Legibility

Takin



Read

it i

ability

PhotoDisc

What makes type eas

ng

in

sy to read—and why

By Kathleen Tinkel

Typography, once a craft practiced quietly by trade specialists, has been democratized. Thousands of computer users—not just those in the publishing business, as in the past—are suddenly responsible for setting type. Most of these new typographers are looking for advice on how to set type so it's easy to read.

That's not surprising, since there's not much useful guidance on this topic in computer manuals. And despite the recent boom in information on type and typography—with magazine articles and a spate of books, both new editions of old classics and brand-new works—too many of the precepts seem counterintuitive, and some even conflict with each other. It's not all that useful to look at what the pros do, either, since so much of what we get in the mail and on newsstands seems hard to read or ugly or both. (And a lot of it seems to ignore most of the advice in the books and magazines.)

One solution is to turn to research for scientific assurance about what's readable and what's not. We may notice that type seems hard to read when it's too small or set with no leading or reversed out of a color—but is it really hard to read, or merely irritating? In fact, there's good news and there's bad news: hundreds of studies of readability have been conducted over the years, but hard-and-fast answers to the most vexing typographic questions are surprisingly difficult to extract from the results.

In this article we'll look at some of the typographic guidelines for setting type and find out where those standards come from, how well (or poorly) they are confirmed by objective research, and what practical advice we can draw. This subject is enormous, so we need to begin by defining a few terms and setting limits on what kinds of typeset material we can usefully discuss.

## Terms and conditions

The terms "legibility" and "readability" seem to refer to the same thing, but they have acquired distinct meanings over time. *Legibility* is an attribute of the type (or even of the alphabet itself)—it refers to the ease with which we can recognize a character or distinguish it from another. We may say that I and l tend to be illegible in some typefaces, that Machine Bold isn't legible at small sizes, or that the italic *h* in many Garamonds tends to be illegible (too easily confused with the *b*).

*Readability* refers to type as it is set, and it can encompass not only the choice of an appropriate typeface for the circumstances but also its size, spacing, column measure, leading, page layout, and so on. The late Walter Tracy, writing in *Letters of Credit: A View of Type Design,* gave one of the clearest definitions of readability: "If the columns of a newspaper or magazine or pages of a book can be read for many minutes at a time without strain or difficulty, then we can say the type has good readability. The term describes the quality of visual comfort—an important requirement in the comprehension of long stretches of text but, paradoxically, not so important in such things as telephone directories or air-line time-tables."

"Readability" can have a variety of meanings, both because of the many types of materials we read and because of the varied ways we read them. We read a lot of "plain" text in books, magazines, newspapers, and so on, which can include both relatively easy reading for information or pleasure and denser, more difficult stuff in manuals or textbooks. But think of all the other kinds of reading we do in this modern age: evocative headlines that accompany magazine articles; lists and other reference materials (like Tracy's timetables); brochures and advertisements; labels and company logos; fanciful titles for books or movies; signs on passing trucks; store names as we drive along the highway; EXIT signs in public buildings; and even STOP signs at the corner. In fact, we are barraged by words, in print, on television, on our computers, and on the road.

However, advice on typographic practice has generally focused on running text (most of it on type for books). Published studies on readability take the same course, with very little of it directly applicable to display type, titling, trademarks, signage, advertising type, or any other of the varied forms of expressive or subjective typography. (See the sidebar "Readability and 'subjective typography'" on page 44.) Because the aims of this kind of typography are in a different class altogether, this discussion of legibility and readability, like virtually all others, will center on plain text.

Where do our conventional notions of what's readable come from? Most of them are inherited from typographic practice as it has evolved over many centuries. Lettering and typography evolved on an experimental basis, out of the practices of scribes, type founders, printers, and—eventually—type designers and typographers. This sounds haphazard, but the evolutionary time frame encompassed centuries. You could view the result as the typographic equivalent of survival of the fittest, with ineffective practices passing naturally from favor.

According to one source, the first recorded legibility test, comparing Didot with Garamond (Garamond won), was conducted by a typographer in France in the 1790s. Most of the more relevant formal studies since then have been done by psychologists, engineers, ophthalmologists, and educators, not by typographers. The researchers have studied various aspects of reading, reporting their findings in journals, oral presentations, magazine articles, and other venues. Most of these reports are difficult or impossible to find today—in fact, I suspect that many no longer exist. I did consult several more recent books (see the "References" sidebar on page 45) whose authors summarized historic studies and reported on work of their own.

