

Patterns of Finger-Tracking in Italian Early Readers with Autism Spectrum Disorder

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OBJECTIVE

Investigate patterns of finger-tracking as a potential non biological marker for identification of children with ASD in a task of reading a connected text, both silently and aloud.

METHODOLOGY

An ICT platform with a tablet front-end was used supporting online monitoring of silent and oral reading abilities in early graders, capturing time-aligned signals including voice recording, time-stamped finger-tracking patterns, reading time and question-answering time. Data are automatically captured and sent to a centralised server for post-processing, where audio and finger-tracking time series are aligned with the text.

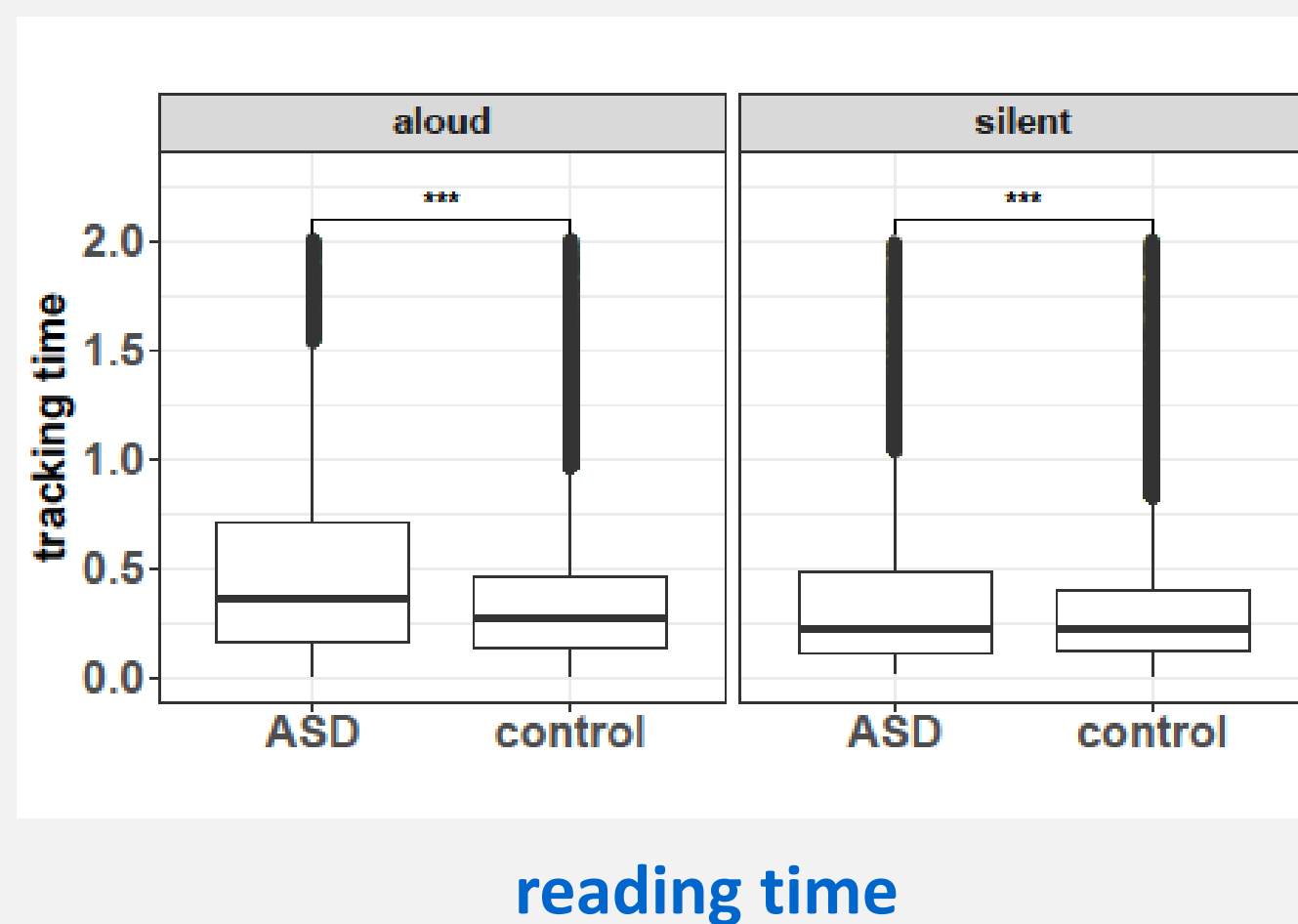
EXPERIMENTAL GROUPS

20 Italian children with high functioning ASD (age range: 6:10–10:11 years), and a grade-matched control group of children with typical development (2nd-5th primary school graders).

