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Descriptivity in Slovak Lyrics

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Abstract. *The aim of the article is to introduce the measurement of „activity" and „descriptivity" of a text based on the proportions of adjectives and verbs. Functions based on interaction of forces, tests for significance of a property and for comparison of two texts are introduced. The methods are applied to the poetry of the Slovak poetess Eva Bachletová.*

Keywords: *activity, descriptivity, text analysis, poetry, lyrics, Slovak*

The measurement of descriptivity (or ornamentality) and activity of a text is a problem stated already by A. Busemann (1925). Since then, different studies have been published and modifications of his procedure have been proposed (cf. Altmann 1988; Antosch 1953; Bakker 1965; Boder 1940; Fischer 1969; Osgood, Walker 1959; Pieper 1979; Schlissmann 1948; Schubert 2008; Tuldava 2005; Wimmer et al. 2001). Descriptivity is measured in terms of adjectives which specify the properties of nouns; activity is measured in terms of "active" verbs. Both sets can be determined differently by individual researchers. Some consider only adjectives as descriptive, other ones also a part of adverbs which are answers to the question "how?". There is an analogous problem with verbs: one can consider some verbs as "non-active", e. g. *to be, to have, to sleep*, etc., and there is surely a possibility to scale the activity from different points of view.

It is generally assumed that lyric poetry is descriptive or ornamental rather than active because it concerns feelings, while epic poetry is rather active. In any case, the degree of descriptivity or activity can be measured and expressed quantitatively. In the present contribution, we shall analyze the lyrical poems of the Slovak poetess E. Bachletová. We shall consider adjectives and adverbs answering the"how" question as well as nominalized adjectives as the descriptive means (A), and active verbs, gerunds and gerundives as the means expressing activity (V). The measurement of the degree of activity will be defined as

$$(1) \quad Q = \frac{V}{A+V}$$

representing a simple proportion because $A + V = n$.

Consider an example of the short poem *Z neba do neba* presented below.

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Z neba do neba

Čistá A
Priezračná A
Radostná A
Chutí V
Slnkom
Do nových vnemov A
Duše
Napĺňa silou V
Triešti sa V
Prebúdza pamäť V
Navracia sa V
Z hôr do morí
Bytia
života.

Chladivá A
Slobodná A
Požehnaná A
Kamením
Rozlieva sa V
Do žíl
Obmýva V
Rozháňa staré V, A
O skaly
Osviežuje srdce V
Prúdi V
Z morí do neba
Sveta

Upokojujúca A
Chvejivá A
Voda
Lístím
Do nových organizmov A
Človeka
Hojí V
Skrútené A
A naše bolesti
Víri zabudnuté V,A
Z času do času
Večný kolobeh A
Božej rieky A

In the above poem, adjectives are more frequently represented than verbs, especially at the beginning. We obtain $A = 15$, $V = 12$ and $Q = 0.4444$, that is, the poem is rather descriptive. Now, we may ask different questions:

(i) Do the appearances of *V* and *A* in the poem display a special trend, movement, regular oscillation or do we have only a random dispersion around the mean?
(ii) How to test the difference between the *Q*s in two poems?
(iii) Is a given *Q* characteristic for the poetess as compared with other poets?
(iv) Does *Q* correlate with the age of the poetess, i.e. is there a historical development?
(v) Does lyric poetry have always a $Q < 0.5$?

For solving all of these and further problems, a very extensive research is necessary. Nevertheless, we can discuss at least some of them. Let us begin with the simplest problem, viz. (i), and demonstrate it using the above poem. As the poem increases, we obtain with each appearance of an *A* or *V* an increasing *n* (= *A* + *V*). Since *V* is our basic entity, and the first 8 entities are all *A*, we obtain 0/1 = 0, 0/2 = 0,…,0. The ninth entity is *V*, hence we have 1/9 = 0.1111 and continuing to evaluate the rest of the sequence VAAVVVVAAVVVVAVVAA we obtain the complete sequence

0; 0; 0; 0; 0; 0; 0; 0; 0.1111; 0.2000; 0.1818; 0.16667; 0.2308; 0.2857; 0.3333; 0.3750; 0.3528; 0.3333; 0.3684; 0.4000; 0.4286; 0.4545; 0.4348; 0.4583; 0.4800; 0.4613; 0.4444

which displays an almost monotonous increase of activity up to the equilibrium at 0.5. The last number of this sequence (0.4444) is the overall characterisation of the active-descriptive (dis)equilibrium. The sequence can be excellently captured by a number of simple functions, but we shall try to find a theoretical background.

Since we have to do with a dichotomic situation: *descriptive* vs. *active*, the course of the A-V-sequence should express the interaction of these two "forces". Since the poetry of E.

Bachletová is quite individual, very different from the classical pattern, we shall experiment with two patterns. In the first, we assume that the change of subsequent A-V values is a multiplicative interaction of two functions and choose the Morse-function defined as

(2) $y = a + b[1 - \exp(-c(x-d))]^2$,

whose derivation yields

(3) $y' = 2bc[1 - \exp(-c(x-d))]\exp(-c(x-d))$,

i. e. in general

(4) $y' = Kf(x)\,(1-f(x))$.