Early studies employed a variety of measures, including the distance at which text became unreadable and measurements of eye blinks. But most of the more recent (and scientifically more credible) studies have measured reading speed, which—according to American researcher Miles Tinker—has been "accepted as the most valid technique for studying the legibility of printed material." There don't seem to be many studies specifically on comprehension, let alone on effectiveness—the difficulty of devising studies that could separate the effect of type and typography from copy, graphic design, color, and art is one of the reasons for this. But it pays to remember that most of the objective tests were measuring reading speed.

Two discoveries from around the turn of the century are among the most important test results about reading:

1. We read whole words, not one character at a time.

2. We read by moving our eyes in saccadic leaps (jumps along a line of text), pausing to read at regular intervals (fixations) rather than by moving our eyes steadily across the line. Scientists can record reading time and the number of saccedes, duration of the fixations, number of regressions (returning to already read text), and amount of doubling (accidentally dropping down a line instead of reading straight ahead).

In a fundamental way, these two discoveries make sense of everything useful we know about legibility and readability. So with them in mind, let's compare mainstream typographic practice with what later researchers have found.

## Letters, legibility, and typefaces

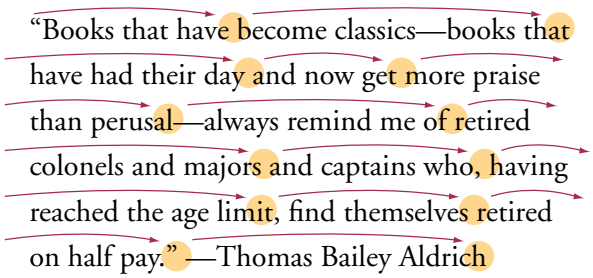
Illegibility is built into the alphabet. The tools of typography can enhance ambiguous letters, but we are stuck with a few inherently ambiguous characters, including some that are among those most often used in English. Various studies cite commonly confused characters: C and G; H and N; E and F; c and e; b and d and p and q (particularly among dyslexic readers); I and l (capital I, lowercase L); i and j; b and h; e, a, and s. Tight spacing introduces the possibility of ambiguous combinations—a P followed by a period can look like an R, rn can be confused with m, and Ti can be misread for Tl, for example. According to Tinker, experienced adult readers take these ambiguities in stride, but they cause special problems for children who are learning to read.

We often hear that certain typefaces—Bodoni, for instance, or sans serif faces as a class—are less legible than others. What research I find, though, suggests that the mainstream text faces are about equivalent in readability. In 1963 Tinker cited results of a speed-of-reading study he'd conducted with D. G. Paterson 31 years earlier. They compared ten typefaces set in 10-point type with 10-point leading and a line length of 19 picas, and found no statistically significant differences in readability among Scotch Roman, Garamond, Antique, Bodoni, Old

Style, Caslon Old Style, Kabel Light, and Cheltenham. Significantly less readable than those were American Typewriter (a regular typewriter face, not the ITC American Typewriter we use today) and Cloister Black, a sort of Old English face.

Two other studies, both conducted in the mid-1960s, tested sans vs. serif faces and showed no significant readability problems for the sans. One of these (cited in Herbert Spencer's *The Visible Word*) compared Gill Sans, Univers, Monotype Grotesque 215, Bembo, Baskerville, and Modern Extended No. 1, a fairly balanced range of sans and serif text faces.

That's not to say that serifs play no role in legibility. A number of studies have shown that we read more by the tops of letters than by the bottoms (see the illustration below). And when sans and serif samples are compared this way, most of the serif lines will be read more easily than the sans. On the other hand, many studies suggest that exaggerated contrast (shifts in lineweight) impairs reading speed, largely by making letters less legible, and sans serif faces tend to have very low contrast. Taking all this into account suggests that most sans serif typefaces may be slightly less legible than most serif faces, but that the differences can be offset by careful setting.




