Studia Metrica et Poetica 12.2, 2025, 19–49

The Depth beyond the Lines: Key Linguistic Features of Three Polish Poems

Danil Fokin*

Abstract. In the current study, I introduce a combination of a qualitative-quantitative approach to discover the content of three Polish poems. The lexical content was annotated on lexical, textual, affective, and stylistic dimensions and then analysed using correlation and exploratory factor analyses. The correlation analysis plausibly reflects how prosodic accentuation and attention guidance operate, with the main accent (stress) in the middle of a verse and with line-final words being often shorter, pre-enjambed, and accumulating near the line break. Poems induce not an emotional but rather an intellectual and introspective engagement, being charged with frequent but more abstract and less vivid lexemes. The variables included in the exploratory factor analysis were clustered into four factors: *abstract-significance continuum*, *affective control*, *lexical domain*, and *linear organisation*. Together, they form a hierarchy of dimensions where imageability, concreteness, arousal, and significance play a superior role in poetic architectonics. Finally, the quantitative analysis enabled establishing affective differences between poems, with A. Zagajewski's poems being least dominant and structurally open, while Szymborska's and Herbert's poems use a dominant lexicon to frame interpretational pathways and emotionally anchor the reader.

Keywords: Polish poetry, contemporary poetry, empirical literary studies, empirical poetics, exploratory factor analysis, poetic affectiveness

0. Introduction

The poem is a multifaceted phenomenon which challenges the reader with poetic devices, visuo-spatial organisation, prosodic organisation, and semantic ambiguity. So, poetry is an example of "unconventional" texts (de Beaugrande, Dressler 1982), where syntactic rules are often violated, semantics is disrupted by reorganisation of meaning, and rhythmo-metrical patterns are key organisational elements. Empirical investigation of poetry requires consideration of the wide range of features involving lexical, textual, and affective domains

* Author's address: Danil Fokin, Faculty of Applied Linguistics, University of Warsaw, Poland, Krakowskie Przedmieście 26/28, 000-325. E-mail: d.fokin@uw.edu.pl.

https://doi.org/10.12697/smp.2025.12.2.02

(see Jacobs 2015; Jacobs, Kuiken 2021). Although, structural parts in poetry are realized only in relation to other elements and to the structural whole of a poem (Lotman 1972: 9).

To bridge literary analysis and cognitive modeling, I apply qualitative and quantitative methods to three contemporary Polish poems. All three poems adhere to the syntactic norms of the Polish language, use conventional lexicon, and analogous poetic devices, such as enumeration, syntactic parallelism, and verse anaphora while being devoid of rhyme regularities. **My aim is to identify interactions between linguo-stylistic features within the poetic structure, and to uncover latent patterns underlying these relations.** To achieve this aim, I *first* defined properties which can be assigned to a word which are lexical, textual, affective, and poetic, and *then* converted lexical content into the measurable units.

1. Lexical variables

I selected two basic lexical properties – *frequency* and *length*. These intralexical characteristics typically follow Zipf's law, i.e. **the principle of least effort**, with high-frequent words tend to be shorter (Linders, Louwerse 2022; Zipf 1949). They also crucially modulate reading behavior: low-frequent words are associated with higher print exposure and vocabulary size (Jared, O'Donell, 2016; Guasch et al. 2023), reducing speed of word recognition and reading fluency (Justino et al. 2023; Rayner et al. 2006). Increase in word length (in letters) leads to decreasing reading pace and rise in regressions. The similar effects are observed in poetry reading (Fokin et al. 2022; van 't Jagt 2014; Xue et al. 2019), demonstrating that these features have text independent and cross-linguistic effects (e.g. Kuperman et al., 2024). Finally, frequency and length influence memory-based processes in line with Kolmogorov complexity (Ehret 2018), which links word length to the restoration of the information content.