Another possibility used quite frequently in linguistics is the considering of the relative rate of change (y'/y) as an additive interaction of two forces proposed as

$$(5)\quad \frac{y'}{y} =, \frac{a}{x} - \frac{b}{M-x}$$

where a is the share of the speaker and b that of the hearer. The solution of this differential equation yields the beta function defined in our case as

(6) $y = Cx^a(M-x)^b$

where C is the integration constant. The parameter M is the maximum of x, and in our case it must be greater then the empirical maximum. Since x represents (discrete) positions beginning with $x = 1$, we take a smaller minimum which, in this case, is simply zero.

For the sake of good optical differentiation, we shall designate the parameters in (2) as $a = P1$, $b = P2$, $c = P3$, and $d = P4$.

Applying (6) to the above data we obtain iteratively the parameters $C = 0.00001$, $a = 2.4436$, $b = 1.1049$, $M = 35$, $R^2 = 0.96$ as can be seen in Figure 1.

In this case both fittings are almost equivalent but in many other cases we shall prefer the function with higher R^2.

As can be seen, in sequences beginning with zero, the parameters $P1 = P4 = 0$ in the Morse function, other ones have $P1, P4 > 0$. Usually, the sequences beginning with zero can be better fitted by the beta-function, those beginning with 1 by the Morse-function.

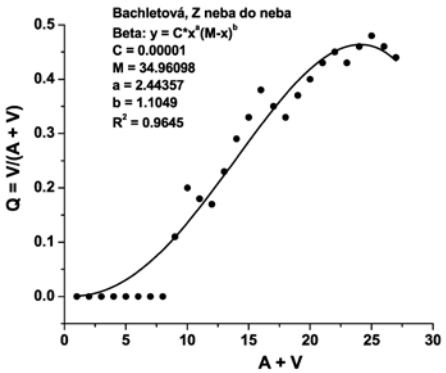

Figure 1: Beta function of the course of "descriptivity"

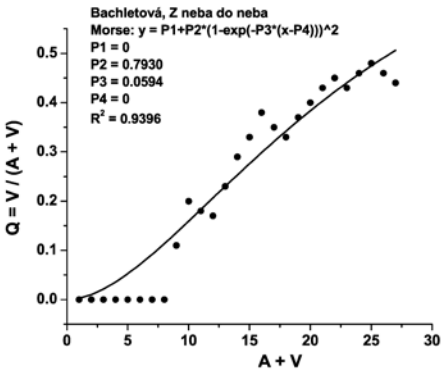

Figure 2: The Morse-function of the course of "activity"

An example of the fitting of the same Q-sequence by the Morse function is shown in Figure 2.

The analysis of several other poems is presented in Table 1.

Table 1: The sequence of *Q*-values in Bachletová' poems (The poems are ordered according to *Q* which is the last number of the sequence, bold marked)

Poem	Descriptive-active sequences
Naše dejiny	AAAAA (A = 5, V = 0); 0; 0; 0; 0; **0**; Beta: C = 0; R^2 = 1.0 Morse: P1 = 0; P2 = 0; P3 = 0; P4 = 0; R^2 = 1.0
To všetko je dar	AAAAAAAA (A = 8, V = 0); 0; 0; 0; 0; 0; 0; 0; **0**; Beta: C = 0; R^2 = 1.0 Morse: P1 = 0; P2 = 0; P3 = 0; P4 = 0; R^2 = 1.0
Každoden-nosť	AAA (A = 3, V = 0) 0; 0; **0**; Beta: C = 0; R^2 = 1.0 Morse: P1 = 0; P2 = 0; P3 = 0; P4 = 0; R^2 = 1.0
Večerné ticho	AAAAAAAAVAV (A = 9, V = 2); 0; 0; 0; 0; 0; 0; 0; 0.11; 0.10; **0.18**; Beta: C = 5.7973E-010; a = 8.1458; b = 0.5799; M = 12; R^2 = 0.91 Morse: P1 = 0; P2 = 5.3187; P3 = 0.0147; P4 = 0; R^2 = 0.65
Ihly na nebi	AAAVVAAA (A = 6, V = 2); 0; 0; 0; 0.25; 0.40; 0.33; 0.29; **0.25**; Beta: C = 2.5821E-015; a = 6.2491; b = 9.7537; M = 15; R^2 = 0.90 Morse: P1 = 0; P2 = 0.4031; P3 = 0.3007; P4 = 0; R^2 = 0.66
Otázka	AAAV (A = 3, V = 1); 0; 0; 0; **0.25**; Beta: C = 8.8261E-014; a = 22.8543; b = -0.9889; M = 25; R^2 = 1.00 Morse: P1 = 0; P2 = 1259.0652; P3 = 0.0030; P4 = 0; R^2 = 0.63
Nemám rada bielu	AAAAAVAAAVVAVAVAAAVAAV (A = 15, V = 7); 0;0;0;0;0; 0.17; 0.14; 0.12; 0.11; 0.20; 0.27; 0.25; 0.31; 0.29; 0.33; 0.31; 0.29; 0.28; 0.32; 0.30; 0.29; **0.32**; Beta: C = 9.7961E-8; a = 2.3546; b = 2.7272; M = 38; R^2 = 0.92 Morse: P1 = 0; P2 = 0.3788; P3 = 0.1286; P4 = 0; R^2 = 0.89
Zbytočné srdce	AAAVVAAVAAV (A = 7, V = 4); 0; 0; 0; 0.25; 0.40; 0.33; 0.29; 0.38; 0.33; 0.30; **0.36**; Beta: C = 7.1195E-011; a = 2.7389; b = 5.8925; M = 25, R^2 = 0.81 Morse: P1 = 0; P2 = 0.3936; P3 = 0.3215; P4 = 0; R^2 = 0.75
Tak málo úsmevu	VAAAAAAVVVVAVAAAAAV (A = 12, V = 7) 1.0; 0.5; 0.33; 0.25; 0.20; 0.17; 0.14; 0.25; 0.33; 0.40; 0.45; 0.42; 0.46; 0.43; 0.40;0.38; 0.35; 0.33; **0.37**; Morse: P1 = 0.2025; P2 = 0.2178; P3 = 0.2867; P4 = 4.7363; R^2 = 0.91