***When we read, our eyes travel along the lines in "saccadic leaps" (roughly approximated here by red arrows), pausing briefly at regular intervals called "fixations" (shown as gold circles). Occasionally we regress to reread a chunk.***

ITC has long asserted that a large x-height makes for more readable type, and Danish researchers Kim Pedersen and Anders Kidmose believe they have confirmed this, although their study included only 20 subjects and one pair of typefaces (ITC New Baskerville and Monotype Baskerville). It seems obvious that increasing the x-height provides more space for the details that distinguish one letter from another. But the fact that reading relies so heavily on the tops of letters suggests that ascenders are also important aids to readability. Other studies have shown that insufficiently distinct descenders cause confusion of one letter with another—i and j, n and p, p and q, for example. Since x-height is increased at the expense of the ascenders and descenders, it seems more likely that a balanced design, with a moderately large x-height and clear ascenders and descenders, is usually the most legible.

Over all, the test results seem to argue for moderate type designs; within that range, it appears that we actually have a good deal of latitude in choosing among text faces, both serif and sans, without making text hard to read.

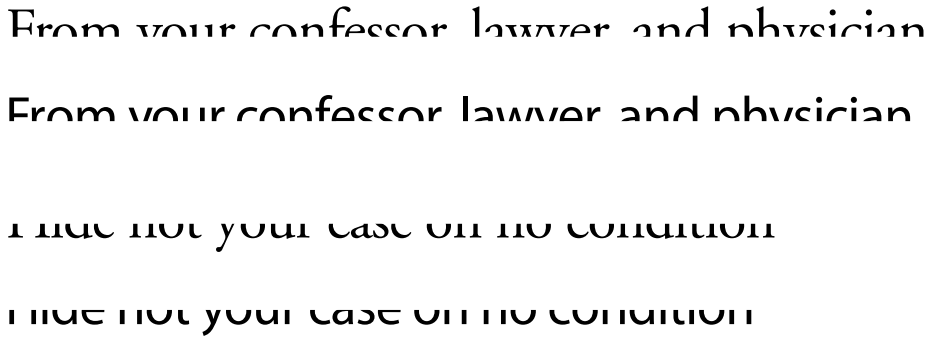
## Words and lines

Once you've chosen a typeface, of course, you have to compose the type, making decisions about size, letter and word spacing, line length (measure), and leading. What do we know about how these choices affect readability?

Common sense tells us that type size affects both legibility and readability, and studies seem to support this view. Paterson and Tinker tested size in several studies, finding that a standard text size (10- or 11-point, depending on typeface) was read significantly faster than smaller or—interestingly—larger sizes (the 12-point was significantly harder to read than 10 or 11). The smaller sizes seem to be less legible; larger sizes may pose subtler problems—inefficient saccadic eye movements may be part of the explanation.

Typographers tend to recommend longer measures for larger type sizes, and this too seems to be supported by research. Although Tinker apparently didn't think specifically in these terms, he did find higher reading speeds with a measure and type size that provide for from 60 to 70 characters and spaces (roughly 10 to 12 words) per line.

Leading tests seem oddly inconclusive. In 1932, Paterson and Tinker found that 10-point Scotch Roman text was more readable set with 2 points of leading (10/12) than when it was set "solid" (10/10); 10/12 was also better than 10/11 and 10/14.




***We recognize letters more by their top halves than by their bottoms—note how much easier to read the top examples here are. Serifs appear to aid in this recognition process (although exaggerated contrast within letters can have the opposite effect).***

Typographers recommend adding leading if you must set small type in long lines, and tests seem to support this. Tinker and Paterson found that adding 2 points of leading to 10-point text set on a 43-pica line made it about as easy to read as the same text set 10/10 on a 19-pica measure. When they set the 43-pica line with no leading or only 1 point (10/10 or 10/11), readability declined dramatically. Setting long lines of small type isn't

***Ascenders and descenders are important in distinguishing letters from one another—and here again, serifs seem to provide an additional cue to the letters' forms.***

recommended, in other words, but doing so without leading is a definite act of cruelty to the reader.

Although we occasionally see claims that justified type is either easier or more difficult to read than flush left/ragged right type, neither statement seems to be borne out by research. However, word spaces have an effect on how much text can be read with each fixation—so if they're too large (because of justification or other spacing controls), reading can be impaired.

## Typographic niceties

There has been little research into the readability of most of the subtle tools of typography—spacing (including tracking, kerning, and ligatures); avoidance of runs of hyphens; and use of small caps, old-style figures, true dashes, and typographic punctuation marks. This may be mostly because typographers haven't done much research into readability in general, or merely because the psychologists, ophthalmologists, and others who did study the subject weren't particularly aware that these were important typographic variables.