PROCEDURE

Patterns of finger-tracking are assessed in connection with three complementary aspects of reading behaviour: (1) word recognition, (2) pace of reading of content and functional words, and (3) text comprehension, controlled by asking children a few multiple-choice questions on text content after each reading session.

DATA ANALYSIS

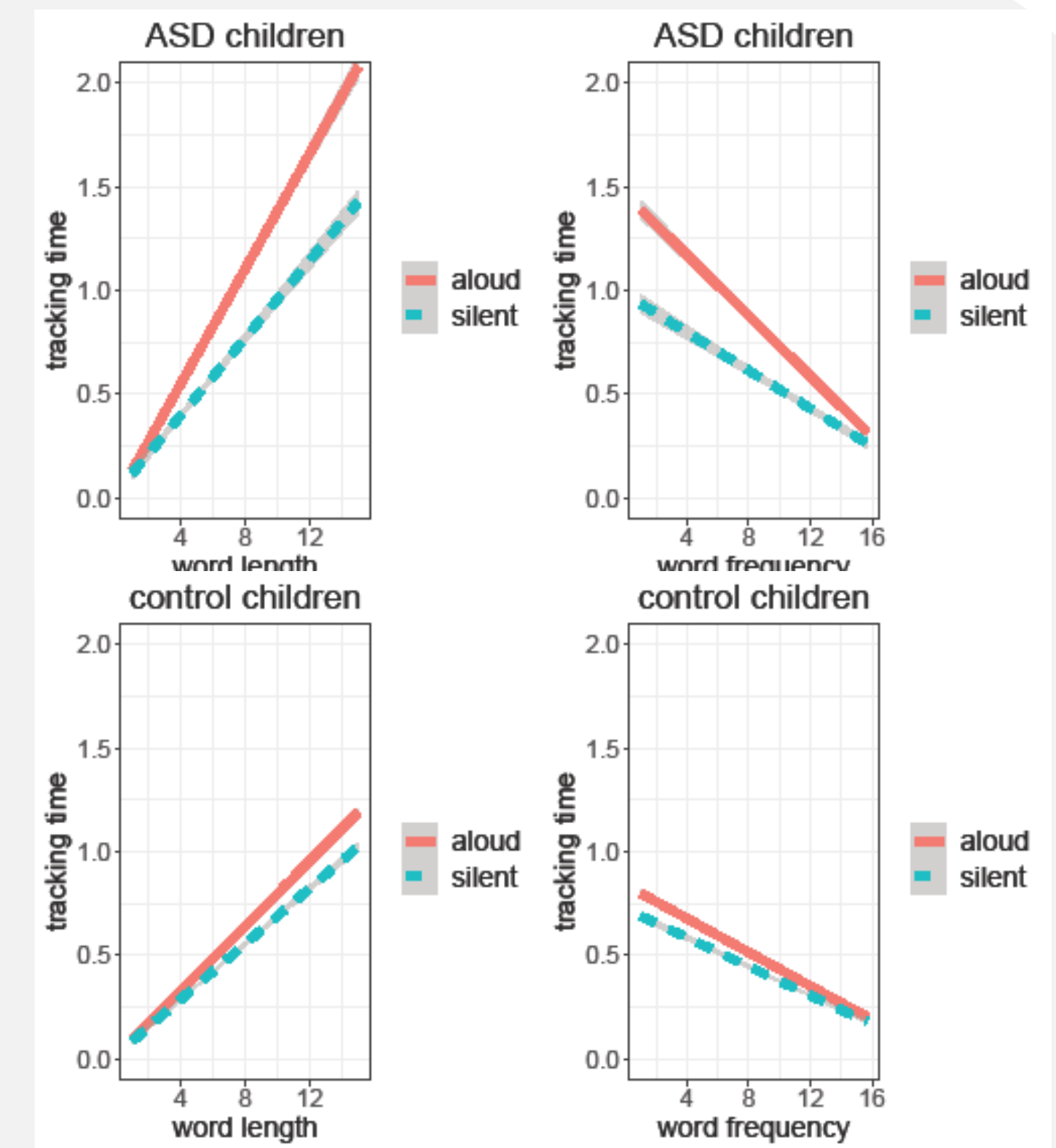


reading time

ASD children show a more variation in reading time than typical developing children – especially for an aloud reading task, and a significant longer tracking time for word tokens in both reading modalities (p-value <0.001).

