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SELECTED ASPECTS OF PHONOSTATISTICS IN AMERICAN POETRY

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1. Introduction

Since the studies on sound symbolism gained momentum with Sapir's work (Sapir 1929) experimental studies have cropped up seeking both universal and language particular properties of various sounds and experimenting with data coming both from natural languages (Jespersen 1933; Brown 1958) and artificially created words (Newman 1933). Recently, thanks to computer aided methods in linguistics, the findings of those experimental studies have had a chance to be verified on the whole corpora of sound symbolism rich material, like onomatopoeia (Sobkowiak 1990), or some literary text samples. Poetry, for example, might seem like a potentially interesting study material that, as the readers perceive it, contains the still undefined and ungraspable expressive power that draws pictures in our minds and makes us hear sounds and melody not to be heard in non-poetical text. It is certain sounds that are said to contribute to this sound-symbolic effect carried out in poetry. Attempts that have been made to assign specific sound-symbolic properties to individual sounds have predominantly focused on individual poems (cf. Fonagy 1983; Tsur 1992) representing rather small samples of linguistic material. An example of a sound-symbolically oriented analysis of a Hungarian poem, where the phoneme /k/ seems to play an important role (Tsur 1992: 158) is a typical instance of a micro scale analysis, which although no doubt valuable, lacks in the power of statistic significance that can only be delivered by phonostatistic analyses of corpora not only going beyond the size of individual poems but, whenever the search for universal sound-symbolic properties of poetry is intended, going beyond the works of individual poets.

Having seen the phonostatistical analysis of a corpus of English onomatopoeia (Sobkowiak 1990), whose phoneme frequencies were then contrasted with the phonostatistics of the remaining part of the lexicon, and seeing that o-words exhibited patterns of over- and underrepresentation of certain phonemes that were significantly different from those observed in the remaining part of the lexicon, I was tempted to ask myself the question whether corpora of poetry intuitively perceived as sound-symbolically charged, would exhibit similar patterns of significant differences in phoneme frequencies compared to some phonosymbolically neutral text. The first important question that such a study would answer was whether poetry being diluted with phonosymbolically inert text would exhibit any statistically significant differences when compared to a non-poetical text corpus, and the second was whether the patterns of over- and underrepresentation would show any universal regularity disregarding the poetical genre being examined and, finally, whether those patterns would be similar to those exhibited by onomatopoeia. It would also provide answers to the question whether the patterns of difference as exhibited in major sound classes would in fact be similar or different from those seen in o-words and if different, what kind of differences are to be expected. It is not, however, the aim of this study to provide an explanation on the exact origin of the differences in the phonostatistics of poetry and non-poetical text.

2. The data

In order to answer the questions put forward in the previous section a selection of American poetry samples was subjected to basic phonostatistical analysis providing individual frequency figures (see Appendix). The corpora selected come mostly from the 19th century and include Longfellow (9,805 segm.), Poe (46,343 segm.), Whitman (429,912) and Dickinson (47,691). In order to provide a wider variety of poetry genres, samples of Ginsberg's poetry (18,379) and Plath's poetry (13,748) were also included. In fact it is a wide variety of genres (from Poe's idealism through Whitman's transcendentalism and conventional poetry by Longfellow to Plath's confessional poetry and Ginsberg's "trash can" style) which motivated my choice of poetry samples and which, as I hoped, would also be reflected in the phonostatistics of those samples.

The control corpus is a compilation of non-fiction text samples from the end of the 19th century including samples of biographies, letters and journalism – all downloaded from the Internet and sized 73,767 segments. With the oldest poetry samples (Poe) dating back to mid 19th century and the latest ones to approximately mid 20th century, the time span separating the various poetry samples from the control corpus seemed reasonably short for this type of analysis. All these corpora were first transcribed phonemically with the abundant help of computer software, which (although using the RP dialect as the model for transcription) did provide transcription for the r-colored pronunciation in word final positions. Next, phoneme frequency counts were obtained from the transcribed corpora and the z-score test of significance was applied.[1]

3. The analysis

Tables 1-7 in the Appendix present the phoneme lists containing only those phonemes whose frequency of occurrence was significantly higher or lower from the frequency of occurrence of phonemes in the control corpus. Z-scores with the absolute value exceeding 1.96 indicate $p \leq 0.05\%$ and those with the value of Z exceeding 2.56 correspond to $p \leq 0.01\%$. The (–) sign indicates that a sound is underrepresented in the non-poetical text corpus.

