LINE LENGTHS *and* STARCH SCORES

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There is a wide range of confusing and often contradictory recommendations for the length of typeset lines. This study investigates the lengths of lines used in advertising body copy. It compared length in terms of character counts and pica widths on the basis of adjusted Starch "read most" scores. The study hypothesized a normal curve with lower scores for the shorter and longer lines and scores above the mean for the lines in the middle of the distribution. The study found support for lower scores for short lines. It also found some evidence of two optimum line lengths rather than one. There is still confusion about the reading ease of the longer lines.

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In the graphics literature there are a variety of often contradictory recommendations regarding optimum line lengths as well as minimum and maximum acceptable lengths. David Yarnold, a well-respected newspaper designer, critiqued a number of newspapers at a recent conference for having lines that exceed 17 to 18 picas which he recommended as the maximum.[1] However Tinker and Patterson in their classic book on legibility, recommended a line length range of from 18 to 24 picas with 19 as an optimum.[2]

Most of the recommendations are based on the number of characters in a line and that depends upon the alphabet size of the particular typeface being used. Arnold recommends 1½ times the lower-case alphabet (39 characters) as an optimum line length. For an acceptable range he suggests using 75% of that optimum (30 characters) as a minimum and 150% (60 characters) as a maximum.[3] In contrast Craig recommends 2½ alphabets (65 characters) as the optimum and 50 to 70 characters as the ideal range.[4]

These conflicting recommendations could reflect differences in reading patterns with books, newsletters, magazine articles, newspaper articles and print advertising all having different needs. No study has been found that compares the different reading patterns of the various media audiences.

One recent experimental study of magazine article formats investigated the legibility of lines with 29, 39, 49, 59, 69, and 79 characters.[5] The study found consistently lower reading scores for short lines (up to 39 characters or 14 picas) but could find no identifiable optimum line length. Furthermore the longer lines tended to get higher reading scores.

THE STUDY

This study investigates advertising line lengths using the "read most" scores provided by the Starch Readership Service as the independent variable. Six years of the Starched magazines sent to educators (1980-1985) provided a total sample of 153 advertisements. The body copy in these advertisements was measured in picas, the average number of characters per line was computed, and these two dependent variables were recorded along with the Starch score.

Because product category is a serious confounding variable, the Starch score was adjusted to compensate for the relative interest of the various product categories. This was done by computing a mean value for the overall "read most" score for all advertisements used in the study. Then an index was computed for the 15 primary product categories that appeared in these magazines. The index was used to increase the weight of the score in those categories where there is little interest, such as insurance, and to decrease the score in the high-interest categories, such as food and automobiles. The categories and their compensating indexed values are as follows:

Category	Index
Financial	1.16
Office	1.03
Insurance	1.33
Automotive	.88
Liquor	1.09
Cigarettes	1.21
Lodging	.88
Health/Fitness	1.14
Information/Media	.98
Institutional/Corporate	1.07
Apparel	.95
Electronics	.86
Transportation/Travel	1.12
Home/Crafts	.72
Food	.70
Personal Care	.98

The objective of this study was to determine the common line lengths used in these advertisements in terms of both character counts and pica widths and then compare the line lengths on the basis of the Starch scores. The study attempted to find out if the Starch scores for these advertisements followed a hypothesized normal curve with the longer and shorter lines having lower Starch scores. The average lengths in the middle of the distribution were hypothesized to have higher scores than the mean. Specifically is there any observable pattern that would suggest an optimum line length and a minimum and maximum range?

FINDINGS

One finding of this study is that while the line lengths in characters do generally follow a normal curve, the curve is dramatically skewed to the left. The range for the number of characters per line is from 19 to 102 with a mean of 48. However the frequency count aggregates between 31 and 45 as can be seen in the frequency distribution depicted in Table I.

