

Reading typography

The configuration of text rendered by printed, mechanical or electronic means encompasses most of what we call typography. Typography may have an impact on legibility, the ease with which strings of letter forms can be decoded into words by a competent reader, and it may serve to supplement or support the semantic content of a text communication. Reading, of course, is an impressive perceptual and cognitive feat, and studying the effects on it of both experimental manipulation and ‘naturalistic’ observation of typographic variables may aid our understanding of more fundamental aspects of object and word recognition, as well as of reading itself.

Typographic effects on legibility and typographic communications may operate at both small and large scales. At small scales, the forms making up individual letters (known as *glyphs*) have an impact on readers’ ability to distinguish and identify individual letters and hence to recognize words or symbols. Stylistic variants of letter forms such as italics and boldface may indicate emphasis, while stylized font families may convey cultural messages (e.g. “old-English”, “Broadway”, or cursive-style fonts). At larger scales, grosser features of typography such as margins, columnar organization, and inter-letter and inter-line spacing (termed ‘leading’) may also affect readability. Such features may also occasionally convey semantic content. An example of this is when very wide spacing (letter or line) is used to communicate opulence or sophistication.

How typography impacts legibility and readability has important applications in signage design. On highways, where drivers may need to read signs from great distance and at high speeds, typography may have an impact on safety. In this setting, the most important criterion of

legibility is the minimum visual (angular) size of letters needed (or inversely, the maximum viewing distance allowable) for good recognition of sign content. This criterion may be termed a *visual acuity* criterion; although in the case of acuity, it is the reader's functional ability that is assessed, whereas in legibility studies, a reader's functional ability, assumed to be constant, is used as a yardstick for assessing effectiveness of typographic manipulation.

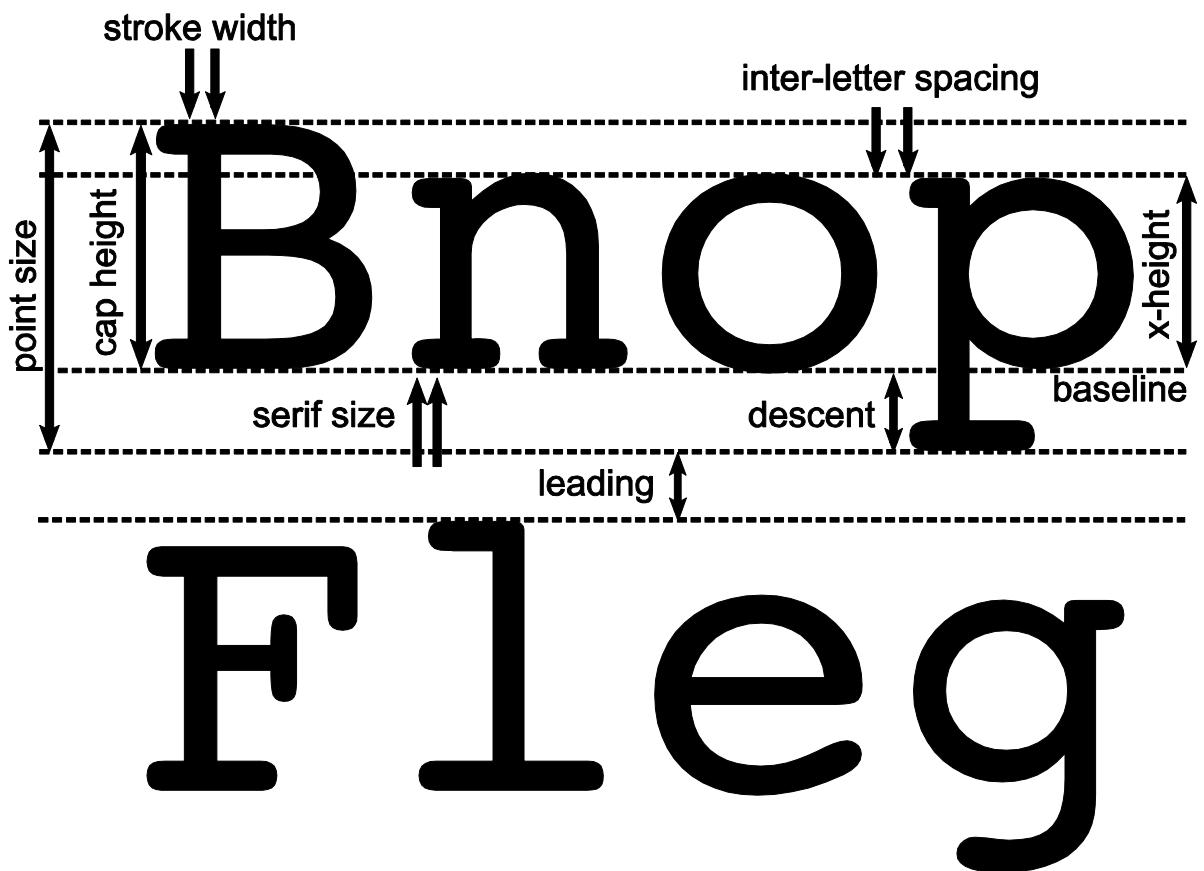
In recent years, many researchers have sought instead to use a *reading speed* criterion to define legibility. Despite advances in computer-controlled presentation and experimental paradigms, reading speed is still difficult to use in legibility studies, because of the high variability between individual text samples and in reading competencies of individual research subjects. To detect small effects despite these sources of noise, such studies often require many experimental trials.