The results of the phonostatistical analysis displayed in the Appendix show that first of all there is a large number of significant differences in the phoneme occurrence frequencies observed in various poetry samples and those found in the corpus of non-poetical text.

Table A. The (+) sign indicates items more frequent (overrepresented) in the highlighted corpora, the (–) sign indicates the items underrepresented in these corpora. When the sign is in brackets, it indicates that the difference in frequency is statistically insignificant.

	ONOM/LEX	POE/TEXT	DICKIN/TEXT	WHITM/TEXT	LONGF/TEXT	GINSB/TEXT	PLATH/TEXT	T-WHIT/TEXT
Voiced consonants	(–)	+	(–)	+	+	+	(–)	+
Voiceless consonants	+	–	(+)	–	–	–	(+)	–
Fricatives	–	+	+	+	+	(–)	(+)	+
Stops	+	–	(–)	–	–	(–)	(–)	–
Vowels	+	–	(–)	–	(–)	+	–	–
Diphthongs	–	+	+	+	(+)	(+)	+	+
Approximants	+	+	+	+	(+)	+	+	+
Nasals	(–)	+	–	+	(+)	+	(–)	+

[1] I am grateful to my colleague Michał Jankowski, who wrote the phonemic transcriber and the phoneme frequency counter which I have been using in my research.

Table A above groups all the major natural classes to provide a more compact view on the patterns of phoneme over- and underrepresentation in the poetry corpora when contrasted with the control corpus and compares them with the data for English onomatopoeia taken from Sobkowiak (1990) whose control corpus was Trnka's (1968) lexicon sample taken from the *Pocket Oxford dictionary of current English*. The results shown in the last column of Table A are based on the analysis of a combined corpus of all the poetry samples with the exception of Whitman, whose relatively large sample size would significantly bias the phonostatistics of the poetry total.

Most of the poetry samples analyzed in this paper, no matter how different genres and styles they represent (from Poe's transcendentalism to Ginsberg's "trash can poetry") show general agreement on patterns of under- and overrepresentation of major natural classes when compared with the control sample. Such an indication of universal traits in the phonemic make-up of poetry irrespective of genre is in itself a very interesting finding yet to be corroborated on more poetry data. Let us finally take a look at some individual sounds and see how the phonostatistically significant differences operate on the segmental level. The consonant /k/, for example, being one of the peripheral consonants known for their derogative sound-symbolic connotation (Taylor – Taylor 1962: 347; Tsur 1992: 158) is significantly overrepresented in Plath and Ginsberg, which is unlike any other poets represented in my corpus. This finding is very interesting in view of the fact that the images found in Plath's poetry are full of nightmarish pictures of death and dying (cf. Kopcewicz – Sienicka 1982: 150) and Ginsberg's writing is filled with vulgar and obscene language (cf. Kopcewicz – Sienicka 1982: 165) much of which nicely coincides with Fonagy's (1983: 90) remark that "the /k/ sound is hard and unpleasant because the relevant articulatory gestures are closely related to the effort required by anal excretion". The fact that in Ginsberg also three other peripheral consonants /m/, /b/ and /g/ are overrepresented and none other in Plath, adds even more spice to the "peripheral" case (it should be added perhaps that each of the other poetry samples cannot boast more than one significantly overrepresented peripheral consonant).