Typographers generally believe that natural letterfit and close word spacing are most readable, and this fits both with the discoveries of the way we read and with common sense. Tight character spacing can produce illegible combinations, as mentioned earlier (such as rn looking like m); too much space between letters may slow reading by altering the shapes of the words so they are less recognizable, and by reducing the number of words that can be read at each fixation.

Tinker compared old-style and modern (lining) figures and found a nonsignificant advantage for old-style figures in terms of reading speed and error rate. (Oddly, modern lining figures were easier to read at a distance—on a billboard, for example. In other tests, capital letters were also found to be more legible than lowercase when set large and at a distance, so these findings do seem to agree.)

Some typographers eliminate first-line paragraph indention or extra line space between paragraphs, striving for a cleaner, supposedly more functional look to the page. This practice infuriates many readers (me among them)—you cannot rely on a short line in the previous paragraph as a cue to the beginning of a new thought. Tinker's research finds such paragraphs less readable: indenting the first line of a paragraph increases readability by 7 percent. (He had nothing to say about extra line space, nor about the common practice of leaving the first paragraph flush left, but it seems clear that neither of these has the same capacity for distracting and irritating the reader.)

There doesn't seem to have been any study of the readability of small caps (either real ones or the kind we can fake with the computer). And what little mention there is of any aspect of hyphenation suggests that sensible word breaks do not have much effect on reading speed. I found no research on justified text set with more than two or three consecutive lines ending with a hyphen. There seems also to be no research on whether good typographic color aids or impedes reading.

Of course, the point of "fine typography" is, at least to some extent, beautiful pages. While this is subjective and difficult (read: expensive) to test, most typographers believe that beautiful type on gracefully laid-out pages is more readable than ugly type laid out carelessly. Readers sometimes complain about very bad typography, so ugly pages can clearly impede readability. But can you turn that around and say that using ligatures, small caps, old-style figures, true quotation marks and apostrophes, and real dashes contributes to readability? It's not clear—although attending to these niceties does make the typography conform more closely to long-accepted "professional" practice, which in itself may minimize distraction for the reader.

## Readability and "subjective typography"

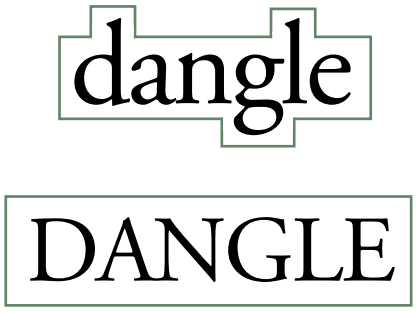
An interest in presenting legible text in readable fashion often seems at odds with the movement variously referred to as "grunge," "postmodern," or "deconstructivist" typography. English designer Phil Baines—an early proponent of this kind of subjective typography, quoted in the book *Typography Now, the Next Wave*—attacks the basic notion of legibility, which, he says, "presents information as facts rather than as experience." Indeed it does—and for most of us most of the time, that is exactly what we're trying to do.

Subjective typography seems to be as much graphic image as type, and its readability must be evaluated (and used) on that basis, like color, photography, painting, and other evocative imagery. This gets us out of neutral communication and into persuasion, even manipulation. (The ultimate in persuasive typography is the brand name—it's not by accident that so many of us anticipate the color, carbonation, and taste of a Coke when we see that familiar red type.)

By emphasizing type's evocative qualities rather than its legibility or readability, we also move from a broadly understood set of conventions into idiomatic niches. Subjective typography is often aimed at particular groups of readers—fans of certain kinds of music, or people who identify with a particular group. The readability of subjective display type hinges on reaching those who already understand the idiomatic imagery (or are motivated to try). But just as a blast of Italian opera or rap music from a passing car can fail to persuade those who are immune to (or loathe) it, idiosyncratic type may be read easily by only a few. In gifted hands, subjective typography can communicate brilliantly—but too much of the imitative work out there is simply bad.

## Reading conditions

It's frustrating for a typographer, but many of the factors that affect readability are completely out of our control—and may be unknown or difficult to anticipate. We have no control over whether the reader has sufficient light for comfortable reading, and cannot know how far away the text will be from the reader or at what angle it will be viewed. Sometimes people read on the train or bus and have to contend with vibration, odd reading angles, and poor (or variable) lighting conditions all at once. Office correspondence may go through generations of photocopying or faxing. Ads designed as full magazine pages may be used in a smaller format; type chosen for print ads may end up in a TV spot. Sometimes documents we create for print need to be "repurposed" for online viewing.