ASD children show a greater effect of word length and frequency on reading time than typical children, and a more pronounced difference between silent and aloud reading.

For increasing length and low frequency, words take significantly more time to be read in ASD children than in control children (p-value < 0.001).

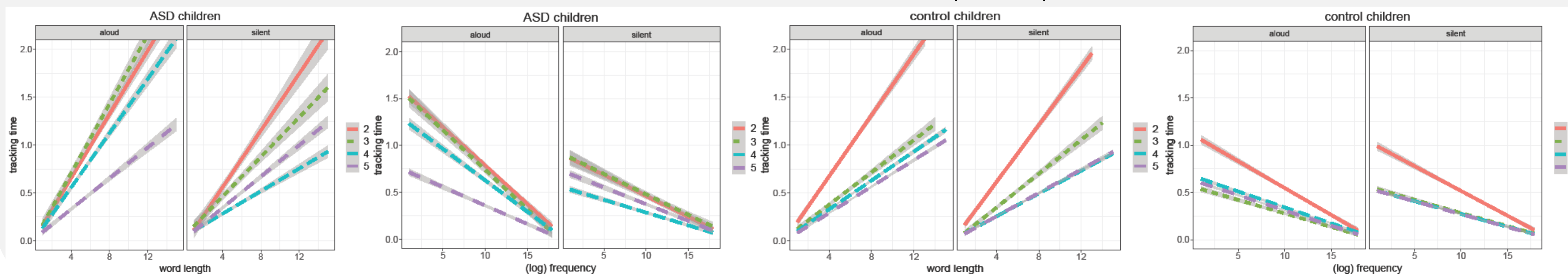


word frequency and length effects

developmental perspective

typical children show a progressive reduction of both word length and word frequency effects on reading times, with a greater effect on 2nd graders, who mainly rely on a syllabic reading route and take considerable advantage from short and highly-frequent words.