This first analysis of number of characters used 18 equal interval cells of five characters. In order to compare the average Starch scores by groups these 18 cells were collapsed to nine. This grouping is seen in Table II. The overall Starch scores range from 0 to 34 and the mean score was 9.8

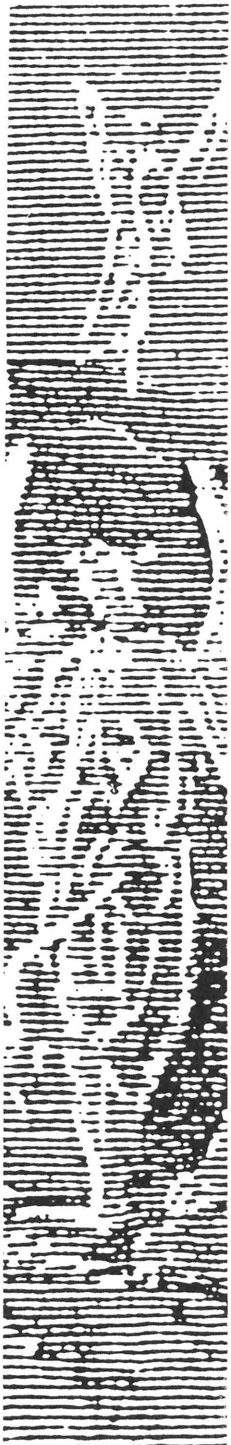


Table I. Characters-per-line Frequency Distribution

Characters	N	Distribution
15-20	1	X
21-25	6	XXXXXX
26-30	14	XXXXXXXXXXXXXX
31-35	19	XXXXXXXXXXXXXXXXXXX
36-40	20	XXXXXXXXXXXXXXXXXXXX
41-45	25	XXXXXXXXXXXXXXXXXXXXXXXXX
46-50	12	XXXXXXXXXXXX
51-55	12	XXXXXXXXXXXX
56-60	9	XXXXXXXXX
61-65	9	XXXXXXXXX
66-70	10	XXXXXXXXXX
71-75	5	XXXXX
76-80	4	XXXX
81-85	0	—
86-90	3	XXX
91-95	0	—
96-100	3	XXX
101-105	1	X

Table II. Starch Scores by Character Count (Equal Interval Cells)

Characters	N	Starch X
16-25	7	6.6
26-35	33	9.6
36-45	45	9.5
46-55	24	12.3
56-65	18	8.1
66-75	15	11.2
76-85	4	5.5
86-95	3	5.0
96-105	4	9.8
Total/Mean	153	9.8

Table II generally exhibits the hypothesized pattern. The shorter lines with from 15 to 25 characters have a lower average Starch score of 6.6. The scores begin to increase as the number of characters increases. The mean character count of 48 is included in the group that has the highest Starch score of 12.3. The middle of the range drops below the mean to 8.1 but in the 66-75 category the score bounces back up to 11.2. Then it begins to fall as the character counts increase beyond the mean or the middle of the distribution with scores of 5.5 and 5.0 for the 76-85 and 86-95 categories. The final group with the longest lines (96-105) jumps back up to the overall mean score of 9.8.

There are two surprises. First is the observation of two potentially optimum character counts. These are the only two groups that are clearly above the mean. Second is the increase in scores in the tail end of the distribution where the averaged Starch scores reach the overall mean. Of course, all of these means in the three categories in the right tail of the distribution are based upon very small cell numbers.

Given the unequal cell sizes, statistical tests of significance are problematic. A one-way analysis of variance test of these categories, however, finds the difference in the scores to be significant at $p. < .05$. ($F = 2.66$, d.f. = 8, 144).

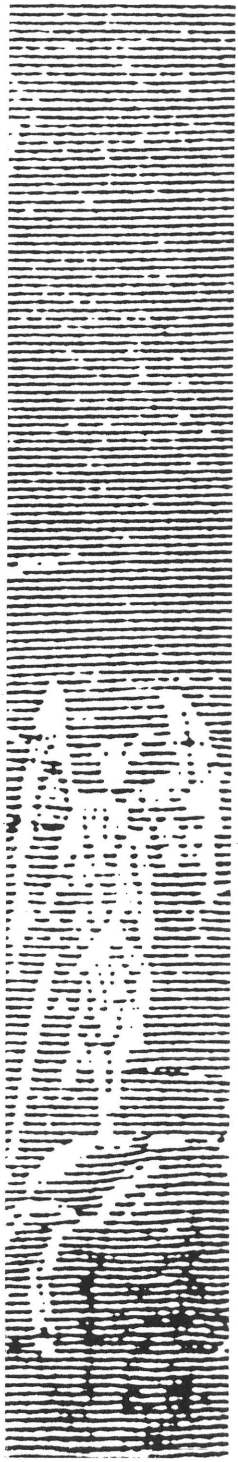
When the data is redistributed using categories determined by the cell width of the widest group (16), then the pattern of significance continues to be seen. Table III displays the data broken into ten cells where the intention was to come as close as possible to an N of 16 per cell. Obviously this can not be exact because of the natural breaks in the cell distributions.