Poem	Descriptive-active sequences
Iba v modlitbe	AAAVAVVA (A = 5, V = 3); 0.0; 0.0; 0.0; 0.25; 0.20; 0.33; 0.43; **0.38**; Beta: C = 0.00012; a = 3.4505; b = 1.2884; M = 10; R^2 = 0.92 Morse: P1 = 0; P2 = 1.1893; P3 = 0.1164; P4 = 0; R^2 = 0.87
Prvotný sen	AVVVVAAAAAAAAVVVAAAAAVVA (A = 15, V = 9); 0.0; 0.50; 0.67; 0.75; 0.80; 0.67; 0.57; 0.50; 0.44; 0.40; 0.36; 0.33; 0.31; 0.36; 0.40; 0.44; 0.41; 0.39; 0.37; 0.35; 0.33; 0.36; 0.39; **0.38**; Beta: C = 1.5408E-014; a = 0.4401; b = 6.6996; M = 100; R^2 = 0.33 Morse: P1 = 0; P2 = 0.4534; P3 = 1.2458; P4 = 0; R^2 = 0.19
Náš chrám	AAAVAAAVVAAAAVAVVVVAA (A = 13, V = 8); 0; 0; 0; 0.25; 0.20; 0.17; 0.14; 0.25; 0.33; 0.30; 0.27; 0.25; 0.23; 0.29; 0.27; 0.31; 0.35; 0.39; 0.42; 0.40; **0.38**; Beta: C = 0.00012; a = 0.8919; b = 1.3310; M = 79; R^2 = 0.80 Morse: P1 = 0; P2 = 0.3718; P3 = 0.1958; P4 = 0; R^2 = 0.79
Dielo Stvoriteľa	VAAAAAAAAAAAAAVAVAVVVAVVAVVVVAAAVA; (A = 21, V = 13); 1.0; 0.50; 0.33; 0.25; 0.20; 0.17; 0.14; 0.13; 0.11; 0.10; 0.09; 0.08; 0.08; 0.07; 0.13; 0.13; 0.18; 0.17; 0.21; 0.25; 0.28; 0.27; 0.30; 0.33; 0.32; 0.35; 0.37; 0.39; 0.41; 0.40; 0.39; 0.38; 0.39; **0.38**; Morse: P1 = 0.0606; P2 = 0.3921; P3 = 0.1099; P4 = 9.1328; R^2 = 0.94
Večerná ruža	AAAVAVVVAAVA (A = 7, V = 5); 0; 0; 0; 0.25; 0.20; 0.33; 0.43; 0.50; 0.44; 0.40; 0.45; **0.42** Beta: C = 0.00002; a = 2.4961; b = 2.0973; M = 17.47; R^2 = 0.92 Morse: P1 = 0; P2 = 0.5484; P3 = 0.2308; P4 = 0; R^2 = 0.86
Tiché verše	VAVVAAA (A = 4, V = 3); 1.00; 0.50; 0.67; 0.75; 0.60; 0.50; **0.43**; Morse: P1 = 0.4104; P2 = 0.1778; P3 = 2.5173; P4 = 1.4121; R^2 = 0.70
Z neba do neba	AAAAAAAAVVAAVVVVAAVVVVAVVAA (A = 15, V = 12); 0;0;0;0;0;0;0;0; 0.11; 0.20; 0.18; 0.17; 0.23; 0.29; 0.33; 0.38; 0.35; 0.33; 0.37; 0.40; 0.43; 0.45; 0.43; 0.46; 0.48; 0.46; **0.44**; Beta: C = 0.00001; a = 2.4436; b = 1.1049; M = 35; R^2 = 0.96 Morse: P1 = 0; P2 = 0.7930; P3 = 0.0594; P4 = 0; R^2 = 0.94
Moje určenie	AVAVAVVAAVAVAAVAAAVAVVAVVVVAA (A = 15, V = 14); 0; 0.50; 0.33; 0.50; 0.40; 0.50; 0.57; 0.50; 0.44; 0.50; 0.45; 0.50; 0.46; 0.43; 0.47; 0.44; 0.41; 0.39; 0.42; 0.40; 0.43; 0.45; 0.43; 0.46; 0.48; 0.50; 0.52; 0.50; **0.48**; Morse: P1 = 0; P2 = 0.4641; P3 = 0.9071; P4 = 0; R^2 = 0.58
Podobnosť bytia	AVVVAVAVVAVVAAVAVAAA (A = 10, V = 10); 0; 0.50; 0.67; 0.75; 0.60; 0.67; 0.57; 0.63; 0.67; 0.60; 0.64; 0.67; 0.62; 0.57; 0.60; 0.56; 0.59; 0.56; 0.53; **0.50** Morse: P1 = 0; P2 = 0.6142; P3 = 0.9338; P4 = 0; R^2 = 0.67
Zasľúbenie jasu	VVVVVAAAAA (A = 5, V = 5) 1;1;1;1;1; 0.83; 0.71; 0.63; 0.56; **0.50**; Morse: P1 = 0.0674; P2 = 2.1030; P3 = 0.0154; P4 = 35.7696; R^2 = 0.83