Table A shows that poetry favors voiced consonants (with the exception of Plath and Dickinson), fricatives (with the exception of Ginsberg), diphthongs (only in Ginsberg the difference isn't statistically significant), approximants (failing to reach significance in Longfellow), and nasals (with the exception of Plath and Dickinson). In all poetry samples where the difference is significant, stops are underrepresented and so are vowels with the notable exception of Ginsberg. Interestingly enough, the pattern of difference between the phoneme frequencies in English onomatopoeic words and the rest of the lexicon is totally unlike that of poetry and the control corpus it was contrasted with. In fact, the relation between these patterns of differences is, for the most part, of a truly polar, or complementary character. O-words contrasted with the rest of the lexicon show that their diphthongs are significantly less frequent and vowels are significantly more frequent. Stops are overrepresented, whereas fricatives are underrepresented. Voiced consonants count significantly higher in o-words, while the voiceless are underrepresented (although the difference isn't statistically significant). Although one is tempted to explain (away) the differences observed for both samples by the sound-symbolic properties of certain sounds/sound classes, it is surprising that patterns of over- and underrepresentation for major natural classes should be so different in o-words and poetry. Obviously, these two samples are of a different nature (o-words being lexicon and poetry text) as are the two control samples respectively. This fact alone, however, may not be enough to justify the differences of the magnitude shown in Table A. What's interesting, it seems that in some respects the phonostatistics of poetry suggest that it favors more of the segments/sound classes that could be expected from a phonosymbolically loaded corpus than onomatopoeia. The overrepresentation of voiceless consonants in o-words, for example, being a class of sounds indicative of "vocal incapacity" (Wescott 1971: 10) and thus "unfit" for onomatopoeia considered to be a "vocal" section of the lexicon expected to favor salient features of referents, is not the case in the poetry corpus analyzed here. Also, as observed in onomatopoeia, the underrepresentation of voiced consonants considered big (Brown 1958: 113; Brown – Nutall 1959: 444) and thus possibly bearing a potentially high expressive value, is not exactly what one would expect in this inherently expressive corpus, whereas their overrepresentation in poetry being definitely more expressive than the non-poetical text it was contrasted with, is more predictable. Nasals, another example of a class of sounds often quoted as highly sound-symbolic (Tsur 1992: 3, 159) and quite consistently overrepresented in poetry, show the pattern of slight underrepresentation in onomatopoeia. It is surprising that vowels and diphthongs, two very similar classes of sounds should be so unlike each other in their patterns of representation both in onomatopoeia and poetry. Note also that while vowels are overrepresented and diphthongs underrepresented in o-words compared to the lexicon, in poetry it is exactly the opposite when we contrast it with the non-poetical text sample; vowels are underrepresented and diphthongs overrepresented in the former. In particular the underrepresentation of peripheral vowels in poetry is quite confusing when one realizes that they are known to be abundant in expressive speech such as slang (cf. Wescott 1977; Sobkowiak 1990) and thus would be justifiably overrepresented in poetry.

Malkiel (1990: 179-198) assigned a powerful phonosymbolic role to the lateral /l/ appearing in word final consonant + l clusters in such verbs as *gargle* or *sizzle*. As he said, verbs containing this cluster refer to states or activities "unusually, even inordinately and sometimes perversely, exciting to the average onlooker, speaker or listener", "abnormal", "atypical", or at least "unlikely to leave the average witness wholly indifferent" (Malkiel 1990: 184). The author of this article extended the above rule to consonant + /r/ clusters (Żuchowski 1993) quite abundant in English onomatopoeia. The limited character of this analysis providing merely frequency counts for the analyzed corpora does not allow to find out how much bearing those clusters might have on the overall frequencies of both liquids in my poetry samples but the above discussion hints at the possibly sound-symbolically active character of these consonants. This assumption finds further support in my poetry data, where the liquids are significantly overrepresented in all samples, the only exceptions being Plath and Longfellow with the consonant /r/ underrepresented. At this point it would be unfair not to mention Fonagy's (1983: 95) argument that the /r/ sound "is significantly more frequent in aggressive and erotic poems than in idyllic poems". It seems that my data cannot directly confirm this claim, but obviously there may be other reasons why the /r/ sound is so preferred in poetry. For example, Tsur (1992: 138) says that "acoustically, the /r/ is continuous, periodic, sonorous, and relatively unencoded, just as all the other liquids (/l, m, n/) are. Indeed the /r/ is employed for its sonorous quality in poems that express especially tender moods." As the two last comments on the discussion of liquids (and nasals) let me mention Jakobson's argument that liquids are among those sounds which are "especially charged with emotion" (Jakobson 1968: 57) and the argument that "liquids and nasals are periodic, while voiceless consonants are aperiodic" (Fry 1970: 35) and that "continuous, periodic sounds are beautiful, whereas the interrupted, aperiodic sounds are ugly" (Tsur 1992: 66). Apparently all poetry is beautiful as two major classes of periodic sounds, approximants and nasals, are consistently and significantly overrepresented in most of the poetry samples used for this study.

