# Diverse Reading Themes for Readability

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Digital reading applications give readers the ability to customize fonts, sizes, and spacings, all of which have been shown to improve

# THERIF

the reading experience for readers from different demographics. However, tweaking these text features can be challenging,

especially given their interactions on the final look and feel of the text.

very shrewd and clever; and the mil

told the king of the land, who used t

daughter could spin gold out of stra

and when he heard the miller's boast

**COMPACT** 

Our solution is to offer readers preset combinations of font, character, word and line spacing, which we bundle together into reading themes.

To arrive at a recommended set of reading themes, we combine (1) crowdsourced text adjustments, (2) ML clustering of the resulting text formats, and (3) design sessions.

#### text formats, and (3) design sessions. **READING THEMES FOR ITERATION R1** By the side of a wood, in a country all By the side of a wood, in a country a By the side of a wood, in a country By the side of a wood, in a country and upon the stream there stood a r upon the stream there stood a mile fine stream of water; and u water; and upon the stream there s water; and upon the stream there s the miller, you must know, had a ven mill. The miller's house w by, and the miller, you must know, let close by, and the miller, you must miller, you must know, had a very b very shrewd and clever; and the mill moreover, very shrewd and clever; was, moreover, very shrewd and clever; shrewd and clever; and the miller w must know, had a very be told the king of the land, who used to daughter could spin gold out of strav king of the land, who used to come moreover, very shrewd ar that he one day told the king of th he one day told the king of the land could spin gold out of straw. Now By the side of a wood, in a country a By the side of a wood, in By the side of a wood, in a country By the side of a wood, in a count By the side of a wood, in a country and upon the stream there stood a m and upon the stream there stood a n water; and upon the stream there and upon the stream there stood a r mill. The miller's house w the miller, you must know, had a the miller, you must know, had a ve must know, had a very bea the miller, you must know, had a ve very shrewd and clever; and the mill by, and the miller, you must know, very shrewd and clever; and the mille told the king of the land, who used to very shrewd and clever; and the mill told the king of the land, who used moreover, very shrewd and clever; daughter could spin gold out of strav told the king of the land, who used daughter could spin gold out of strav FEEDBACK LOOP $\bullet$ $\bullet$ $\bullet$ $\bullet$ $\bullet$ $\bullet$ **ALGORITHM** DESIGNERS **CROWDWORKERS** PICKS REPRESENTATIVES FINAL READING THEMES By the side of a wood, in a countr By the side of a wood, in a cou By the side of a wood, in a country and upon the stream there stood a water; and upon the stream there the miller, you must know, had a ve

Figure 1. Our pipeline for generating **the**mes for **r**eadability from **i**terative **f**eedback (THERIF).

close by, and the miller, you must

She was, moreover, very shrewd ar

of her, that he one day told the ki

hunt in the wood, that his daug

**OPEN** 



stream of water; and upon the

house was close by, and the mi

**RELAXED** 

## Participant demographics

<sup>1</sup>Adobe Research <sup>2</sup>Adobe Inc.

We used the Prolific platform to recruit crowdworkers with English as their first language. We recruited 200 participants for the first iteration (R0) and 100 for each subsequent iteration (R1-R3), for a total of 500 participants.