Poem	Descriptive-active sequences
Čas pre nádych vône	AVVVAVVAAVVVAAAVAAVVAAAV (A = 12, V = 12); 0; 0.50; 0.67; 0.75; 0.60; 0.67; 0.71; 0.63; 0.56; 0.60; 0.63; 0.67; 0.62; 0.57; 0.53; 0.56; 0.53; 0.50; 0.53; 0.55; 0.52; 0.50; 0.48; **0.50** Morse: P1 = 0; P2 = 0.5868; P3 = 0.9851; P4 = 0; R^2 = 0.56
Do večnosti beží čas	VAAVAVAAVAAVVV (A = 7, V = 7) 1.0; 0.5; 0.33; 0.50; 0.40; 0.50; 0.43; 0.38; 0.44; 0.40; 0.36; 0.42; 0.46; **0.50**; Morse: P1 = 0.4099; P2 = 0.0235; P3 = 0.8094; P4 = 3.2172; R^2 = 0.90
Iba život	VAAAVVVVVAAA (A = 6, V = 6) 1.0; 0.50; 0.33; 0.25; 0.40; 0.50; 0.57; 0.63; 0.67; 0.60; 0.55; **0.50**; Morse: P1 = 0.2500; P2 = 0.5259; P3 = 0.2662; P4 = 4.000; R^2 = 0.64
Spájanie	AAVVVVVAA (A = 4,V = 5); 0; 0; 0.33; 0.50; 0.60; 0.67; 0.71; 0.63; **0.56** Beta: C = 2.3941E-006; a = 2.7790; b = 3.4605; M = 15; R^2 = 0.96 Morse: P1 = 0; P2 = 0.7406; P3 = 0.3705; P4 = 0; R^2 = 0.86
Dnešný luxus	AVAVVVVAA (A = 4, V = 5); 0; 0.50; 0.33; 0.50; 0.60; 0.67; 0.71; 0.63; **0.56**; Beta: C = 0.0557; a = 1.0404; b = 0.4417; M = 10; R^2 = 0.80 Morse: P1 = 0; P2 = 0.6503; P3 = 0.5959; P4 = 0; R^2 = 0.78
Istota	VAAAVAVVV (A = 4, V = 5) 1.00; 0.50; 0.33; 0.25; 0.40; 0.33; 0.43; 0.50; **0.56**; Morse: P1 = 0.2863; P2 = 0.4412; P3 = 0.2865; P4 = 03.8614 R^2 = 0.97
Smútok	AVVVAAV (A = 3, V = 4); 0; 0.50; 0.67; 0.75; 0.60; 0.50; **0.57**; Beta: C = 0.00014; a 1.6831; b = 2.9697; M = 12; R^2 = 0.79 Morse: P1 = 0; P2 = 0.6368; P3 = 0.8804; P4 = 0; R^2 = 0.69
Keď dohorí deň	VVVVAAVVVVAVVAAVAAA (A = 8, V = 11); 1.0; 1.0; 1.0; 1.0; 0.80; 0.67; 0.71; 0.75; 0.78; 0.80; 0.73; 0.75; 0.77; 0.71; 0.67; 0.69; 0.65; 0.61; **0.58** Morse: P1 = 0.7017; P2 = 0.0053; P3 = 0.1326; P4 = 17.2315; R^2 = 0.66
Nado mnou Ty sám	AVVVVVVAAAVA (A = 5, V = 7); 0.0; 0.50; 0.67; 0.75; 0.80; 0.83; 0.86; 0.75; 0.67; 0.60; 0.64; **0.58**; Beta: C = 3.5377E-019; a = 1.4731; b = 10.4847; M = 50; R^2 = 0.89 Morse: P1 = 0; P2 = 0.7312; P3 = 0.8019; P4 = 0; R^2 = 0.73
Iba neha	VAAVAAAAVVVVVVVVAAAVVVVAAAAAAAVVVVVVVVV (A = 16, V = 23); 1.00; 0.50; 0.33; 0.50; 0.40; 0.33; 0.29; 0.25; 0.33; 0.40; 0.45; 0.50; 0.54; 0.57; 0.60; 0.62; 0.59; 0.56; 0.53; 0.55; 0.57; 0.59; 0.61; 0.58; 0.56; 0.54; 0.52; 0.50; 0.48; 0.47; 0.48; 0.50; 0.52; 0.53; 0.54; 0.56; 0.57; 0.58; **0.59**; Morse: P1 = 0.3129; P2 = 0.2408; P3 = 0.2614; P4 = 4.8712; R^2 = 0.75
Nepoznateľ-né	VVVVVVAAVAVAAVAVAVVVAAVA (A = 10, V = 15); 1; 1; 1; 1; 1; 1; 0.86; 0.75; 0.78; 0.70; 0.73; 0.67; 0.62; 0.64; 0.60; 0.63; 0.59; 0.61; 0.63; 0.65; 0.67; 0.64; 0.61; 0.63; **0.60** Morse: P1 = 1.0491; P2 = -0.4464; P3 = 0.2418; P4 = 2.4551; R^2 = 0.94

