

The length hierarchy in handwriting and signatures

1. Introduction

This contribution attempts to show how a linguistic analysis of handwriting can generate interesting results and support graphematic theories by using the length hierarchy as an example. The length hierarchy will be matched to handwritings and used as an explanation for certain phenomena. In particular, I will look for evidence in signatures, which I will describe as marked forms of handwriting.

2. The length hierarchy

Primus (cf. 2004) divides letters into at least two segments, which she calls head and coda. The following rules apply to distinguish both parts:

1. Codas do not have length.
 2. Heads fill the x-height in the shortest possible way.
- (cf. Fuhrhop/Peters 2013, p. 193)

This method allows us to discern between head and coda for almost all letters. Therefore, we are able to distinguish several classes of heads and codas: Letters with long heads (|b|, |p|, |q|, |d|, |g|, |k|, |h|, |t|, |β|, |j|, |f|), skew heads (|v|, |w|, |x|, |z|, |s|), short heads (|m|, |n|, |r|, |l|) and compact letters (|i|, |u|, |a|, |e|, |o|).

Compact letters constitute the core of a graphematic syllable, which is defined by the form of its segments. It appears that letters with length seem to stick to the edges of a syllable, while letters without length have a position nearer to the core. An explanation for this is proposed by the idea of a length hierarchy (cf. Fuhrhop/Buchmann 2009). This hierarchy sorts letters by the form of their heads.

It is possible to find this length hierarchy in handwriting, too. Figure 1 shows the length hierarchy for German educational fonts.

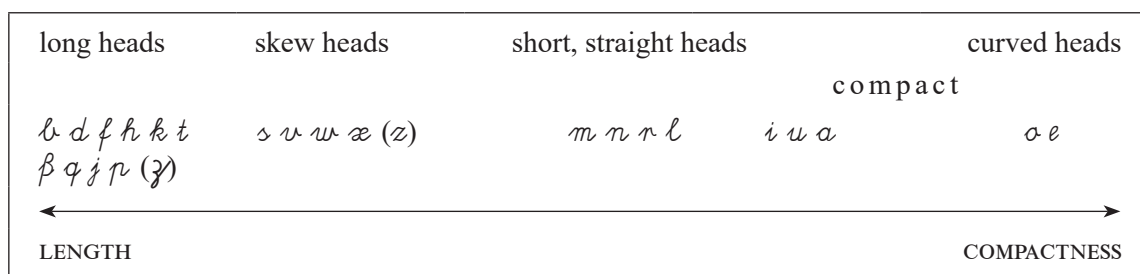


Fig. 1: The length hierarchy in German educational fonts

Psycholinguistic evidences indicate that the structuring of syllables could simplify reading (cf. Drews 2011). If the length hierarchy does, in fact, facilitate reading, it should not be as prominent in cases in which reading is not the primary purpose. Such cases are signatures. My thesis is that letters are leveled according to their position in the length hierarchy. That means, letters with length are more visible in signatures than letters without length, such as compact letters. Leveling describes the reduction of distinctive features of

letter. As a result, the visual difference between syllable core and edges is increased and the alternating structure of the syllable becomes stronger (cf. Primus 2003).

If data support this thesis, it would be an indication of a possible structural classification of letters. This would support the idea of a length hierarchy.

3. Signatures as extreme forms of handwriting

My supposition is that a principle of economic writing lessens readability in favor of writability. Frequently written words are optimized in their production at the expense of reception: I'm writing fast, so I'm writing indistinctly. An extreme example of frequent writing is surely signatures. Signs of economic writing are normally very plain in signatures.

And these signs can be identified in signatures. Some examples do comply with typographic graphs, though, while others do not show any recognizable graphs at all. The latter examples often exhibit ascenders and descenders, though (cf. Fig. 2):



Fig. 2: Two extreme signatures

It is obvious that, just like handwriting, signatures change over the years. With increasing production frequency, signatures increasingly differ from regular handwriting. This contribution attempts to confirm that assumption by classifying the sample signatures into three types:

- 1) *isographic*: All the graphs of a signature match the regular handwritten graphs. Small variations may occur, of course. Figure 3 presents examples of isographic signatures:



Fig. 3: Examples of isographic signatures

- 2) *allographic*: In allographic signatures, the concrete form of some graphemes differs from the graphs of the regular handwriting (cf. Fig. 4):



Fig. 4: Examples of allographic signatures

Some graphemes may be recognized, but they do not necessarily match the prototypes used in the regular handwriting.

- 3) *logographic*: The third type of signatures combines all the types in which graphs do not match any usual prototype of the Modern Roman Alphabet. Thus, the word cannot be read in a linear way – as normally allowed for by our alphabet – but must be

read entirely as one segment. It does resemble logographic signs, in which segments only make sense in their combination as one sign (cf. Meletis 2015, p. 125). Examples for logographic signatures are shown in Figure 5:



Fig. 5: Examples of logographic signatures

Due to the numerous variations in handwriting in general and signatures in particular, the proposed classification is not always unambiguous. Transitions between types are smooth.

4. Outcomes

4.1 Economic writing

Frequent signers seem to write logographically more frequently and very rarely isographically (cf. Fig. 6). This indication supports the idea of economic writing.