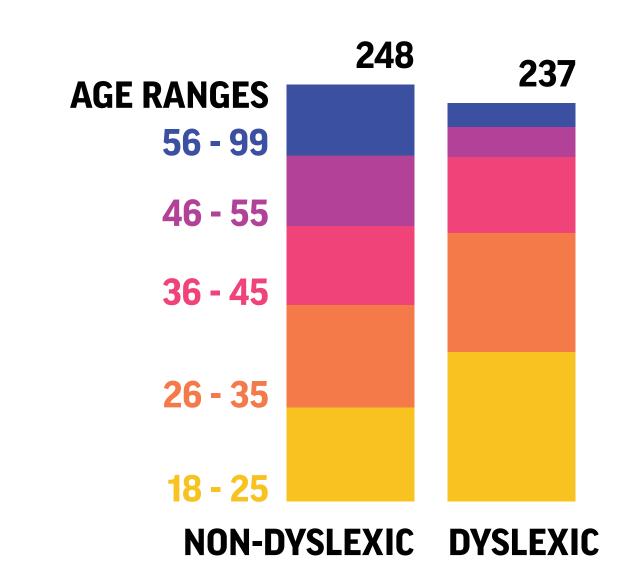
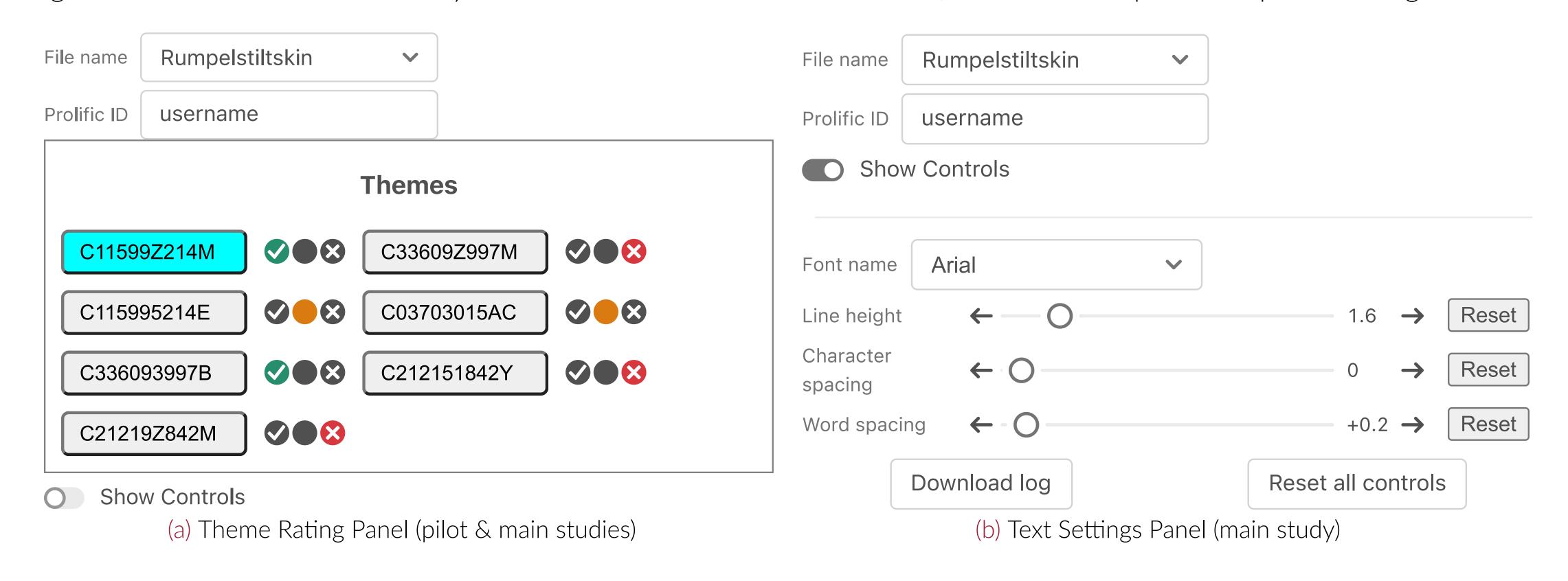


Figure 2. We recruited equal numbers of participants with and without dyslexia and attempted to balance participants across ages by recruiting separately from each of the age buckets visualized.

# Study interface

Crowdworkers in each THERIF iterations first review and rate each theme (good, unsure, or bad) from the previous iteration before selecting their favorite theme. We always included a random validation theme, intended to represent a poor reading format.