Poem	Descriptive-active sequences
Návraty	AVVAV (A = 2, V = 3); 0.0; 0.50; 0.67; 0.50; **0.60**; Beta: C = 0.0001; a = 2.1640; b = 3.3825; M = 9.46; R^2 = 0.79 Morse: P1 = 0; P2 = 0.6527; P3 = 0.7800; P4 = 0; R^2 = 0.73
Vyznania	AAAVAAAVVAVVVVVAVVVV (A = 8, V = 12); 0; 0; 0; 0.25; 0.20; 0.17; 0.14; 0.25; 0.33; 0.30; 0.36; 0.42; 0.46; 0.50; 0.53; 0.50; 0.53; 0.56; 0.58; **0.60**; Morse: P1 = 0; P2 = 0.7404; P3 = 0.1142; P4 = 0; R^2 = 0.94
Som iná	VVVAVAAVVVAAVV (A = 5, V = 8); 1.0; 1.0; 0.67; 0.75; 0.60; 0.50; 0.57; 0.63; 0.67; 0.60; 0.55; 0.58; **0.62** Morse: P1 = 0.5817; P2 = 0.1106; P3 = 0.1517; P4 = 8.3665; R^2 = 0.82
Naše svetlo	VVVAAVVVAAAVV (A = 5; V = 8) 1;1;1;0.75; 0.60; 0.67; 0.71; 0.75; 0.67; 0.60; 0.55; 0.58; **0.62**; Morse: P1 = 0.5616; P2 = 5.7977E-6; P3 = 0.1199; P4 = 48.3456; R^2 = 0.80
Precitnutie	AVAAVVVV (A = 3, V = 5); 0; 0.50; 0.33; 0.25; 0.40; 0.50; 0.57; **0.63**; Morse: P1 = 0; P2 = 0.5514; P3 = 0.5360; P4 = 0; R^2 = 0.56
Hľadanie odpovedí	VVAVVVAAVAVVAAVVVVAAVVV (A = 8, V = 15); 1.0; 1.0; 0.67; 0.75; 0.80; 0.83; 0.71; 0.63; 0.67; 0.60; 0.54; 0.67; 0.62; 0.57; 0.60; 0.63; 0.65; 0.67; 0.63; 0.60; 0.62; 0.64; **0.65** Morse: P1 = 0.6245; P2 = 0.0008; P3 = 0.1524; P4 = 21.5976; R^2 = 0.75
Čakáme šťastie	VAVAVVVVA (A = 3, V = 6); 1.0; 0.50; 0.67; 0.50; 0.60; 0.67; 0.71; 0.75; **0.67** Morse: P1 = 0.5250; P2 = 0.1804; P3 = 0.6449; P4 = 2.4892; R^2 = 0.81
Vrátili sa	VAAVVVAVVVVA (A = 4, V = 8); 1.0; 0.5; 0.33; 0.50; 0.60; 0.67; 0.63; 0.67; 0.70; 0.73; **0.67** Morse: P1 = 0.4030; P2 = 0.3135; P3 = 0.5355; P4 = 2.6261; R^2 = 0.94
Mladé oči	VAAVVV (A = 2, V = 4); 1.0; 0.50; 0.33; 0.50; 0.60; **0.67** Morse: P1 = 0.3864; P2 = 0.6111; P3 = 0.3820; P4 = 2.8229; R^2 = 0.98
Stály smútok pre šesť písmen	AVVAAAAVAVVAAVVAAVVVVVVVVVVVVAVVVV (A = 11, V = 22); 0; 0.50; 0.67; 0.50; 0.40; 0.33; 0.29; 0.38; 0.33; 0.40; 0.45; 0.42; 0.38; 0.43; 0.47; 0.44; 0.41; 0.44; 0.47; 0.50; 0.52; 0.55; 0.57; 0.58; 0.60; 0.62; 0.63; 0.64; 0.62; 0.63; 0.65; 0.66; **0.67** Morse: P1 = 0.3650; P2 = 0.4207; P3 = 0.0802; P4 = 7.8894; R^2 = 0.84
Neopusť ma	VVAVVAVAVV (A = 3, V = 7); 1.0; 1.0; 0.67; 0.75; 0.80; 0.67; 0.71; 0.63; 0.67; **0.70** Morse: P1 = 0.6778; P2 = 0.0642; P3 = 0.1608; P4 = 8.4994; R^2 = 0.74
Čakanie na boží jas	VVAAAAAVVVVVVVVVV (A = 5 , V = 12) 1.0; 1.0; 0.67; 0.50; 0.40; 0.33; 0.29; 0.37; 0.44; 0.50; 0.55; 0.58; 0.62; 0.64; 0.67; 0.69; **0.71** Morse: P1 = 0.3587; P2 = 0.7920; P3 = 0.1139; P4 =6.8979; R^2 = 0.89
Bez rozlúčky	VAAVVVV (A = 2, V = 5); 1.0; 0.50; 0.33; 0.50; 0.60; 0.67; **0.71** Morse: P1 = 0.3864; P2 = 0.6111; P3 = 0.3820; P4 = 2.8229; R^2 = 0.98

