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Reading with Noisy Orthographic Input: Easy-to-Read Formats and Visual Processing Across the Adult Lifespan

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INTRODUCTION & AIM

As online reading becomes essential, concerns about digital text readability have grown (Droutsas et al., 2024). Although Easy-to-Read (E2R) guidelines aim to improve accessibility, evidence is inconsistent, especially in non-clinical populations, and shows no benefits in university students (González-Sordé & Matamala, 2024; Schmutz et al., 2019; Navas-León & Duñabeitia, 2025). Evidence across the broader adult population remains unknown.

Aim:

To fill the gap, the present study examine how different text formats (Control, and E2R) impact reading comprehension, reading time, and eye-tracking metrics in a cognitively healthy adult sample.

H1: E2R ≥ Control in comprehension; reading time E2R < Control. Additionally, age is expected to be associated with longer reading times and lower comprehension, with stronger E2R effects at older ages.

H2: E2R ≤ Control in number and duration of fixations; E2R ≥ Control in saccade amplitude. Additionally, age is expected to be associated with longer and more fixations, with stronger E2R effects at older ages.

METHOD

Participants

70 adults (ages 18-79; M= 43.82; DT= 19.05) with normal/corrected vision, no cognitive/mental health conditions, and no history of neurological visual impairments.

Procedure

The ~1h session included sociodemographic and cognitive screening (CAB™), eye-tracking calibration, a counterbalanced reading task (30 trials), a Flanker task, and later comprehension questionnaires. Data were recorded with the EyeLink Portable Duo (500 Hz) in a controlled lab setting.

Materials

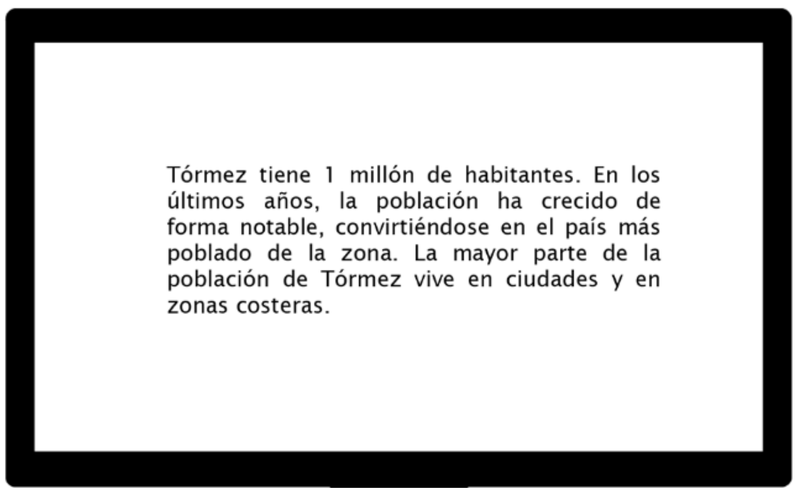
Texts described two fictional countries. Each condition manipulated typography and layout according to varying disfluency levels and E2R guidelines (UNE-EN 301549:2022). Stimuli were presented as images on a computer screen.

The two conditions varied in readability:

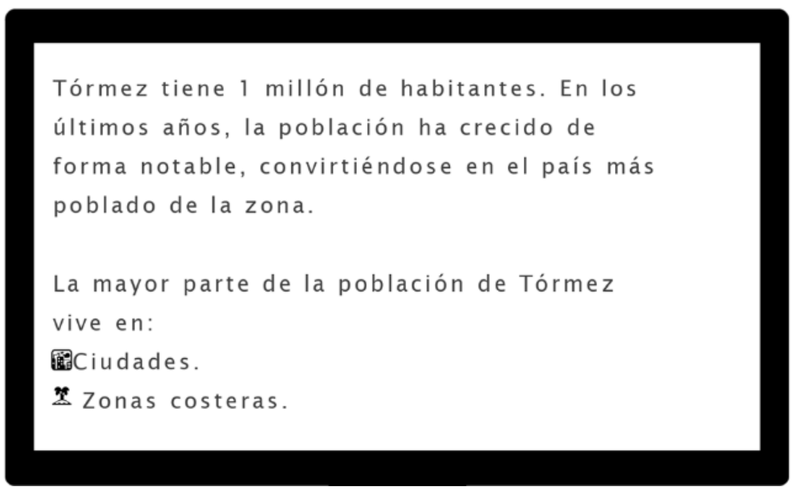
a) Control used a sans-serif font, non-aligned text, and high contrast.