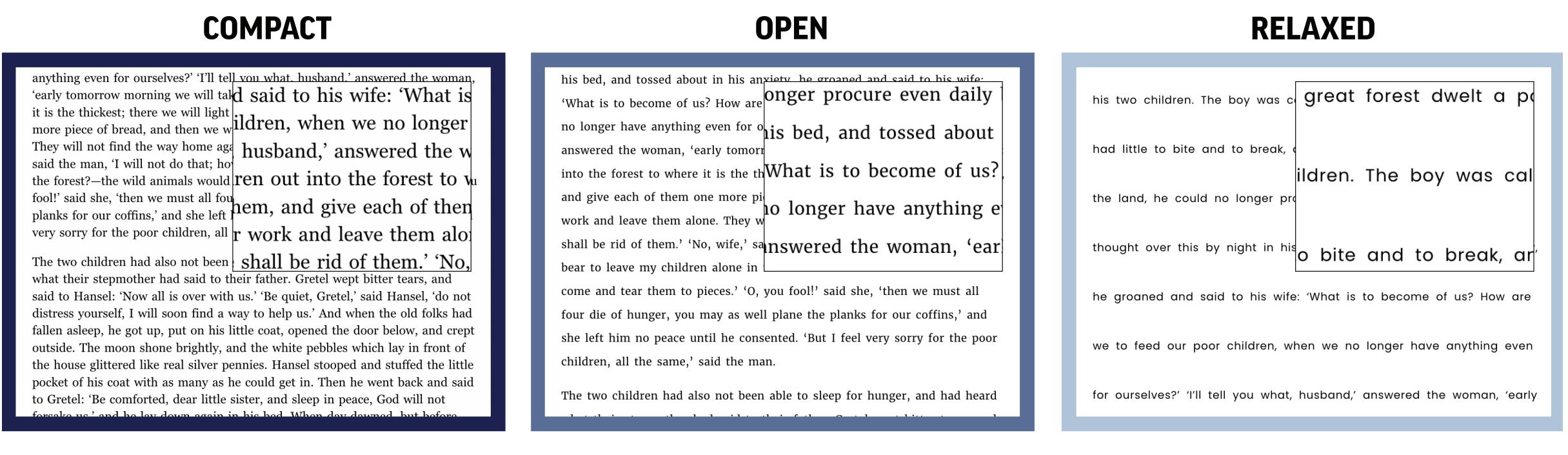
#### Final themes

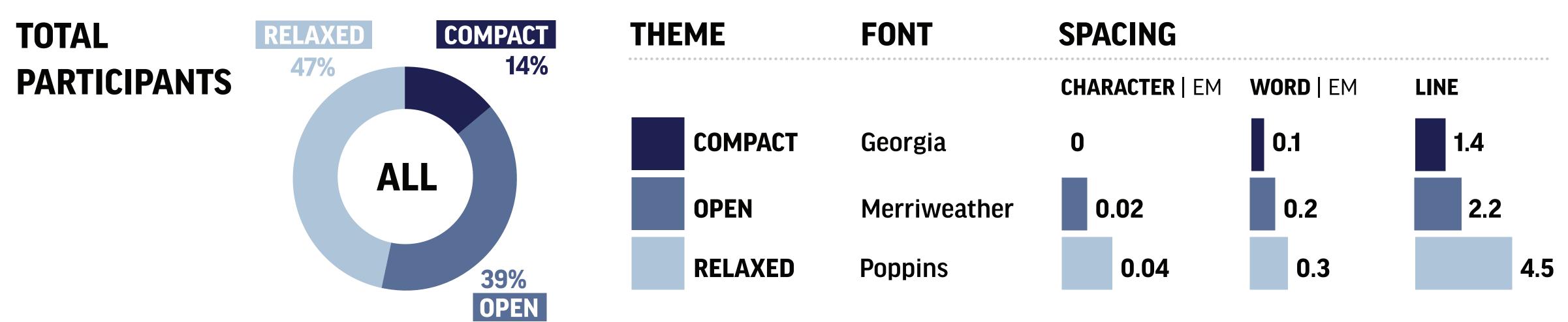
Four iterations of THERIF converged on a set of three COR (Compact, Open, and Relaxed) themes that are designed for different readers.

From the last THERIF iteration (R3), we plot the demographics of participants whose text formats were clustered to produce each of these three themes.

- 1. Almost half the participants (47%) made text setting adjustments that corresponded to the Relaxed theme.
- 2. A vast majority of participants with dyslexia had text settings that corresponded to the Relaxed theme, whereas mostly participants without dyslexia had settings that corresponded to the Open theme.
- 3. We see similar differences by age. For instance, no participants over 55 had text settings that corresponded to the Compact theme.