Poem	Descriptive-active sequences
Vo večnosti slobodná	VVVVVVAAVAAAVVVVVVVVVA (A = 6, V = 17) 1;1;1;1;1;1; 0.86; 0.75; 0.78; 0.70; 0.64; 0.58; 0.61; 0.64; 0.67; 0.69; 0.71; 0.72; 0.74; 0.75; 0.76; 0.79; **0.74** Morse: P1 = 0.6744; P2 = 95.5368; P3 = 0.0046; P4 = 15.18390; R^2 = 0.80
Neha domova	AVVV; 0; 0.50; 0.67; 0.75 (A = 1, V = 3); Beta: C = 0.3236; a = 0.0163; b = 0.3398; M = 10; R2 = 0.95 Morse: P1 = 0; P2 = 1.06536; P3 = 0.49248; P4 = 0; R2 = 0.90
Kým ich máme	VAVVVAVVVVAV (A = 3, V = 9) 1.0; 0.50; 0.67; 0.75; 0.80; 0.67; 0.71; 0.75; 0.78; 0.80; 0.73; **0.75** Morse: P1 = 0.4184; P2 = 0.3318; P3 = 1.5202; P4 = 1.5548; R^2 = 0.90
Rozdelená bytosť	AAAVVAVVVVVVAVVVVVVV (A = 5, V = 15); 0; 0; 0; 0.25; 0.40; 0.33; 0.43; 0.50; 0.56; 0.60; 0.64; 0.67; 0.62; 0.64; 0.67; 0.69; 0.71; 0.72; 0.74; **0.75** Morse: P1 = 0; P2 = 0.7687; P3 = 0.1980; P4 = 0; R^2 = 0.96
Malý ošiaľ	VVVVVAVVAVVVAV (A = 3, V = 11); 1.0; 1.0; 1.0; 1.0; 1.0; 0.83; 0.86; 0.88; 0.78; 0.80; 0.82; 0.83; 0.77; **0.79** Morse: P1 = 0.7855; P2 = 0.5339; P3 = -0.0979; P4 = 12.5580; R^2 = 0.83
Ešte raz	VVAVV (A = 1, V = 4); 1.0; 1.0; 0.67; 0.75; 0.80; Morse: P1 = 0.7465; P2 = 24.5245; P3 = 0.0358; P4 = 3.9126; R^2 = 0.67
Rozťatá prítomnosť	VVAVVVVVVVAVVVVVVVA (A = 3, V = 16) 1.0; 1.0; 0.67; 0.75 ;0.80; 0.83; 0.86; 0.88; 0.89; 0.90; 0.82; 0.83; 0.85; 0.86; 0.87; 0.88; 0.88; 0.89; **0.84** Morse: P1 = 0.7883; P2 = 0.0871; P3 = 0.3511; P4 = 3.8146; R^2 = 0.49
Malé modlitby	VVVVAVVVVVVV (A = 1, V = 11) 1;1;1;1;0.80; 0.83; 0.86; 0.88; 0.89; 0.90; 0.91; **0.92** Beta: C = 1.2084; a = -0.1071; b = -0.0600; M = 13; R^2 = 0.48 Morse: P1 = 0.8972; P2 = 0.0007; P3 = 0.4062; P4 = 7.6420; R^2 = 0.34
Zázrak	VV (A = 0, V = 2); 1.0; **1.0**; Beta: C = 1.0; a = b = 0; R^2 = 1.0 Morse: P1 = 1; P2 = 0; P3 = 0; P4 = 0; R^2 = 1.0

Since the poetic license is immense, not all poems can be captured by the above functions. Hence, the theory is not complete. It may be expected that the analysis of other poets brings still different results. In any case, this is at least a beginning of a future theory.

In Figure 3 one finds some different courses of the Q-sequence.

As can be seen, the courses are quite different and they display an aspect of the poetess' mood in which they were written. The sequence begins either with 0 (= A) or with 1 (= V). Some of them remain at this stage and can be considered

(Ia) *extreme descriptive* (f(r) = 0.0). They contain only adjectives.

(Ib) *extreme active* (f(r) = 1.0). They contain only verbs.