2. Textual variables

A key structural variables in text processing are a *word position in a line and a poem*. Kuperman et al. (2010) reported a wrap-up effect when reading sentence-final words, though they did not systematically observe this effect at line- and paragraph-final positions. The wrap-up effect is well-documented (Just, Carpenter 1980) and has been linked to punctuation and implicit prosody (Hirotani et al.

2006), the combined effects of punctuation and complexity (Warren et al. 2009), or the frequency and predictability of final words (Parker, Slattery 2025).

These spatial cues not only affect visual layout but also modulate reader's internal prosodic representations, influencing processing speed and emotional resonance. Previously, it was observed that metric anomalies at the stanza-final words disrupt reading fluency (Beck, Konieczny 2021), line-final words are read longer (Fechino et al. 2020; van 't Jagt et al. 2014) that might be caused by the savoring (Menninghaus, Wallot 2021) or wrap-up (Warren et al. 2009) effects, or stylistic devices such as enjambement. Wassiliwizki et al. (2017) reported emotional release occurred at the end of a line, stanza, and the poem, likely provoked by anticipation of the closure. Finally, syntactically deviant sentences are perceived as more poetic (Blohm et al. 2018).

3. Affective variables

Lately, great attention is paid to the affective dimension of the lexicon and its role in reading and aesthetic evaluation (e.g. Guasch et al. 2016; Imbir 2016; Moors et al. 2013). Affective norms enable examination of lexical influence on cognitive and emotional processes emerged while perceiving words. Recently, affective characteristics are analysed within neurocognitive poetics framework (Lüdtke et al. 2021; Jakobs 2015).

Overall, affective word properties – particularly valence, arousal, and imageability – modulate readers' engagement, emotional response, and aesthetic appreciation. Hugentobler et al. (2021) revealed that lower semantic cohesion produced more diverse associations among readers, which may indicate a broader imagery space. Gao and Guo et al. (2018) reported that poetry stimulates "aesthetic centers" in the brain, provoking complex emotions. Ullrich et al. (2016) observed that affective properties modulate reader's emotional reactions.

4. Poetic features

Among the variety of poetic tropes, *metaphor, enumeration,* and *enjambement* crucially affect reading behavior. *Rhyme*, in turn, is a key aspect of poetic prosody. **Metaphor** is a rearrangement of the whole semantic space and also the gestalt needs to be solved (see Glicksohn et al. 2021). "Decoding" a metaphor requires the mapping between literal and figurative language layers that may complicate comprehension (Citron, Goldberg 2014; Holyoak et al. 2018). So does **enjambement** by destabilizing the syntactic weave and graphical

organisation of the text fragment (Greene et al. 2012: 435). This inconsistency may increase reading time and impedes understanding (van 't Jagt et al. 2013). Additionally, prospective and retrospective enjambements (reject vs counter-rejet) function differently within a poem (Delente 2024), creating a cognitive gestalt by conflicting syntactic and versification lines (Tsur 2015; Norman 2020). The presence of **enumerations** benefits the rhythmical properties of a poetic sequence. It extends the narrative space with references, serving as stasis and motion by exhibiting various degrees of connections, cohesion, or disintegration (e.g. Brickey 2022; Vedder 2022). Finally, **rhymed** and metered poetry is perceived as more beautiful and touchable (Menninghaus, Wallot 2021), distributes sensual experience (Johnson-Laird, Oatley 2022), and evokes more intense emotions and aesthetic appreciation (Obermeier et al. 2016).

The present study

Despite the increasing interest in empirical approaches to poetry, the rich Polish poetic tradition remains underexplored within the empirical poetics framework. In 2014, Opara (2014) applied quantitative methods to investigate the change in preferences of grammatical rhymes in Polish poetry. Grabska-Gradzińska et al. (2012) compared English and Polish literary texts and found that poetry and prose show a **scale-free network structure**. In such networks, most words have few connections, while a small number of key concepts are highly connected and dominate the structure (Nodus Labs 2012; Solé, Valverde, 2012). Osowiecka and Kolańczyk (2018) found that reading Szymborska's poem *Utopia* enhanced participants' creative thinking, in contrast to non-literary texts such as cookbooks. This finding supports Hanauer's (1998) hypothesis on genre-specific cognitive effects.