But to keep the discussion in a more serious vein, one cannot forget that besides vowels and approximants also all the remaining voiced sounds are periodic and many of them (mostly fricatives and diphthongs) are overrepresented in most of my poetry samples. Is it really the beauty in the conventional sense of the word that motivates such an intensive use of periodic sounds in poetry? As interesting as the question of beauty in poetry might seem, I will not proceed to discuss it any further here as it would go far beyond the scope of this article.

4. Some final remarks

The study presented here, limited as it is, has however been able to provide answers to some basic questions related to the phonostatistics of poetry. First of all, it showed that certain sounds/sound classes are favored in poetry relative to the non-poetical corpus and that their overrepresentation is statistically significant. They include voiced consonants, diphthongs, approximants and nasals – all being periodic sounds. Secondly, individual poetry samples also exhibit their own unique patterns of sound over- and underrepresentation, which may be a direct indicator of some special traits characterizing a given genre. Thirdly, poetry exhibits entirely different patterns of sound frequency difference from onomatopoeia, another sound-symbolically active corpus. The question why o-words are so unlike poetry remains to be answered. In fact what this study does best is stir up a large number of questions. Another one is the question why some of the poetry samples exhibit a much larger number of significant differences from the non-poetical corpus than others? Table A shows that while Poe and Whitman differ significantly from the control corpus with respect to all eight indicated natural classes, in Dickinson, Longfellow and Plath only four of them show significant patterns of difference. Unusual, knowing that Plath's or Dickinson's poetry, for example, is perceived as poetry filled with a powerful expression of various emotions (cf. Kopcewicz – Sienicka 1982: 149; Kopcewicz – Sienicka 1983: 272-273). That might be an indicator of the fact that segmental carriers of sound-symbolism cannot always be detected by simple phonostatistic means. After all, individual segments don't carry their symbolic properties alone but in a broader linguistic context, which might be provided by certain cooccurrence patterns of segments within a word or phrase, or special types of consonant clusters, for example. It may then often be the question of *how* the symbolically active sounds are distributed in the text rather than how *many* of them there are.

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APPENDIX

Table 1. Selected phonostatistics for Longfellow.

SOUND	TEXT(%)	LONG(%)	TEXT(N)	LONG(N)	Z-SCORE
ei	1,71	1,34	1264	132	2,66
uə	0,08	0,02	58	2	2,02
tʃ	0,44	0,61	331	60	–2,22
ʌ	1,78	1,30	1317	128	3,42
u	0,52	0,29	390	29	3,06
p	2,34	1,78	1729	175	3,48
t	7,41	5,80	5471	569	5,79
k	2,52	2,04	1864	200	2,91
g	0,93	0,71	687	70	2,13
f	1,82	2,31	1348	227	3,33
v	1,79	2,12	1322	208	–2,28
ð	3,32	4,70	2450	461	–7,00
s	4,22	5,01	3119	492	–3,61
ŋ	1,10	1,48	815	145	–3,26
l	3,63	4,63	2682	454	–4,80
w	2,88	2,38	2128	233	2,85
SAMPLE TOTAL	100	100	73767	9805	

Table 2. Selected phonostatistics for Poe.

SOUND	TEXT(%)	POE(%)	TEXT(N)	POE(N)	Z-SCORE
ei	1,71	1,40	1264	649	4,21
ou	1,14	1,71	846	797	–8,32
ai	1,66	2,94	1228	1365	–14,86
au	0,77	0,98	569	458	–3,97
eə	0,29	0,50	218	233	–5,71
dʒ	0,49	0,31	367	146	4,72

i:	2,34	1,88	1733	874	5,36
ə	7,14	6,58	5271	3052	3,71
a:	1,06	0,89	786	414	2,92
ə:	0,69	0,88	516	409	–3,53
u:	0,83	0,99	616	460	–2,82
u	0,52	0,25	390	118	7,12
p	2,34	1,74	1729	809	7,01
t	7,41	6,54	5471	3035	5,70
d	5,21	4,64	3845	2152	4,40
k	2,52	1,62	1864	753	10,42
g	0,93	0,73	687	342	3,53
v	1,79	2,30	1322	1069	–6,21
θ	0,44	0,74	328	343	–6,68
ð	3,32	4,36	2450	2022	–9,28
m	3,13	3,51	2313	1629	–3,59
ŋ	1,10	1,32	815	616	–3,48
l	3,63	5,10	2682	2366	–12,35
r	4,90	3,90	3644	2734	–7,21
w	2,88	2,16	2128	1004	7,60
SAMPLE TOTAL	100	100	73767	46343	

Table 3. Selected phonostatistics for Whitman.