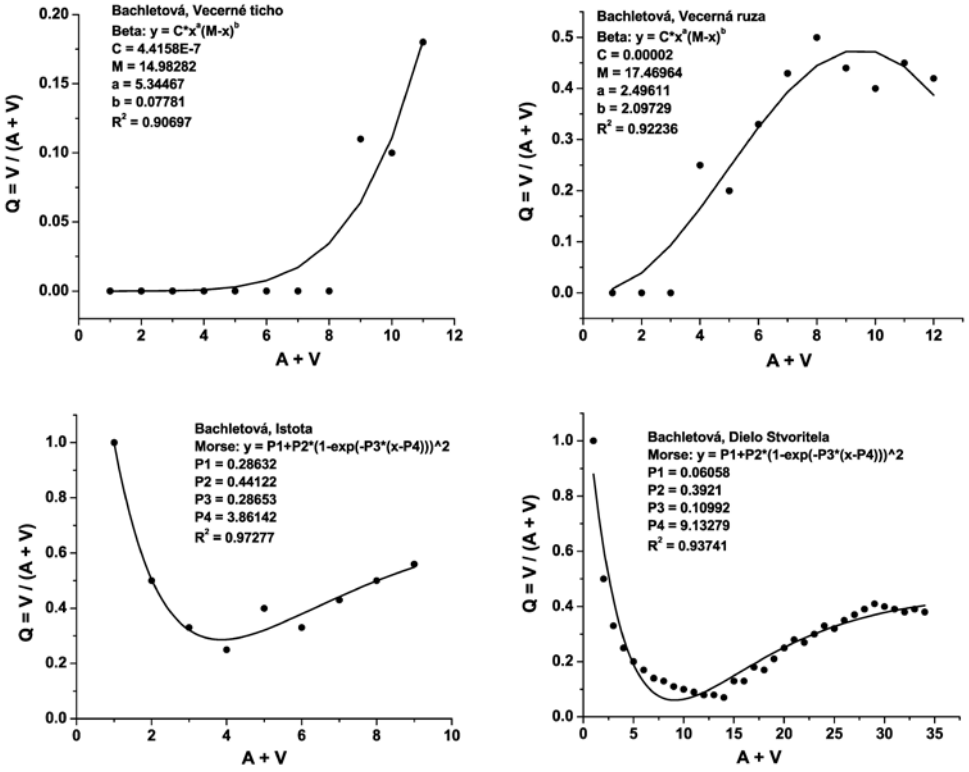

Figure 3. Some special courses of the Q-sequence

For example *To všetko je dar* is an extremely descriptive poem (cf. also *Každodennosť*; *Naše dejiny*) , the poem *Zázrak* is extremely active.

The second class are those which begin at some extreme point but do not attain the equilibrium ($Q = 0.5$). Here we have

(IIa) *descriptive not equilibrating*, i.e. those that begin with 0 and remain under the $Q = 0.5$ point; they are mostly sigmoid sequences beginning with an adjective and the number of adjectives in the sequence is always greater than that of verbs. The contrary case are

(IIb) *active not equilibrating* beginning with 1 but not attaining $Q = 0.5$. They are mostly inversed sigmoid curves, i.e. they begin with a verb and the number of verbs in the sequence is always greater that that of adjectives.

The third group attains the equilibrium but after attaining it, the sequence may behave in different ways.(e. g. continuing, returning, oscillating, etc.). For the sake of simplicity we can establish again two classes:

(IIIa) *descriptive equilibrating* attaining the equilibrium and either holding it, oscillating around it or continuing downwards

(IIIb) *active equilibrating* attaining the equilibrium and either holding it, oscillating around it or continuing upwards

The classification may be interesting for differentiating text sorts, style, development of child language, etc. Of course, such a classification may hold only for short poems. Long poems will automatically tend to the equilibrium Q = 0.5. The above classification is presented in Table 2.

Table 2: Types of descriptivity/activity in poems by E. Bachletová

Type	Poem
Ia. Extreme descriptive	Naše dejiny; - Každodennosť; - To všetko je dar;
Ib. Extreme active	Zázrak;
IIa. Descriptive not equilibrating	Z neba do neba; - Nemám rada bielu; - Ihly na nebi; - Iba v modlitbe; - Otázka; - Náš chrám; - Večerné ticho; - Zbytočné srdce;
IIb. Active not equilibrating	Rozťatá prítomnosť; - Malý ošiaľ; - Neopusť ma; - Nepoznateľné; - Hľadanie odpovedí; - Keď dohorí deň ; - Ešte raz; - Malé modlitby; - Naše svetlo; - Vo večnosti slobodná;
IIIa. Descriptive equilibrating	Neha domova; - Moje určenie; - Spájanie; - Dnešný luxus; - Naše mamy; - Vyznania; - Rozdelená bytosť - Podobnosť bytia; - Stály smútok pre šesť písmen; - Nado mnou Ty sám - Návraty; - Prvotný sen ; - Večerná ruža; - Čas pre nádych vône; - Smútok;
IIIb. Active equilibrating	Iba neha; - Tak málo úsmevu; - Bez rozlúčky; - Mladé oči; - Čakáme šťastie; - Dielo Stvoriteľa; - Som iná; - Čakanie na boží jas; - Do večnosti beží čas; - Kým ich máme; - Istota; - Tiché verše; - Iba život; - Zasľúbenie jasu - Precitnutie;

Some sequences display a very strong oscillation and do not allow fitting a simple function. They could be captured by a polynomial or by a function resulting from another interaction of forces.

Since one usually judges the property of the text using the final result, here the last Q of the sequence, we need a criterion in order to say whether the text as a whole is significantly "active", significantly "descriptive" or whether it is in active-descriptive equilibrium. The tests can be performed in the following way (cf. Altmann 1978; Altmann, Altmann 2008):

(a) For small samples, i. e. those in which $A + V = n$ is small, we test the *hypothesis of high activity* using the binomial criterion

$$(3) \quad P(X \geq V) = \sum_{x=V}^{n} \binom{n}{x} 0.5^n$$

i. e. computing the probabilities that X is equal to or greater than the observed V; and the *hypothesis of high descriptivity* as

$$(4) \quad P(X \leq V) = \sum_{x=0}^{V} \binom{n}{x} 0.5^n$$

i. e. as the probability that X is equal to or smaller than the observed V.

If the results of (3) or (4) are smaller than a predetermined α, say 0.05, then we have to do with significant activity in case (3) and significant descriptivity in case (4).

(b) If A and V are great, one can use two asymptotic tests, namely

$$(5) \quad X^2 = \frac{(V-A)^2}{V+A}$$

being a chi-square test with 1 degree of freedom, or identically

$$(6) \quad u = (2Q-1)\sqrt{V+A}$$

being a normal test. Evidently $u^2 = X^2$.

