Statistical Learning and Visual Word Identification: An eye-tracking investigation of natural reading in children

Valentina N. Pescuma1, Maria Ktori2, Benedetta Cevoli1,2, Eleonora Lomi1,2, Francesca Franzon1, Davide Crepaldi1

1 International School for Advanced Studies (SISSA), Trieste, Italy
2 Royal Holloway University of London, UK
3 University of Oxford, UK

v.pescuma@sissa.it

Background

- Reading proficiency may develop through the chunking of lower-level units (e.g., letters) into larger ones (e.g., words and morphemes).
- Morpho-orthographic chunking in adults may be interpreted similarly — morphology drives regularities in letter co-occurrence within words1,2,3, which the reading system may exploit to facilitate visual word identification.
- In this perspective, reading may be conceived as a form of statistical learning.

Aims and Hypotheses

- We try to identify statistical learning proxies in developing readers of Italian (3rd–6th graders).
- The present work focuses on nGram frequency. Other possible indexes (e.g., transitional probabilities, word predictability) are currently under investigation.
- Age is expected to play a role in the development of sensitivity to statistical learning cues in reading.
- We will make the data available, thus creating the first database of eye tracking data in children.

Methods

Participants:
- 39 (22 M) native Italian speakers (age range: 8-12 years).

Procedure:
- Natural reading task on text from kids’ books.
- Simple 2-AFC comprehension questions after every other excerpt displayed.
- Eye movements recorded through a tower-mount Eyelink 1000 Plus eye-tracker.
- Computerized cloze probability task, currently under analysis.

Stimuli features:
- 1935 tokens
- 728 different words
- 609 different lemmas
- 12 parts of speech

Results

In line with previous data1,2, total looking time depends on word length (F[4,22400]=81.93, p<.001) and word frequency (F[4,22400]=303.14, p<.001), with no interaction (p=.44).

A size gradient: 2grams don’t work (F[4,5900]=.61, p=.61), 3grams do (F[4,5900]=3.09, p=.01), 4grams strongly significant (F[4,5900]=5.05, p<.001; figures on the right).
- Stronger effects on early measures (FoM much better than TLT).
- nGram effects fade when word frequency is considered (e.g., 4grams, p=.36).
- nGram effects not modulated by age (e.g., 4grams, p=.26; figure below).

References