However, these isolated studies did not employ a mixed-method approach nor address the structural and multidimensional features of poetic texts. Thus, the number of quantitative research on Polish poetry remains limited. To my knowledge, this is **the first empirical attempt to analyze and to cluster lexical, textual, affective, and poetic features relevant for the reception of Polish poetry.**

The study is driven by the following research questions:

1. How do lexical, textual, affective, and poetic features interrelate in selected poems?
2. What latent factors can be identified through exploratory analysis, and how do they reflect the structural and emotional architecture of the poems?

3. What insights about poetic structure emerge from analyzing the multidimensional configuration of these features?

By addressing these questions, I contribute to a deeper understanding of poetic architectonics, creating underpinnings for further broad research on Polish poetic material.

Materials and Method

Stimuli

In the study, the three poems were selected: W. Szymborska's "*Muzeum*" (Museum), Z. Herbert "*Mój Ojciec*" (My father), and A. Zagajewski's "*Z życia przedmiotów*" ("From the life of the things"). They are three of the most renowned Polish poets of the XX century. Their poetic practices exemplify the most prevalent forms of contemporary Polish poetry (Kulawik 1994; Pszczołowska 2001). Szymborska's and Zagajewski's poems are written in free verse (the so-called sentence poem) while Herbert's poem adheres to regular syllabic-accentual verse. "My Father" has no punctuation marks, creating an effect of inner uninterrupted monologue.

The poems differ in visuo-spatial organisation, prosodic patterns, and poetic devices employed. They are comparable in readability index (SMOG) (McLaughlin 1969; Scott 2025), number of lines, and average word length but differ in the number of words (Table 1).

Table 1. Descriptives of the selected poems

Author	Poem	Readability (SMOG)	Nlines	Nwords	Mword_length	Metered	Rhyme
Wisława Szymborska	"Muzeum" (Museum)	5/7 (10.46)	20	121	5.7	no	irregular
Zbigniew Herbert	"Mój ojciec" (My Father)	5/7 (9.78)	24	98	5.6	yes	no
Adam Zagajewski	"Z życia przedmiotów" (From the life of things)	5/7 (10.2)	20	98	5.6	no	internal

Thus, poems represent a broad yet comparable spectrum of poetic practice.

Research variables: conversion of linguistic units into countable ones

Lexical, textual, affective, and poetic variables included in the analysis are summarized in Table 2.

Table 2. Descriptives of features used in the study

Type (N)	Variable	M_all (SD)	Zagajewski Mean (SD)	Szymborska Mean (SD)	Herbert Mean (SD)
Lexical (316)	log_frequency	2.206 (1.377)	2.084 (1.335)	2.021 (1.354)	2.452 (1.405)
	length	5.269 (2.810)	5.551 (2.781)	5.165 (2.637)	5.124 (2.971)
Textual * (316)	position in text	53.633 (31.357)	49.5 (28.434)	49.000 (28.145)	61.000 (35.074)
Poetic ** (316)	enumeration	.158 (.366)	.235 (.426)	.175 (.382)	.083 (.276)
	metaphor	.326 (.479)	.214 (.412)	.423 (.497)	.339 (.475)
	rhyme	.500 (.501)	.490 (.502)	.423 (.497)	.570 (.497)
	enjambement	.111 (.314)	.82 (.275)	.041 (.200)	.200 (.394)
Affective *** (121)	valence	5.380 (1.275)	5.090 (1.537)	5.380 (1.008)	5.560 (1.076)
	arousal	3.740 (.876)	3.850 (1.096)	3.820 (.810)	3.580 (.535)
	origin	5.520 (.898)	5.380 (1.014)	5.900 (.715)	5.550 (.857)
	dominance	5.360 (1.058)	5.160 (1.169)	5.480 (1.061)	5.420 (.774)
	concreteness	4.180 (1.608)	4.396 (1.562)	3.936 (1.684)	3.967 (1.582)
	imageability	6.740 (1.340)	6.650 (1.195)	6.540 (1.569)	6.880 (1.261)
	significance	4.240 (.854)	4.450 (.749)	4.060 (.954)	4.040 (.870)