b) E2R: followed accessibility guidelines with clear formatting, increased spacing, paragraphs and pictograms to support comprehension.

a) Control ↓



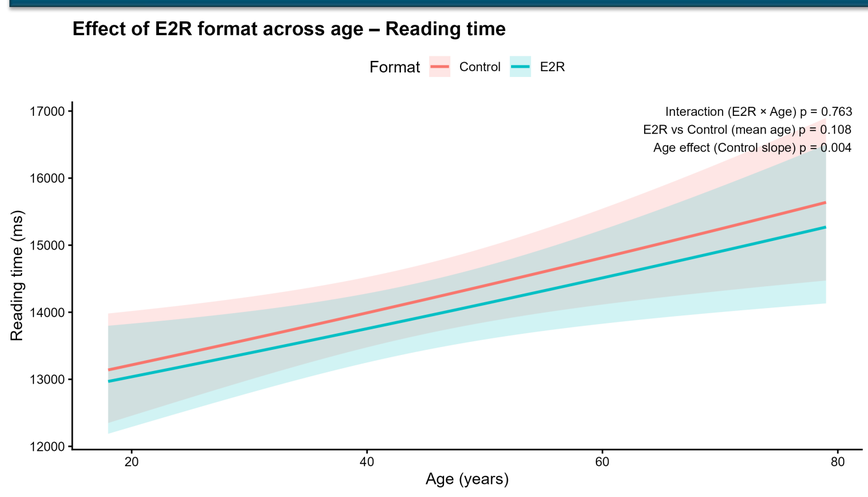
b) E2R ↓



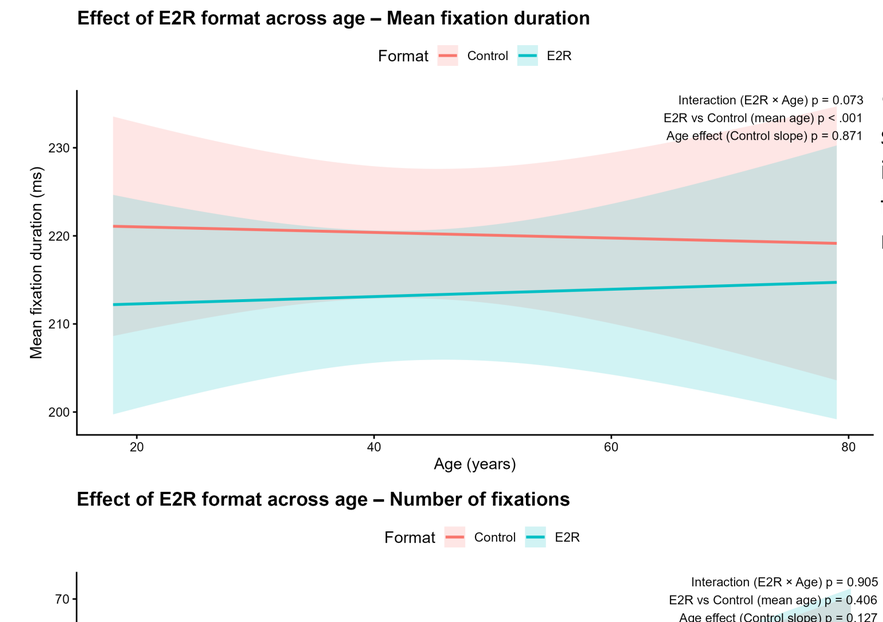
Data Analysis

Data for reading time and eye movements outcomes was analysed using linear mixed-effects model (LMM) from the lme4 package (v.1.1.37) (Bates et al., 2015) in R. Data for comprehension scores was analysed using t-tests.