SOUND	TEXT(%)	WHIT(%)	TEXT(N)	WHIT(N)	Z-SCORE
ei	1,71	1,57	1264	6781	2,72
ou	1,14	1,50	846	6481	–7,55
ai	1,66	2,36	1228	10163	–11,80
oi	0,10	0,14	75	635	–3,07
iə	0,35	0,49	264	2115	–4,90
eə	0,29	0,37	218	1597	–3,18
i:	2,34	1,80	1733	7752	10,08
ə	7,14	6,90	5271	29666	2,41
a:	1,06	0,92	786	3987	3,57
æ	3,62	3,25	2674	13989	5,20
e	2,48	2,31	1835	9952	2,86
ʌ	1,78	1,58	1317	6821	3,95
o:	1,32	1,61	981	6964	–5,84
u:	0,83	1,15	616	4950	–7,59
u	0,52	0,33	390	1421	8,30
p	2,34	1,91	1729	8250	7,65
b	1,85	1,67	1371	7212	3,50
t	7,41	6,09	5471	26213	13,63
d	5,21	4,77	3845	20545	5,06
k	2,52	2,33	1864	10031	3,19
g	0,93	0,80	687	3454	3,55
f	1,82	2,06	1348	8889	–4,27
v	1,79	2,21	1322	9524	–7,31
θ	0,44	0,58	328	2498	–4,58
ð	3,32	3,97	2450	17079	–8,46
s	4,22	5,15	3119	22172	–10,67
z	2,71	3,27	2001	14067	–7,98
ʃ	0,60	0,71	445	3084	–3,43
ʒ	0,05	0,03	37	131	2,70
h	2,01	1,26	1483	5417	16,19
m	3,13	3,29	2313	14175	–2,27
ŋ	1,10	1,51	815	6518	–8,61
l	3,63	4,64	2682	19952	–12,17
r	4,93	5,44	3644	23411	–5,62
j	0,59	1,02	442	4421	–11,01
w	2,88	1,96	2128	8435	16,15
SAMPLE TOTAL	100	100	73767	429912	

Table 4. Selected phonostatistics for Dickinson.

SOUND	TEXT(%)	DICKI(%)	TEXT(N)	DICKI(N)	Z-SCORE
ei	1,71	1,97	1264	942	–3,33
ou	1,14	1,51	846	722	–5,53
ai	1,66	2,58	1228	1231	–11,07
eə	0,29	0,39	218	186	–2,79
tʃ	0,44	0,53	331	254	–2,06
dʒ	0,49	0,35	367	168	3,73
i:	2,34	2,58	1733	1233	–2,60
ə	7,14	6,61	5271	3156	3,53
a:	1,06	0,80	786	384	4,53
æ	3,62	3,10	2674	1481	4,86
ɔ	2,75	2,32	2031	1107	4,63
ə:	0,69	0,85	516	408	–3,05
u:	0,83	0,98	616	468	–2,64
b	1,85	2,26	1371	1080	–4,91
d	5,21	4,68	3845	2236	4,08
f	1,82	2,06	1348	986	–2,97
v	1,79	1,61	1322	768	2,37
s	4,22	5,08	3119	2425	–6,98
z	2,71	2,97	2001	1417	–2,66
h	2,01	1,75	1483	838	3,14
n	7,31	6,93	5398	3309	2,50
ŋ	1,10	0,89	815	428	3,50
l	3,63	4,50	2682	2148	–7,56
r	4,93	5,22	3644	2490	–2,18
w	2,88	2,18	2128	1044	7,42
SAMPLE TOTAL	100	100	73767	47691	

Table 5. Selected phonostatistics for Ginsberg.