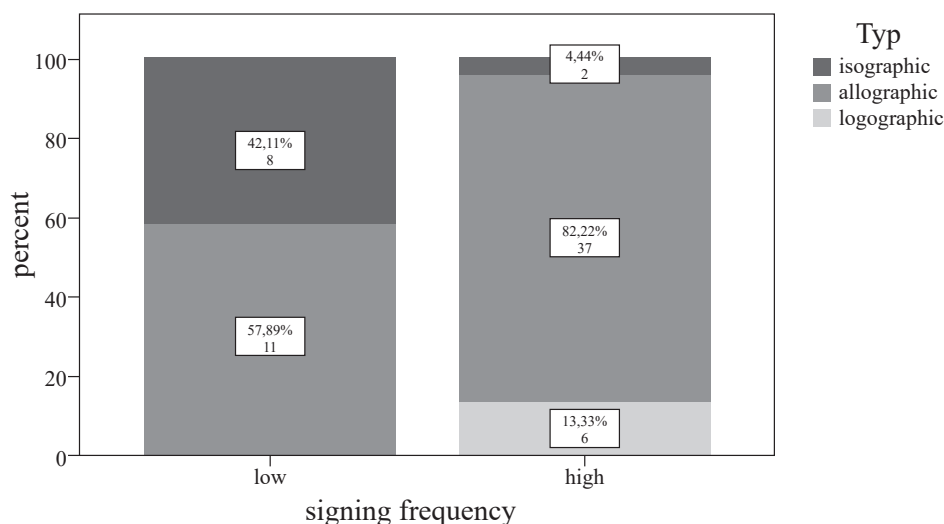


Fig. 6: Distribution of signature types per signing frequency

4.2 Lengths remain visible

A leveling of compactness occurs in 58.2% of signatures, while a leveling of length only occurs in 19.1% of length-containing signatures. So, lengths are considerably less frequently leveled than compact graphemes. This supports the thesis that lengths are particularly useful in signatures for determining them in their entirety: Lengths support identification of the word and therefore, they are not leveled in economic writing.

4.3 Reduced syllable cores

More than half of the signatures (51.8%) that contained a reduced syllable core (cf. Evertz 2016), presented this core in a leveled manner.

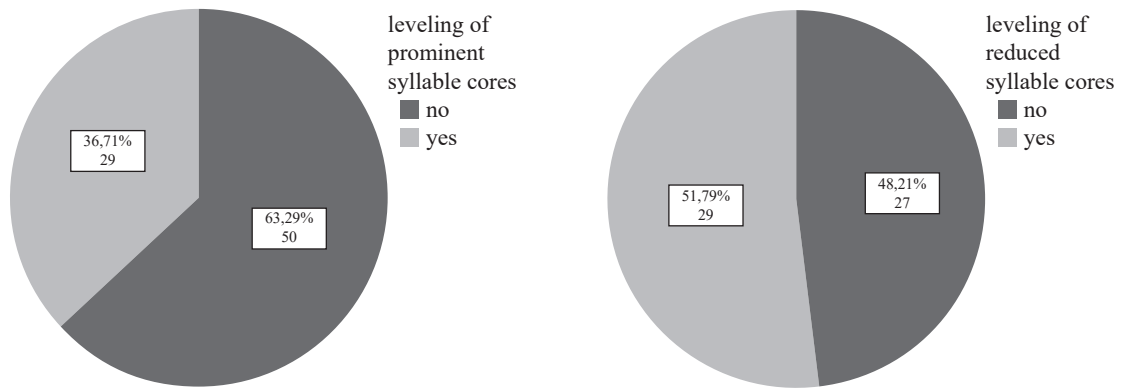


Fig. 7: Leveling of prominent and reduced syllable cores compared

The difference between the frequency of leveling of prominent and reduced syllable cores suggests a more or less apparent pedification of signatures.

However, it must be noted that reduced syllables occur on the right edge of signatures by nature and could be leveled in terms of production. This tendency contradicts the observation that the right edge is specifically marked, though. Apparently, the leveling of reduced syllables seems to serve a more important purpose, which outweighs the right-edge marking. The varying graphic quality of syllables could highlight the foot structure of the written word.

4.4 Right-edge marking

The right edge is more specifically marked in 62% of signatures than the writing of other syllable segments would suggest. The most common form of right-edge marking is by means of a horizontal stroke (35.4%). This is not very surprising, since this stroke meets our right-facing writing orientation. However, a marking by length is also possible – and occurs more commonly than you might think (26.6%). This is surprising, considering that only 20.3% of signatures are based on a grapheme chain that ends on length by default.



Fig. 8: Examples for length-based right-edge marking

The right edge can apparently be marked by length regardless of the based grapheme chain.

This conclusion could be a sign that the internal structure of signatures does not seem to be relevant, but its external restriction is – it does not seem to depend on specific graphemes, but on the signature in its entirety. It is implied that the readability of specific segments is diminished in favor of identification of the compound signature.

4.5 Leveling of letters

Due to the small sample, the analysis of which letters are leveled most often, and which are not, can only be attempted. I do not count letters that occur in less than 10% of signatures. The following list is sorted by frequency:

t	d	h	l	k	u	s	a	c	i	p	o	m	g	n	r	e
0,0	0,0	8,0	9,5	13,0	15,8	20,0	20,5	25,0	27,0	27,3	30,8	31,3	37,5	44,4	45,2	45,9
%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%

Tab. 1: Frequency of leveling per letter

There is a discernible tendency: Letters, which are positioned near to the syllable's core or are part of the core (like |e|, |r|, |n|, |m|, |o|) are more frequently leveled than letters which are further away from the core (like |t|, |d|, |h|, |k|, |s|).

5. Conclusion

In this article, a length hierarchy for handwriting was established. For further support of this transformation, features and functions of the typographic length hierarchy were located in extreme handwritings, such as signatures. To this end, I assumed the principle of economic writing, which means that the writing saves on features that are less relevant for defining a graphematic syllable and thus less relevant for a rapid capture of the inherent word structure. These observations support the concept of the graphematic syllable by Primus (2003), who defines a syllable by its alternating structure. A strong difference between length and compactness improves this alternation even further.

It was shown that the transformation of graphematic principles and methods of analyzing can be quite productive and can serve as further support for grapho-linguistic theories.

References

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