

Maximising Legibility - Overview of Selected Papers

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Summaries

Paper	Useful Sections	Main Relevant Points
Gemma Walsh (2016) Screen and Paper Reading Research – A Literature Review, Australian Academic & Research Libraries, 47:3, 160-173, DOI: 10.1080/00048623.2016.1227661	<ul style="list-style-type: none">• Section on reading theory; in particular the paragraph exploring theories of spatial recognition.• Section on academic documents - of limited relevance, but some points on why students tend to prefer printed documents may be transferable.• Final paragraph in <i>screen reading platforms</i> section.• Subsection on content in the section on document design.• Last two paragraphs in subsection on navigation.	<ul style="list-style-type: none">• May be worth reading Rothkopf 1971 paper as well as Payne and Reader 2006 paper to find out more, but should pay close attention to the placement of information within blocks of text.• For lengthy academic texts, students tend to prefer printed documents - given that visualisations are confined to the screen, emphasis should be placed on shorter, less syntactically complex text content to avoid being off-putting.• 2013 paper by Mangen et al. emphasizes the potential source of distraction posed by screen resolution, backlighting and the <i>illuminative effect of LCD screens</i>. Therefore we should try to consider these factors as much as possible when making design choices that will be effected by these factors, eg. colour schemes and div sizes for screens of different resolutions.• The paper notes the importance of taking advantage of the possibilities offered by electronic media, such as embedded videos and interactivity. Perhaps this could apply to the text part of our pages as well as the visualisation itself?• Linearity and clearly defined sections, working in tandem with <i>more visual functions</i> such as scrolling and searching functions and links to multimedia are identified as being key to keeping users engaged and aware of where they are in the content.

Dyson, Mary & Haselgrove, Mark. (2001). The Influence of Reading Speed and Line Length on the Effectiveness of Reading from Screen. *Int. J. Hum.-Comput. Stud.* 54. 585-612. 10.1006/ijhc.2001.0458.

- The first two paragraphs of the *reading speed, reading rate and comprehension* subsection in *related research*.
- The subsection *the nature of comprehension*.
- The subsection *line length*.
- The *scrolling patterns* subsection, particularly the final paragraph.
- Points 3 and 13 in *research questions*.
- A brief read through the *method*.
- Figure 2 is the most relevant part of the results section.
- Section 5.4.2 (*comprehension and scrolling patterns*) is worth reading.
- Finally, the fourth paragraph of *general discussion and conclusions* reiterates and contextualises the findings in figure 2.
- The paper goes into some of the previous research, including one paper, that found that the optimal line length for legibility was 52cpl (characters per line). A slight divergence between optimal line lengths on screen and in print is noted; it is theorised that this could be because users tend to sit further away from screens than from print media, therefore a line of the same length on a screen subtends a smaller visual angle.
- A 2000 study from the same authors found that scrolling patterns can affect comprehension - *When reading at normal speed, the readers with higher comprehension scores were those who spent more time pausing between scrolling and made fast and frequent scrolling movements*. For the purposes of ImpVis, perhaps we should structure text in such a way as to encourage faster, more frequent bursts of scrolling.
- The data shown in figure 4 in the paper shows that, for people reading quickly, 25cpl seems to maximise comprehension, while for people reading at a normal speed, 55cpl seems to be optimal. Given that we expect ImpVis users to be reading at their usual pace, we should aim for 55cpl.
- The paper notes that for shorter lines, comprehension is highest for those who pause for longer between scrolling. By comparison, for longer lines, the participants with the greatest levels of comprehension were those who scrolled more frequently, in smaller bursts. In practice, we can use mathematical formulae to break up text in order to balance out scrolling behaviours, such that when users make large scrolling movements, they will easily be able to tell where they are.
- **NB:** In this study, the texts the participants were reading were edited articles from National Geographic.

<p>Rothkopf, E.Z.(1971). Incidental memory for location of information in text. <i>Journal of Verbal Learing and Verbal Behaviour</i>, 10, 608-613.</p>	<p>The abstract and discussion have most of the relevant material.</p>	<p>The study presented in this paper finds a link between participants' <i>substantive recall</i> of content and their ability to recall where they found this content within each page of a document. The authors hypothesize that readers may, consciously or unconsciously, <i>use location memory as a mnemonic aid for location recall</i>. One possible interpretation of this for the purposes of ImpVis is to maintain a clear, page-like structure in the explanatory text, while aiming to make different sections within each page visually memorable, using visual keys as tools to help users distinguish between sections. These tools should be used in sections where we want to encourage recall of wording as well as understanding, for instance when axioms are enumerated at the start of a derivation.</p>
<p>Metzger, Samantha, & Fuson, Stephani. (2015-2016).Highlighting for reading comprehension: Is two better than one?. Arts and Humanities. 6. 1.</p>	<p>The abstract and discussion sections give a goo overview of the relevant findings.</p>	<p>The study presented in this paper finds that highlighting different types of information with two different colours holds no benefit over merely highlighting relevant sections with one colour. While the study involved participants physically highlighting a printed document, there is no basis to assume that there would be any benefit to using more than one colour to highlight important points in our text. We should therefore use only one colour in order to avoid unnecessarily distracting users from the content.</p>