
Towards evidence-based typography: Literature review and experiment design

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Abstract

During several centuries of typography many rules have been developed purporting to ensure better legibility and readability of printed copy. However, modern experimental research questions the absolute importance of these rules.

In this paper we provide a short review of the existing literature and discuss an experimental design for the work we are planning to perform.

1 Introduction

Typography is both a science and an art with several hundred years of history — or, if we count its ancestor, calligraphy, with several thousand years of history. A beginning typographer faces a large amount of knowledge and rules (see, e.g. [8]): for example, that serified fonts improve readability of body texts, while sans serif is good for advertising and posters; that we know the optimal number of words per line and lines per page, etc. Some of these rules are aesthetic ones, while some are purported to reflect the neurophysiology of reading. With respect to the latter, we can ask, how do we know what we know? The fact that sometimes these recommendations are contradictory — even when offered by one great typographer (compare Tschichold in [36] and [37]!) — adds to the confusion.

The situation here may resemble the history of medical science (and art!). Centuries of practical medicine resulted in a vast number of rules and methods of cure (see a fascinating medical book of the 1600–1700s [16]). Some of them we now know to be reasonable, like the use of diuretics for lowering blood pressure. Some, like purging, have much narrower applicability than was assumed in the past. Some rules turned out to be ineffective or even harmful, like the unrestrained use of bloodletting. Modern evidence-based medicine tries to use a more scientific approach to these rules, putting empirical knowledge in a more formal framework [18].

In this talk we discuss the applicability of an evidence-based approach to typography. While it is difficult to measure the beauty of the book page, we can measure the readability and the understandability of the text and their dependence on the fonts, type area dimensions and other typographic parameters. This area has been actively developing in the last decade. The modern studies question the widespread notions of classical typography such as the use of

serified fonts [3,6,32], the mix of minuscule and majuscule letters in body texts [4,33], text layout [15,40], x -height [25] and other factors [14,27,35]. This research was stimulated by the challenges presented by new technologies [6,17,21,24,34], the use of type in messages and signage [12,19,20,38,39] and special situations like texts for low vision readers [2,4,32], drug information leaflets and other medical data [7,13,29].

An overwhelming majority of published studies deals with English texts, while there are some works on Arabic [1], Chinese [22], Japanese [5,21] and Korean [23] typography. We could find no comparable research on Cyrillic scripts and text perception by Russian readers.

Our group works on a large scale study of the neurophysiology of reading for Russian subjects. We plan to collect a database of readability and understandability as dependent on typographic parameters for Cyrillic texts. In this paper we provide the literature review and discuss the setup of the experiments.

2 The ecological hypothesis and its consequences

The easiest things to measure for the psychophysiology of reading are legibility [31] and readability [26]: the abilities to distinguish between the letters and to read words without errors. There are many studies that try to correlate these metrics with the typography of the text. Some of the results might be surprising for practitioners: for example, it seems that uppercase text is more readable than lowercase [4,33] and it is not clear whether serifs improve legibility or not [3,6,30]. One should keep in mind, however, that a font is a collection of features, and when one compares, for example, Times with Arial, one does not compare just a serified font with a sans serified one: many other features are different between these fonts, and the comparisons have too many confounding factors. It is interesting that one study [28] suggested the use of METAFONT to have a better control of font features for such comparisons.

The study of the influence of font size on the legibility and readability is more straightforward. In the recent work [25] a methodical study of such comparisons leads to the following result: legibility suffers when the fonts are too small (x -height smaller than about 4 pt) or too large (x -height larger than about 40 pt), but between these limits lies the “fluent reading range” where the ease of reading largely does not depend on the size. After studying fonts in the old and new copy the authors find that the most of it lies in this zone. Thus they formulate the *ecological hypothesis*:

... [F]luent reading is restricted to a broad but limited range of print sizes. The essential claim of our ecological hypothesis is that print sizes in most contemporary and historical publications fall within this fluent range [25].

The hypothesis is formulated for font sizes only. It has a quasi-Darwinian origin: a publisher that systematically makes copy outside of the fluent range would probably go out of business. Interestingly, there *are* some texts that are not meant to be read: for example, the (in)famous small print in legal contracts and drug inserts. In many cases this print is obviously outside the fluent range. This fact probably corroborates the ecological hypothesis.

While the authors of [25] do not discuss other typographic features, it seems reasonable to assume that they follow the pattern of font sizes: the typography of the historical and contemporary publications lies in the fluent range for a reader with normal or correctable vision.

Does this mean that typography does not matter at all?

Some experiments show that such a conclusion is unwarranted. Lewis and Walker [27] studied the perception of text as a function of the font it is typeset in. They used the standard (in psychology) technique of measuring the reaction time for signals: for example, a person is asked to press one button when she sees the word “strong” on the screen, and another button when she sees the word “weak”. When the word “strong” appears in bold and “weak” in light weight, the reaction was significantly faster than in the opposite case. Experiments by Brumberger [9–11] show that the font influences the impressions about the author formed by the readers. This might show that typography might be important for other metrics of reading, besides readability or legibility. This might be very important because the aim of a book is not just to be read without errors: it should convey some message to the reader.

3 Proposed experimental setup

In the proposed experiment we study the influence of typography on the long term effect of texts on the example of Russian typography. The subjects are students of Bashkir State Medical University with normal or corrected vision, fluent Russian speakers. They are given short texts in Russian about history of neurology typeset with different fonts and layouts. We are going to use \TeX for layout and METAFONT to change the font parameters.¹

¹ There are several high quality free Cyrillic fonts in METAFONT format to enable such study.

The subjects are asked to read the texts and answer questions about them in writing. After this the texts and the answers are collected.

In one to two weeks the students are again asked to answer the questions about the texts. The difference between the number of errors in the first and the second battery of questions can be used as the metrics to study the influence of typography on the rate of long term effect of the texts.

4 Conclusions

The modern research has shown that some typographic rules of the past are evidently not grounded in legibility and readability requirements. It is still not quite clear, however, how and whether more subtle things such as text impression and long term effects depend on a work’s typography.

We propose a study of how typography influences the way the text is remembered. Such study might be of interest to the publishers of textbook and study materials, especially for Cyrillic script.

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