is shown to be the outcome of an optimally adaptive viewing strategy, interactively modulated by three factors: a subject's reading skills, the tracking mode, and lexical and structural features of the written text. In particular, we observed that:

- i) the voice span may vary across subjects depending on their rate of articulation;
- ii) spans vary even more prominently within the same reader, as they tend to get larger when the text contains larger intonational and structural units;
- iii) spans are modulated differently depending on tracking mode, with the eye being mainly sensitive to larger text units, and the finger to smaller ones.

While all this evidence agrees with recent studies emphasizing interactive effects between eye/voice distance to the voice and eye/finger movements, it also suggests that the fine coordination between voice, finger and eye is functional to fluent oral reading, as it allows the reader to optimally plan articulation, using her phonological working memory to buffer lexical units into larger meaningful intonation units before reading them out. Ultimately, a more proficient reader is able to better adapt her working memory buffer and articulation rate to the structure complexity of a text.