ASD children **do not** show the same developmental pattern

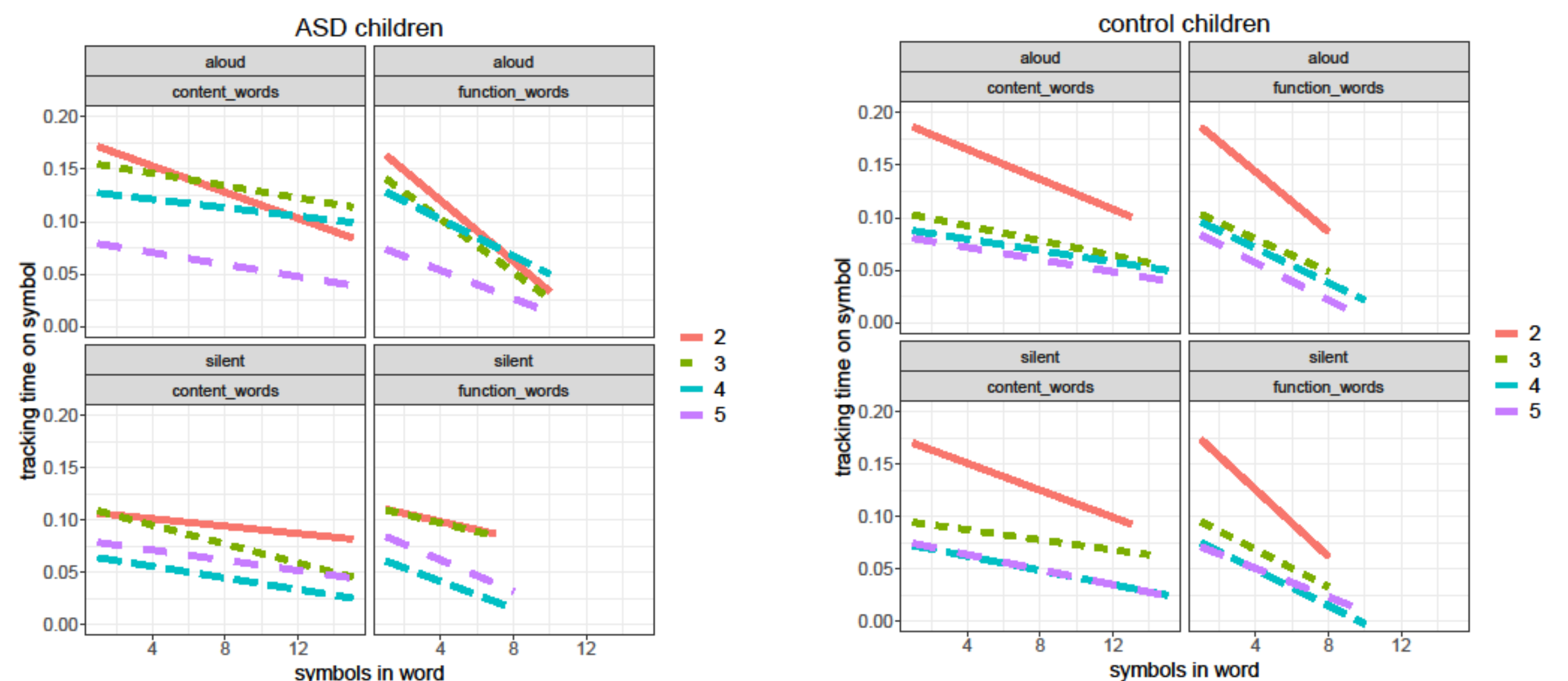


content vs. function words

monitoring intra-word serial reading dynamics, function words are predicted more quickly during recognition than content words are.

The same pattern is observed in ASD children, with a significantly smaller difference between content and function words, and a significantly less prominent bias to predict words during recognition.

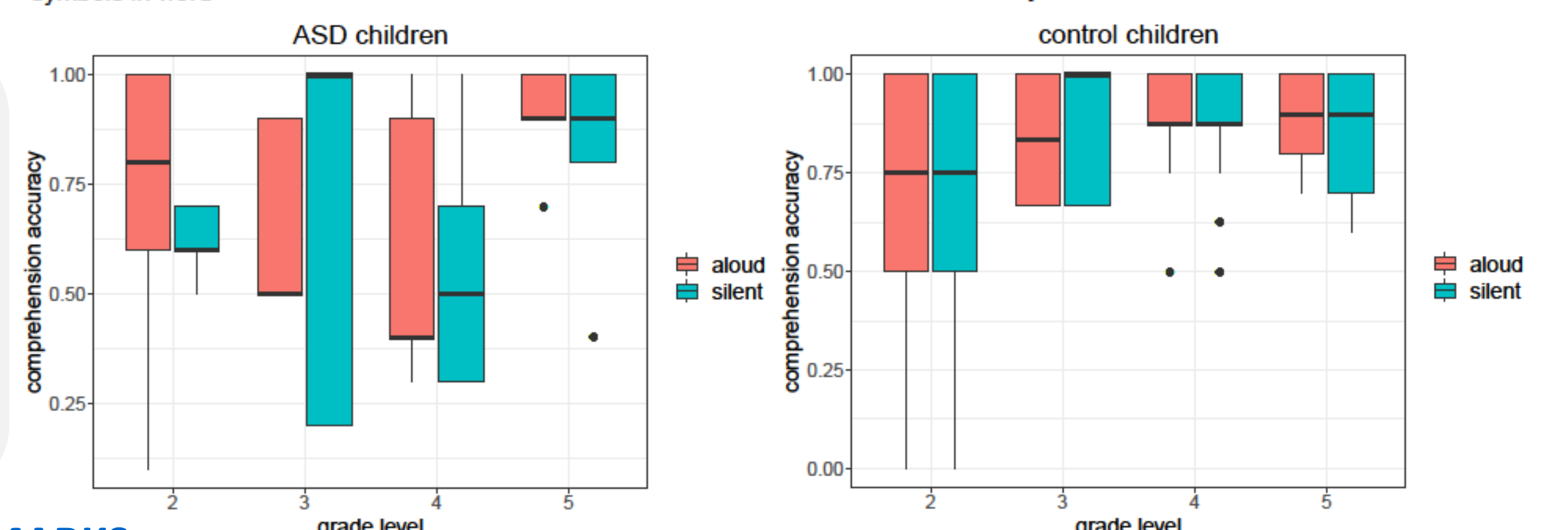
This evidence coupled with a different developmental pattern in connection with word length and word frequency, may suggest that ASD children tend to more heavily rely on a **sublexical reading route**, and to a lesser extent on a lexical reading route.



text comprehension

by asking children a few multiple-choice questions on text content after each reading session, we controlled for text comprehension.

We observe an incremental accuracy rate for increasing grade levels in typical children as opposed to a greater variability in the ASD group.



CONCLUDING REMARKS:

Preliminary findings confirm the heterogeneous nature of reading skills in children with ASD, showing that the use of a tablet screen as a tactile interface for visual perception analysis can offer a robust experimental protocol for large-scale, multimodal collection of naturalistic data for extensive assessment of readers with ASD.