SOUND	TEXT(%)	GINSB(%)	TEXT(N)	GINSB(N)	Z-SCORE
ei	1,71	1,49	1264	275	2,05
ou	1,14	1,77	846	327	–6,84
ai	1,66	2,13	1228	393	–4,36
eə	0,29	0,51	218	95	–4,61
tʃ	0,44	0,24	331	45	3,87
dʒ	0,49	0,69	367	128	–3,30
i:	2,34	1,87	1733	344	3,90
a:	1,06	0,83	786	153	2,81
æ	3,62	2,73	2674	502	5,94
ʌ	1,78	1,40	1317	258	3,57
ɔ	2,75	3,50	2031	644	–5,42
ə	0,69	0,52	516	97	2,56
u:	0,83	1,89	616	348	–12,61
u	0,52	0,34	390	63	3,22
p	2,34	1,91	1729	352	3,49
b	1,85	2,53	1371	465	–5,82
t	7,41	6,39	5471	1175	4,79
d	5,21	4,64	3845	854	3,11
k	2,52	3,27	1864	602	–5,62
f	1,82	1,50	1348	277	2,95
v	1,79	2,10	1322	386	–2,77
ð	3,32	2,93	2450	540	2,62
s	4,22	4,65	3119	856	–2,56
h	2,01	1,68	1483	309	2,89
m	3,13	3,97	2313	731	–5,71
ŋ	1,10	1,32	815	243	–2,47
l	3,63	4,22	2682	777	–3,77

r	4,9	5,58	3644	1026	–3,55
j	0,59	0,99	442	183	–5,85
w	2,88	2,12	2128	390	5,67
SAMPLE TOTAL	100	100	73767	18379	5,67

Table 6. Selected phonostatistics for Plath.

SOUND	TEXT(%)	PLATH(%)	TEXT(N)	PLATH(N)	Z-SCORE
ou	1,14	1,49	846	205	–3,40
ai	1,66	3,62	1228	499	–15,20
dʒ	0,49	0,37	367	51	1,97
ə	7,14	5,94	5271	818	5,05
a:	1,06	0,82	786	113	2,60
e	2,48	2,05	1835	283	3,00
o:	1,32	1,57	981	217	–2,30
ə:	0,69	0,96	516	132	–3,27
u:	0,83	1,23	616	170	–4,58
t	7,41	6,80	5471	935	2,54
d	5,21	4,60	3845	633	2,97
k	2,52	3,18	1864	438	–4,43
ð	3,32	2,85	2450	393	2,80
s	4,22	4,68	3119	644	–2,42
ʃ	0,60	0,88	445	122	–3,81
ʒ	0,05	0	37	0	2,62
h	2,01	1,57	1483	216	3,42
n	7,31	6,50	5398	894	3,39
l	3,63	4,69	2682	646	–5,98
j	0,59	0,98	442	135	–5,09
w	2,88	1,99	2128	274	5,87
SAMPLE TOTAL	100	100	73767	13748	

Table 7. Selected phonostatistics for combined poetry samples excluding Whitman.

SOUND	TEXT(%)	T-WHIT(%)	TEXT(N)	T-WHIT(N)	Z-SCORE
ou	1,14	1,61	846	2257	–8,59
ai	1,66	2,73	1228	3823	–15,48
eə	0,29	0,43	218	613	–5,05
dʒ	0,49	0,39	367	552	3,44
i:	2,34	2,20	1733	3075	2,20
ə	7,14	6,56	5271	9170	5,10
a:	1,06	0,84	786	1175	5,17
æ	3,62	3,22	2674	4508	4,86
e	2,48	2,34	1835	3271	2,11
ə:	0,69	0,84	516	1176	–3,52
u:	0,83	1,15	616	1608	–6,83
u	0,52	0,37	390	530	5,01
p	2,34	2,08	1729	2918	3,85
b	1,85	2,20	1371	3081	–5,32
t	7,41	6,92	5471	9682	4,17
d	5,21	4,69	3845	6567	5,23
k	2,52	2,36	1864	3307	2,29
v	1,79	1,96	1322	2741	–2,72
θ	0,44	0,51	328	716	–2,13
ð	3,32	3,64	2450	5087	–3,79
s	4,22	4,63	3119	6472	–4,27
h	2,01	1,79	1483	2507	3,51
m	3,13	3,38	2313	4736	–3,11
n	7,31	7,04	5398	9848	2,30
l	3,63	4,66	2682	6513	–11,09
r	4,93	5,50	3644	7696	–5,55
j	0,59	0,72	442	1014	–3,37
w	2,88	2,16	2128	3020	10,36
SAMPLE TOTAL	100	100	73767	139742	