***Rather than deciphering letter by letter, experienced adult readers take in most words all at once, partly by recognizing their shapes—which is why lowercase is easier to read than all caps.***

Readers may have vision problems—some have permanent impairments, others may have forgotten their glasses. There is also the question of motivation—readers who really want to understand what is on the page will do better than those who aren't very interested.

Such impediments as these tend to exacerbate any typographic deficiencies. Tinker studied some of these factors:

- Holding a page a few inches farther away can make 12-point type effectively the same as 9-point, while 9-point type becomes simply illegible.
- Reading with the page flat on the table has the effect of distorting the type, exaggerating any quirkiness in the design.
- Poor contrast between ink and paper isn't much of a problem in normal reading light—readers are comfortable with paper colors ranging from yellow to gray and tolerate some colored inks on most white papers. But if you reduce available light, pages with lower contrast become impossible to read sooner than plain old black and white.

We can't control reading conditions, but we can often anticipate them. Sometimes the subject matter hints at likely problems—we can assume that a museum guide will be read in dim light, for example. People who read books on planning for retirement are likely to use bifocals. Shop manuals may be propped up at odd angles. Projects that seem likely to face such difficult circumstances need to be designed with greater emphasis on readability than normal.

## Bottom line

While researching and writing this article, I kept being reminded of Hippocrates' admonition in *Epidemics:* "To help, or at least to do no harm." It's clear that those of us who set words in type have the power to affect readability, especially negatively. Yet we can often do a good job simply by keeping out of the reader's way.

Set running text in one of the hundreds of standard text faces (including humanistic sans serif designs), at a reasonable size—usually between 9- and 12-point. Leave the letterfit alone (don't use tracking), don't enter two spaces between words or sentences, and don't allow justification to enlarge word spaces unreasonably. Use a measure that allows for 60 to 70 characters per line and add a couple of points of leading. Indent paragraphs (all except the first after a heading, anyway) by one em or a pica, and allow for reasonable margins so readers have a place to hold the book. Avoid reader distractions like typewriter quotes and apostrophes or double hyphens where dashes ought to be.

All these factors work together. If you use a typeface that seems to be harder to read than average—Bodoni, for example—you can compensate by taking pains with spacing, adding leading, or making other adjustments. If you're pretty sure the work will need to be read by people with impaired vision, avoid low contrast and small sizes. If you anticipate poor lighting, avoid small type and designs with fine hairlines, and don't use colored inks or papers.

In the end, achieving readability seems to be one of those 80/20 solutions. Mastering the basics should get you 80 percent of the way to readable type for experienced readers in normal reading conditions. Once you master that, you can strive for the other 20 percent, whether that means catering to particular needs (such as readers who have impaired vision or read in a poor environment), or aspiring to beautiful typography, ground-breaking page design, creative expression, or great originality—for which there are no rules. ◗

*Kathleen Tinkel writes about typography, graphic design, and digital prepress for many publications. Her work appears regularly in* Adobe Magazine.

## References

Although this article makes indirect use of many of the standard works on typography published in the past couple of centuries, in preparing and writing the piece I read or referred to these books:

*In Black & White: An R&D Report on Typography and Legibility,* by Kim Pedersen and Anders Kidmose (Graphic College of Denmark, 1993)

*Language & Typography,* by Cal Swann (Van Nostrand Reinhold, 1991)

*Legibility of Print,* by Miles A. Tinker (Iowa State University Press, 1963)

*Letters of Credit: A View of Type Design,* by Walter Tracy (David R. Godine, 1986)

*Typography: How to Make It Most Legible* (2nd revised edition), by Rolf F. Rehe (Design Research International, Carmel, Ind., 1976)

*Typography Now, the Next Wave,* edited by Rick Poynor and Edward Booth-Clibborn (Booth-Clibborn Editions, 1994)

*The Visible Word: Problems of Legibility* (2nd edition), by Herbert Spencer (Hastings House, Publishers, 1969)



All product pricing and offers represented in *Adobe Magazine* are applicable in the U.S. and Canada only. Prices and availability outside this area may vary; residents of other countries should check with their distributors regarding offers available to them.

**browse**