In studies of font glyph legibility, visual acuity and reading speed criteria generally agree---seldom are letter forms of one font found to be more legible by one criterion and less legible by the other. Letter spacing, however, does seem to have differential effects on the two criteria. Generous spacing helps make visually small text more legible, but reading is generally at least as fast, and sometimes faster, for closer-spaced text when letter sizes are substantially higher than threshold size, possibly because the eye movements required to read are more compact.

Typography, of course, may have an economic impact, in that setting text with larger type, wider spacing, or wider margins, results in more space (e.g. print pages, sign dimensions) required to print the same content. Enhanced legibility, which generally requires more space, is sometimes compromised for the sake of economy. The balance point of this trade-off may shift

with changing demographics, as the number of older readers and readers with impaired vision increases.

Letter size is conventionally characterized by the vertical size of a font, in points. (A point is most often defined as 1/72.27 inch or 1/72 inch in digital publishing applications, but there are many other definitions as well, all reasonably close to one another.) Prior to computer typesetting, there was no commonly accepted way to measure exact point size of a font: A 12-point font was one which appeared to be the same size as other 12-point fonts. Nowadays, font point size usually refers to the vertical height required to set lines of text vertically abutting but not overlapping (i.e. with no *leading*, or extra space, added). Fonts on computers and the web are characterized by size measures in addition to points, such as pixels, but they also use only a vertical measurement.



Some key typographic parameters.

It is well known (and perhaps obvious) that increasing point size increases font legibility. However, characterizing font size by vertical size alone fails to capture the impact of horizontal letter and word size, which (within limits) also generally enhance legibility, whether achieved by increases in glyph width or in inter-letter or inter-word spacing.

One such typographic variable that is known to affect font legibility is fixed-width (each glyph fits into a “box” of fixed width, with space added as necessary) vs. proportional (box width varies with glyph width). Fixed-width fonts are more legible at very small character sizes (relative to visual acuity), whereas proportional fonts are more legible at medium and larger character sizes. Close-spaced type is also less legible at small sizes than wide-spaced type, and there is evidence that the effect of font proportionality is due merely to differences in letter spacing.

Another variable with a strong impact on legibility that is not captured by point size is x-height, which generally typifies the size of most of the lower-case letters. Thus fonts with large x-heights (relative to point size) tend to be more legible, because the glyphs are on average, larger.

A couple of common misconceptions about font legibility are worth noting: First, many believe that serifs have a strong impact on legibility (some believing that they increase legibility while others believe the opposite). Experimental evidence, however, suggests only a minuscule enhancement effect of legibility by the addition of serifs, and only at visually small sizes. This is likely a secondary effect due to the slight increase in inter-letter spacing that is required to accommodate the serifs.

Second, it is often claimed that mixed-case and/or lower-case text is more legible than all upper-case text, due to more distinctive letter and word shapes. Again, controlled experiments

show that for both acuity and reading speed legibility criteria, all upper-case text is more legible than lower- and mixed-case, when set in equal point sizes that are small relative to the reader's size threshold. With larger point sizes, the upper-case advantage disappears

Other variables known impact legibility are letter stroke width (which also usually varies, even within glyphs), with thick strokes tending to enhance legibility provided gaps and holes (termed 'counters') remain salient; and glyph width (or letter aspect ratio), with wider letters generally being more legible---a form of horizontal magnification.

Given variations the in letter shape and size within a single point size, it would seem that there is no simple way to characterize font size in a standard way that is meaningful across all fonts. Indeed, since some letters extend below, and some above the baseline, characterizing even a single reference location for individual letters is a challenge.

Comparing and ranking legibility of specific fonts is fairly straightforward, using a visual acuity, reading speed, or some other criterion. However, conclusions drawn are limited to the specific fonts chosen. Another approach to studying legibility is to design fonts parametrically so that they vary only in a characteristic of interest, such as stroke width or serif size. In this case, conclusions can be more general, but some may argue that special purpose fonts designed for such studies are less natural looking and unlikely to be used in ordinary printed matter.

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See also Object perception; Reading; Visual acuity; Word recognition; Rapid serial visual presentation.

Further Readings

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