#### FINAL THEMES





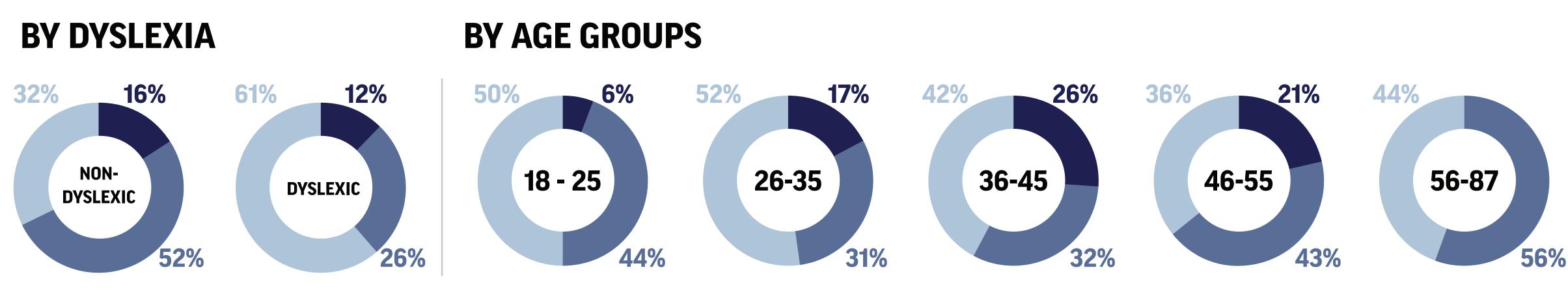


Figure 4. Final "COR" reading themes

### Themes converge to match readers' preferences

In the initial refinement iteration (RO), most participants increased character, word, and line spacing from the default theme, resulting in a set of diverse formats.

Participants with dyslexia increased word spacing during R1 and R3, and participants without dyslexia increased character spacing in R2 and word spacing in R3, respectively.

As the THERIF iterations progressed, participants made fewer refinements to the provided themes, indicating that the defaults meet their preferences.

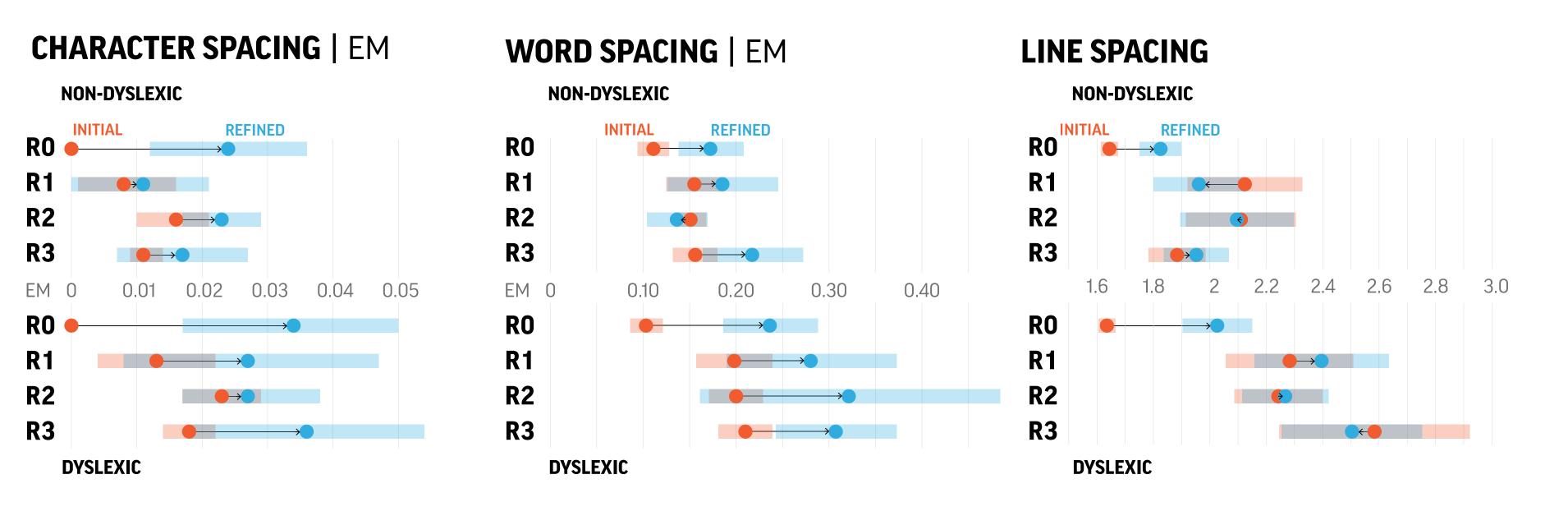


Figure 5. Differences between initial theme settings and the refined settings in each THERIF iteration.

With more iterations, participants also spent less time refining the text settings, indicating that themes now better meet their needs.

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