Note *. Position in line is limited to three – initial, middle, and final – and converted into numbers, thus the mean is equal to 2 for each poem. *Note* **: Poetic devices were coded as binary variables. The mean values in the table show the proportion of words in each text that contain the respective poetic device; *Note* ***. Affective features for poems are represented in medians due to the large number of missing data.

Word length represents the number of letters per word. **Word frequencies** were derived from Polish Web Corpus 2019 (Jakubíček et al. 2013; Lexical Computing CZ n.d.) and log-transformed to normalize the distribution and

mitigate skewness typical for raw word frequencies. Textual features included the word's **line** (1 = initial; 2 = medial, 3 = final) and **serial position** in the poem. Poetic variables are poetic devices and were manually annotated (0 = absent; 1 = present). **Metaphors** were identified based on conceptual mappings and figurative language markers. For instance, *wój wyścig z suknią nadal trwa* ("my race with the dress is still on") represents an extended metaphor; therefore, all its constituent words were assigned a value of 1. For **enjambments**, only the line-final words preceding a line break in potential enjambed constructions were annotated as 1, e.g.

> Omszały woźny drzemie *słodko* / zwiesiwszy wąsy nad gablotką (W. Szymborska)
> The moss-grown guard in *golden slumber* / props his moustache on the exhibit number. (transl. S. Barańczak and C. Cavanagh)

Enumerations were defined as list-like sequences occurring within one or across several lines and forming the stylistic unity:

> dotykamy i *oka* i *powietrza*, *ciemności* i *światła*, *Indii* i *Europy* (A. Zagajewski)
> We touch the eye and air, the darkness and the light, India and Europe. (literal transl. D.F.)

Rhymes were identified as any sound repetitions (*consonance*) across stanzas or internal positions, and all participating words were coded as 1:

na czter*ech* wiatr*ach* Po atlas*ach*	On the four winds, across the atlases
biegliśmy za nim zatroskani	we ran after him concerned
a on się gub*ił* W końcu wrac*ał*	He kept getting lost Then he returned
zdejmow*ał* zap*ach* kł*adł* pantofle	took off his scent set down his slippers.
Z. Herbert	(literal transl. D.F.)

Finally, **affective features** were derived from Imbir's (2016) norms, collected using the 9-point scale Self-Assessment Manikin (SAM) (Lang 1980). They included: **Valence** (pleasantness of affect): *umierać* (to die) (1.78) vs *uśmiech* (smile) (7.66); **Dominance** (sense of control): *przegrać* (to lose) (2.52) vs *korona* (crown) (7.1); **Origin** (emotional vs rational processing): *wiedzieć* (to know) (7.12) vs *serce* (heart) (2.66); **Arousal** (calmness vs excitement): *cichutko* (silently) (2.58) vs *cierpienie* (suffering) (6.84); **Significance** (perceived importance): *lutnia* (lute) (2.16) vs *żyć* (to live) (6.74); **Concreteness**[1] (concrete vs

[1] Concreteness is a reversed scale. Thus, a higher concreteness rate is associated with abstract words.

abstract): *noga* (food) (1.56) vs *wstyd* (shame) (7.08); **Imageability** (low vs high degree of mental imagery)[2]: *oko* (eye) (8.4) vs *tylko* (only) (2.92). Importantly, affective scores could be assigned to only 121 lexemes, of which 102 were unique and 19 repeated. Therefore, the affective dimension is analysed in terms of general tendencies rather than through a fully robust quantitative approach, due to the limited data available.