Consider the poem *Rozdelená bytosť* containing $A = 5$, $V = 15$, hence $Q = 15/20 = 0.75$. Is the poem significantly active? Using (4), i.e. testing the null hypothesis that the poem is not significantly active, we compute

$$P(X \geq 15) = \sum_{x=15}^{20} \binom{20}{x} 0,5^x = 0.0207.$$

Since $0.0207 < 0.05$, we reject the null hypothesis and accept the hypothesis that the poem is significantly active. If we test the same hypothesis using (5), we obtain

$$X_1^2 = \frac{(15-5)^2}{15+5} = 5,0.$$

Again, since the obtained chi-square is greater than the tabulated value with one degree of freedom (3.84), ($P = 0.0253$), we accept the hypothesis of significant activity. Finally, using the normal test we obtain

$u = (2(0.75) - 1)\sqrt{20} = 2.2361$.

Evidently, $u^2 = X^2$, hence all tests tell the same story. The critical value of u is 1.96.

Using these tests – we used always the exact binomial test – we obtain the results presented in Table 3 showing a different look. The table shows that the majority of these lyric poems have an active-descriptive equilibrium; there are only eight significantly active poems and three descriptive ones. The result is rather surprising.

Table 3: Texts by Bachletová classified in three classes (the third class contains the rest)

Poems			
Significantly active			
Iba neha	Čakáme šťastie		
Rozdelená bytosť	Stály smútok pre šesť písmen		
Rozťatá prítomnosť	Malé modlitby		
Malý ošiaľ	Vo večnosti slobodná		
Significantly descriptive			
Naše dejiny	Večerné ticho	To všetko je dar	Precitnutie

In order to judge the difference of activity-descriptivity of two texts, one can use the normal test (cf. Altmann 1978) and set

$$u = \frac{|Q_1 - Q_2|}{\sqrt{Q_1 Q_2}\sqrt{\frac{1}{V_1}+\frac{1}{A_1}+\frac{1}{V_2}+\frac{1}{A_2}}} \cdot \tag{7}$$

If $u < 1.96$, we accept the null hypothesis and reject the hypothesis of difference. However, this is adequate only if the *A*s and *V*s are great. The poems by Bachletová are very short, hence this test does not display any differences.

However, the exact test using the binomial distribution can be applied here, too. We consider $n_1 Q_1$ the expected value of one text, i.e. Q_1 is simply the parameter p of the binomial distribution, and ask, what is the probability that under this condition one can obtain $V \geq V_2$ in the second text having n_2. That is we seek the probability

$$P(X \geq V_2) = \sum_{x=V_2}^{n_2} \binom{n_2}{x} Q_1^x (1-Q_1)^{n_2-x}$$

For the sake of illustration let us take a text with small Q and compare it with a text with great Q. In *Ihly na nebi* we have $A = 6$, $V = 2$, $Q = 0.25$ and in *Naše svetlo* there is $A = 5$, $V = 8$, $Q = 0.62$. Are they different? We insert the values $Q_1 = 0.25$, $n_2 = 13$ and obtain

$$P(X \geq 8) = \sum_{x=8}^{13} \binom{13}{x} 0.25^x (0.75)^{13-x} = 0.0057$$

that is, the second text is significantly more active then the first.

In this way another kind of classification could be set up but our aim is rather to measure a property and to capture it starting from a language mechanism than to classify. Nevertheless, the methods presented above may be helpful in the construction of a theory or it can be used by literary scholars.

References

Altmann, G. (1978)**:** Zur Anwendung der Quotiente in der Textanalyse, in: *Glottometrika* 1, 91–106.

Altmann, G. (1988): *Wiederholungen in Texten*. Bochum: Brockmeyer**.**

Altmann, V. & Altmann, G. (2008): *Anleitung zu quantitativen Textanalysen*. Lüdenscheid: RAM.

Antosch, F. (1953): The diagnosis of literary style with the verb-adjective ratio, in: Doležel, L. & Bailey, R. W. (eds*.), Statistics and style: 57–65.* New York: Elsevier.

Bakker, F. J. (1965): Untersuchungen zur Entwicklung des Aktionsquotienten. *Archiv für die gesamte Psychologie* 117, 78–101.

Boder, D. P. (1940): The adjective-verb quotient: a contribution to the psychology of language, in: *Psychological Revue* 3, 309–345.

Busemann, A. (1925): *Die Sprache der Jugend als Ausdruck der Entwicklungsrhythmik.* Jena: Fischer.

Fischer, H. (1969): Entwicklung und Beurteilung des Stils, in: Kreutzer, H. & Gunzenhäuser, R. (eds.): *Mathematik und Dichtung.* München: Nymphenburger, 171–185.
Osgood, C. E., Walker, E. G. (1959): Motivation and language behavior: a content analysis of suicide notes, in: *Journal of abnormal and social psychology* 58–67.
Pieper, U. (1979): *Über die Aussagekraft statistischer Methoden für die linguistische Stilanalyse.* Tübingen: Narr.
Schlissmann, A. (1948): Sprach- und Stilanalyse mit einem vereinfachten Aktionsquotienten, in: *Wiener Zeitschrift für Philosophie, Psychologie und Pädagogik* 2
Schubert, F. (2008): *Differentielles Ausdrucksverhalten unter Berücksichtigung der Sprechersituation.* Dresden: Diss.
Tuldava, J. (2005): Stylistics, author identification, in: Köhler, R.; Altmann, G. &. Piotrowski, R. G. (eds.), *Quantitative Linguistics. An International Handbook:* Berlin,New York: de Gruyter, 368–387.
Wimmer, G. et al. (2001): *Úvod do analýzy textov*. Bratislava: Veda.

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