

Effect of Text Presentation Format on Eye Movement Metrics while Reading

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Abstract (Now word count is 463, it should be 500)

We have collected and analyzed eye movement data from users reading texts on a computer screen. Several text presentation formats were compared, including sentences as part of a full paragraph, sentences presented one by one, sentences presented in chunks of at most 30 characters at a predefined rate (RSVP), and line by line presentation that fits the width of the computer screen. The goal of the experiment was to study how these different text presentation modes affect the eye movement metrics (fixation duration, fixation count per minute, regressions, etc.). The hypothesis was that the format does have an effect on the typical eye movement metrics.

17 participants took part in the experiment which was divided into two parts. In Part 1 the changing of texts was paced automatically and in Part 2 pacing was manual. In each part four different texts (about 100 words in length) were presented using a 4x4 Latin Square format. All the texts were organized in such a way that they were counter-balanced.

Data from 16 participants was used for the analysis. One way ANOVA showed that fixation duration and fixation count per minute are affected significantly by different presentation formats. In both parts (automatic and manual pacing), the longer the presentation format, the shorter the average fixation duration while the trend is opposite with normalized fixation count.

More specifically, for the automatic pacing paired sample t-test found significant differences in both average fixation duration and normalized fixation count between paragraph-sentences, paragraph-lines, paragraph-chunks, sentences-lines, sentences-chunks, and lines-chunks with $p < 0.01$. For the manual pacing we can see almost the same trend, though the difference between paragraph-sentences was insignificant. Difference between sentence-lines was close to the threshold of significant level $p = 0.05$ regarding both the metrics.

On the other hand, number of regressions is affected significantly (one way ANOVA) by different presentation formats with manual pacing. Though the general effect is insignificant (by ANOVA) in automatic pacing, paired sample t-test showed that in both parts the shortest format (chunks) got a significantly higher number of regressions than the longest format (paragraph).

Finally, except line by line presentation format, there is no significant difference between automatic and manual part of the experiment.

The post-test questionnaire reveals that the participants preferred the sentence and paragraph formats. Their least preferred format was chunk. Statistical analysis showed that when the text format is shrinking from paragraph to sentences and then to chunks, eye movement metrics also change. The results should help to connect studies made in different contexts (e.g., psycholinguistic studies with short stimuli vs. translation studies with longer stimuli); if an observation is made in one context, the results of this study should help at least in hypothesizing whether the observation can be expected to hold also in the other context.