Data Analysis

I tested linear relationships using Pearson's correlations and quadratic relations, employing polynomial regression. Exploratory Factor Analysis (EFA) was applied to identify latent factors and to cluster features. Bartlett's sphericity test and Kaiser-Meyer-Olkin (KMO) measure were performed to assess data suitability for EFA. I employed the Maximum Likelihood factoring method and built the model using a backward elimination approach, initially including all factors and iteratively removing variables with low KMO values (< .50), ensuring model adequacy through the chi-square test. The oblique promax rotation method was used because of the factors' correlations. Factors with Eigenvalues < 1 were removed based on Kaiser's criterion. Analyses were conducted in JASP (JASP Team, version 0.19.2) and R (R Core Team, version 2025), using the lmtest package (Zeileis, Hothorn 2002).

[2] Imageability is a reversed scale. Thus, hard-to-imagine items are low in scores.
For the entire list of word properties, please consult https://osf.io/nb8yt/

Results

Pearson's correlation analysis

I constructed a correlation matrix, including all variables (Figure 1).

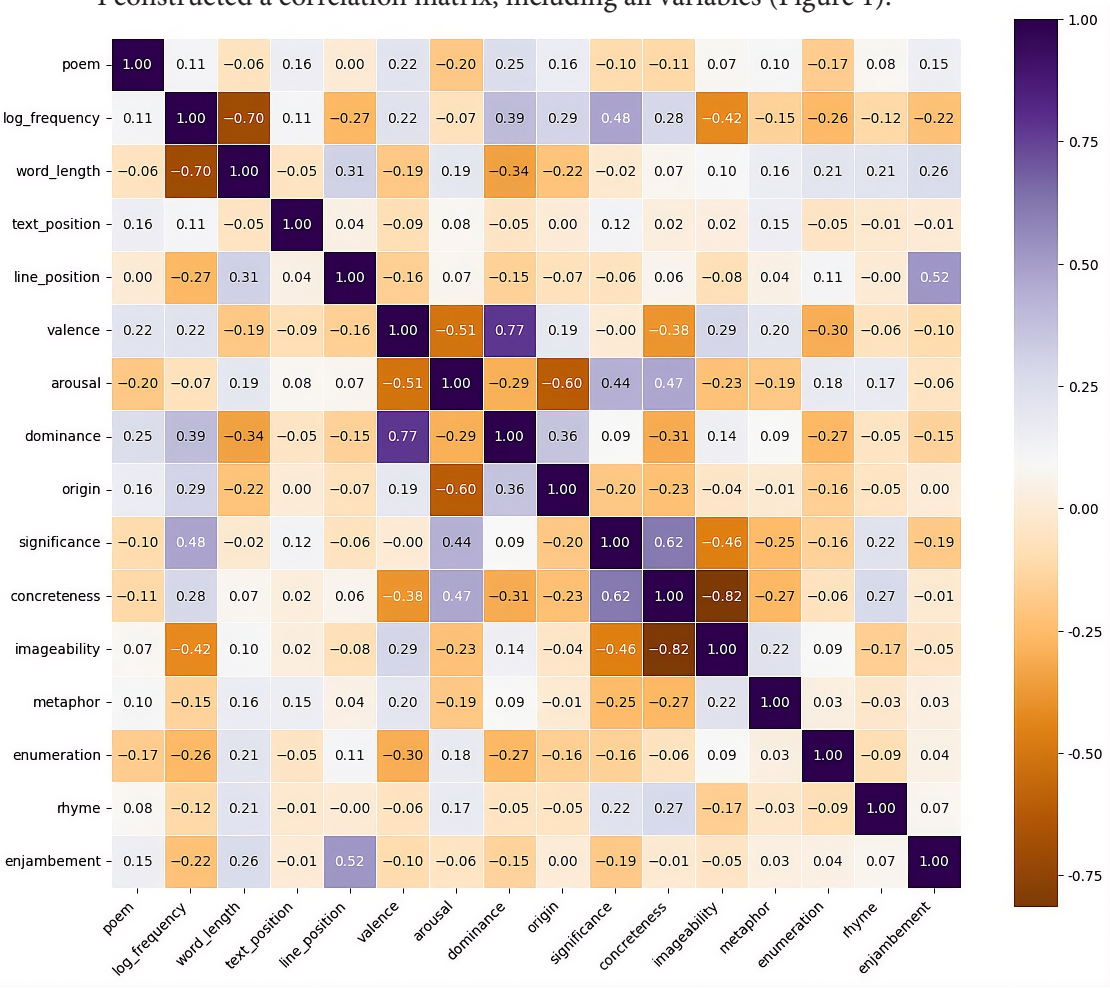

Figure 1. Correlation matrix on variables in selected poems.

In the paper, I discuss significant ($p < .001$) and large ($r > .30$ and $r < -.30$) correlations with shared variance exceeding 10%.

Word frequency and *length* show strong negative correlation ($r = -.70$) aligning with the principle of least effort (Linders, Louwerse 2023; Zipf 1949) and confirming the tendency for frequent words to be shorter (e.g. Guasch

et al. 2016; Moors et al. 2013). *High-frequency* words are associated with increased *dominance* ($r = .39$) and *significance* ($r = .48$) and decreased *imageability* ($r = -.42$).

A moderate correlation between *short words* and *line position* ($r = .31$) suggests that **shorter words accumulate near the line endings and carry lower dominance** ($r = -.34$). The strong link between *line position* and *enjambement* ($r = .52$) extends this observation: **pre-enjambed words tend to be shorter and less important.**