Table III. Starch scores by character count (equivalent cell sizes)

Characters	N	Starch X
19-26	10	6.2
27-32	16	9.4
33-36	17	10.2
37-40	17	9.4
41-42	16	9.7
43-48	16	9.7
49-55	17	13.3
56-64	15	8.0
65-73	16	12.0
74-102	13	6.8

In Table III the lower scores for the shorter (19 to 26) and longer (74 to 102) lines are even more apparent. There are also two cells (49 to 55 and 65 to 73) with very high scores above the mean. The group of 33 to 36 characters is also slightly above the mean. One-way analysis of variance finds these sets of scores to be significantly different from one another at $p < .05$. ($F = 2.47$, d.f. = 9, 143).

The Starch scores can also be compared on the basis of line length in picas. There is a correlation, of course, between number of characters in a line and the length of the line in picas. Therefore the same skewed distribution is apparent. The range was from 8 to 44 picas and the mean was 20. Table IV displays a frequency distribution for the line length in picas.



What is of interest in Table IV is the identification of the most commonly specified line lengths. From the frequency distribution it can be seen that there are two groups of line lengths that are most often used. They are 13-14 picas and 21-22 picas. As can be seen in Table V these same two groups also have the highest Starch scores.

Table IV. Frequency Distribution for Line Length in Picas

7-8	1	X
9-10	9	XXXXXXXXX
11-12	18	XXXXXXXXXXXXXXXXXX
13-14	30	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
15-16	8	XXXXXXXX
17-18	14	XXXXXXXXXXXXXX
19-20	15	XXXXXXXXXXXXXXX
21-22	23	XXXXXXXXXXXXXXXXXXXXXXX
23-24	4	XXXX
25-26	1	X
27-28	3	XXX
29-30	3	XXX
31-32	5	XXXXX
33-34	3	XXX
35-36	3	XXX
37-38	5	XXXXX
39-40	2	XX
41-42	6	XXXXXX
43-44	2	XX

Table V displays the data grouped as much as possible into natural cells. This display also makes it a little more clear where those longest lines fall.

Table V. Starch Scores by Pica Lengths

Column Width	N	Starch X	
7-11	15	8.6	
12	13	10.5	
13	17	10.5	Average
14	13	10.8	= 10.6
15-17	13	9.0	
18	9	11.2	
19	6	11.5	
20	9	10.3	Average
21	16	10.4	= 10.7
22-28	13	9.2	
29-33	10	9.4	
34-39	10	7.5	Average
40-44	9	8.7	= 9.0

While these scores are not statistically different (F = .47, d.f. = 9, 137) the pattern is observable and probably not a function of chance. In other words, the line lengths that are used the most often are line lengths that seem consistently to get higher Starch scores. The shorter and longer lines, as well as the middle or the distribution, consistently score lower Starch scores.

CONCLUSIONS

This study of advertising line lengths did not provide clear support for the hypothesized normal curve. There is support for the hypothesis that shorter line lengths (up to 11 picas and 26 characters) receive lower reading scores.

Surprisingly the concept of optimum was supported but in an unpredicted way. There seems to be two optimum line lengths as evidenced in both the character counts and the pica measures (Table VI). These two optimum lengths are roughly equivalent to the standard two-column and three-column formats for an 8½ x 11 page size. Further research might investigate whether we use these line lengths because they are easier to read or are they easier to read because we are used to seeing them?

Table VI. Optimum Line Lengths

Characters	Picas
49 to 55	13 to 14
65 to 73	18 to 22

The longer line lengths are still in question. In the analysis by character counts, scores decreased after line lengths of 76 characters until reaching the longest group (96-105) where the scores jumped back up to the mean. In the analysis by pica lengths the groups on the longer end of the distribution were generally below the mean. The analysis of this data is hampered by the long tail in the distribution and the small number. There definitely needs to be more research conducted to try to determine what is happening to reading scores typeset on these longer line lengths.

REFERENCES

1. Dave Yarnold, Colorado Press Association Annual Conference, Denver, Feb. 21, 1986.

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3. Edmund C. Arnold, *Ink on Paper* (NY: Harper & Row, 1963).

4. James Craig, *Designing with Type: A Basic Course in Typography* (NY: Watson-Guptill Publications, 1971).

5. Sandra E. Moriarty, "A Search for the Optimum Line Length," *Journalism Quarterly,* (Summer, 1986) 63:2 (1986) 337-340.