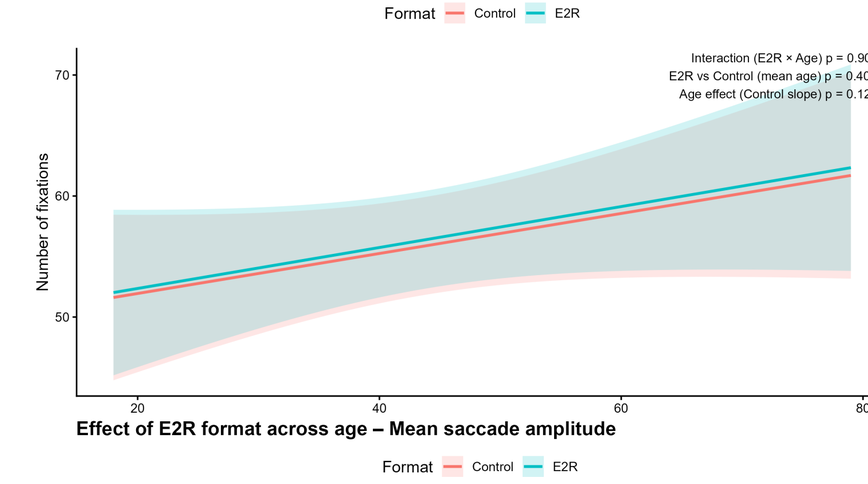
RESULTS & DISCUSSION



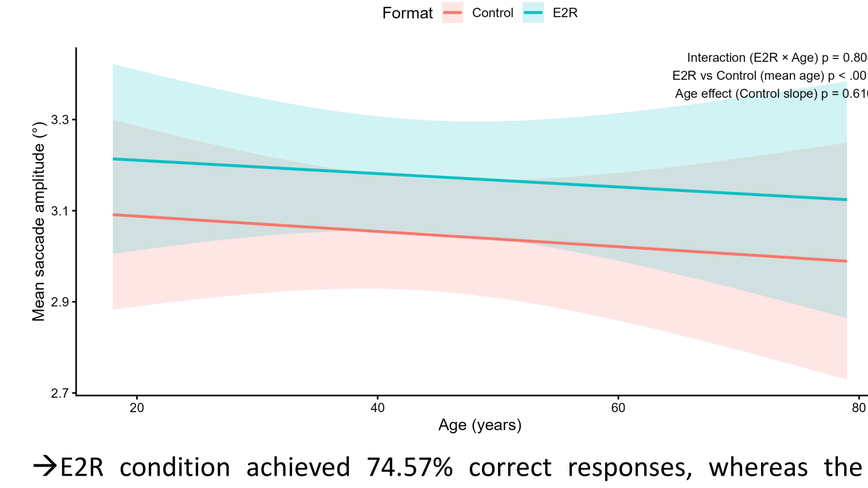
→Reading time increased with age, but no differences between formats were found, suggesting that E2R does not reduce overall reading time.



→Fixation duration showed a significant age × format interaction, with shorter fixations in E2R, indicating more efficient processing.



→Fixation counts increased with age, reflecting higher processing demands, but no interaction with text format was observed, indicating that E2R does not differentially benefit older readers.



→Saccade amplitude was larger in the E2R condition across ages, indicating more efficient visual exploration, with no age effect.

→E2R condition achieved 74.57% correct responses, whereas the Control condition achieved 72.47%. However, no statistically significant differences were observed (p > .05).

CONCLUSION / FUTURE WORK

→Overall, while reading time varied, there was no clear evidence that E2R formatting produced measurable improvements in comprehension or reading efficiency.

→This pattern highlights the need to revisit and empirically refine current E2R guidelines, particularly when applied beyond their original target populations.

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