Inverse relationships between *valence* and *arousal* ($r = -.51$) reveal fundamental dynamics of emotional language: **pleasant words are less emotionally activating** (Betancourt et al. 2024; Ullrich et al. 2017; Wierzba et al. 2015). This link is amplified by valence's negative correlation with *concreteness* ($r = -.38$) and *enumeration* ($r = -.32$), indicating that **emotionally positive items drift towards concrete and list-like structures**.

A strong link between *valence* and *dominance* ($r = .77$) reinforces the idea that pleasantness is associated with a greater sense of control over emotional experience (e.g. Warriner et al. 2013). *Dominance* is associated with increased origin ($r = .36$) and decreased *concreteness* ($r = -.31$), suggesting that **dominative words are likely rationally processed and more concrete**. *Arousal*, in turn, is negatively related to *origin* ($r = -.60$), signifying that **exciting words are linked to more instinctive processing.** Yet arousal also correlates with *significance* ($r = .44$) and *concreteness* ($r = .47$), indicating that **emotionally intense words are abstract and personally meaningful**. Positive relations between *significance* and *concreteness* ($r = .62$) and negative link between significance and *imageability* ($r = -.46$) reflect that **abstract, easy-to-imagine words tend to have higher perceived significance**. Strong negative relations between *concreteness* and *imageability* ($r = -.82$), confirming that **abstract words are also harder-to-imagine.**

Polynomial regression analysis

To assess whether nonlinear (quadratic) functions offer a better explanation of between-variable relationships, I conducted polynomial regression analysis. I included only correlations with $R^2 > .20$ and $p < .05$, indicating a meaningful fit. Table 3 presents correlations for which the quadratic model significantly improved the fit. *Figure 2* visualizes quadratic coefficients.

Table 3. Determination coefficients (r^2) for statistically significant polynomial regressions.

