Eye-tracking during reading

What can we learn from the measures?

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1 Eye-tracking

- in (psycho)linguistics

    - during reading
    - visual world paradigm

- in psychology

    - pupillometry
    - visual search

- but also

    - market research
    - diagnostic tool

1.1 Eye movements

- **saccades**: eye *movements* (e.g., from one word to another)
  - average saccade legnth: 7-9 letters (in alphabetic writing systems)
- **fixations**: 'looking at' something, e.g., a word (little movement)
  - when information is taken in
  - average duration: 225-250ms (ranging 50-600ms)
- **regressions**: saccades to earlier text
  - occurance: 10-15% of saccades in skilled readers

Rayner (2009)

1.2 The eye-tracker

- eye-tracker
  - camera + infrared illuminator
- screen
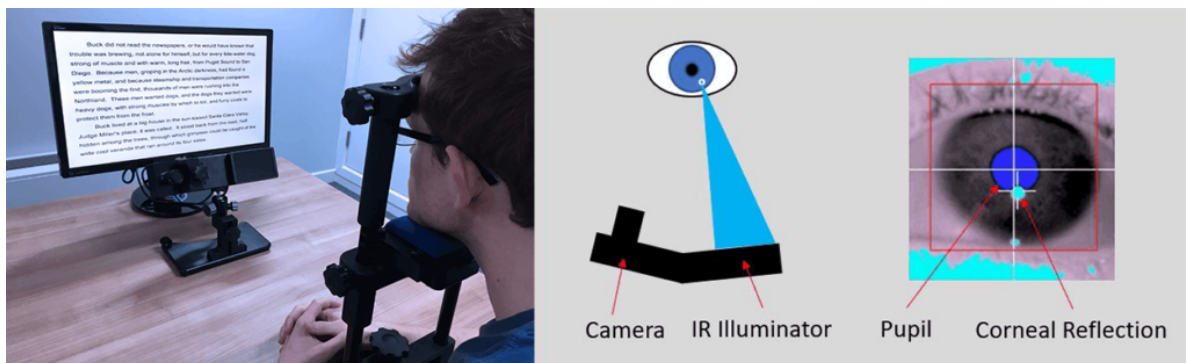- chin/head rest
- in our lab: desk-mounted

Figure 1: Image source: SR Research (all rights reserved)

2 Eye-tracking during reading

2.1 Eye-tracking reading measures

- inform theories of language processing via linking hypotheses

– linking visual attention to processing

- typically, we compare reading times as a function of some manipulation

    – e.g., Sally *went/goed* to the store.

- longer reading times are taken to reflect processing costs, associated with e.g., sentence complexity or anomalies

2.2 Region of interest (ROI)

- can be anything on-screen

    – sentence-level
    – word/region-level
    – a certain part of the screen

2.3 Measures (dependent variables)

- what we measure = *dependent* variables (usually…)

    – their value *depends* on some *predictor* (e.g., word frequency)

- measures of duration (time spent on a region)

    – first fixation
    – first-pass reading time
    – regression path duration
    – total reading time

- data type: *continuous*

- measures of revisits

    – number of fixations
    – number of regressions in/out
    – regression in/out (yes or no)
    – probability of regressions in/out (0:1)

- data type: *binary* (0,1) or *count*

2.4 Independent variables

- what can influence reading measures? (Clifton & Staub, 2011; Juhasz & Pollatsek, 2011; Rayner & Liversedge, 2011; Warren, 2011)

    - some examples:

- Word properties

    - word frequency
    - word length

- Sentence-level influences

    - context (i.e., prediction)
    - semantic or grammatical manipulations

- Inter- and intra-individual

    - domain-specific expertise
    - reading skill level

2.5 What do these measures tell us?

- eye-tracking during reading can tell use *when* and *where* processing costs are incurred
- *early measures* involve "first contact with a word" or region: first-fixation, first-pass reading time (Vasishth et al., 2013, p. 126)
- *late measures* involve regressions to a region: e.g., total reading time

    - may also include 'spillover' effects from early processing

- eye-tracking during reading measures can therefore tell us about stages of processing

References

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