Predictor	Response	quadratic r^2	p-value	Pearson's r	p-value
valence	arousal	**.584**	.0001	–.509	< .001
valence	origin	**.339**	<.0001	.189	< .05
valence	significance	**.274**	<.0001	– .002	.986

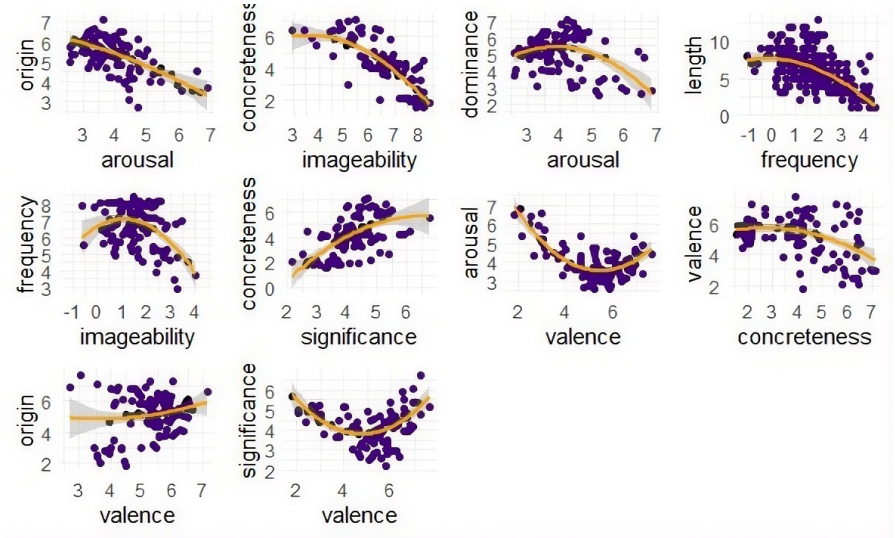

Figure 2. Polynomial relations between affective and lexical variables.

The results corroborated prior findings (e.g., Brysbaert et al. 2014; Moors et al. 2013; Imbir et al. 2016): the relationship between *valence* and *arousal* and *valence* and *significance* follows a U-shaped curve, while *valence* and *origin* display an inverted-U pattern. These findings indicate that **neutral words tend to be less arousing, less significant,** and **rated higher in origin** (i.e., more reflective while processing). In contrast, **emotionally polarized words** (both positive and negative) elicit **greater arousal and personal significance**, while appearing less rooted in reflective processing (lower origin scores). This suggests that emotional salience in poetry may arise not only from the valence itself but from its deviation from neutrality, driving heightened emotional engagement and associative meaning-making.

Exploratory Factor Analysis

Exploratory Factor Analysis (EFA) was employed to uncover latent dimensions underlying the observed correlations between variables, reveal structural patterns, and reduce complexity by identifying coherent clusters (Taherdoost et al. 2014; Watkins 2018).

I compared two models: a full 12-variable model including *text position*, and a reduced 11-variable model without it. The full model demonstrated superior fit indices (KMO score = .60; SRMR = .017; CFI = .965; Chi-squared Test = 80.209; df = 16; p < .001) (Hu, Bentler 1999: 24–28) but lacks qualitative interpretability with *text position*, *arousal*, and *enumeration* functioning as independent factors. Statistics of the reduced model is worse (KMO score = .60; SRMR = .033; CFI = .856; Chi-squared Test = 279.044; df = 17; p < .001) but factor loadings are more meaningful, with *arousal* logically integrated into the structure. Thus, the reduced four-factors model may be preferred for conceptual clarity.

Table 4 demonstrates the contribution of each factor in explanation of the poems.

Table 4. Factor loadings for variables included.

	Abstract significance continuum	Affective regulation	Lexical domain	Linear organisation	Uniqueness
imageability	—.681				.342
concreteness	.970				.105
significance	.838				.307
arousal	.493				.573
valence		1.060			–.000
dominance		.760			.366
word length			.863		.287
log_frequency			— .736		.121
enjambement				.774	.384
line position				.590	.584
enumeration					.844
Note. Applied rotation method is promax.					

The first factor (explaining 28% of the variance) represents an **abstract–significance continuum**, characterized by high *concreteness* and *significance*,

moderate *arousal*, and low *imageability*. This factor captures the role of abstract, hard-to-imagine words that evoke stronger emotional engagement and personal relevance. The second factor (26%) loads positively on valence and dominance, indicating a dimension of **affective control**. The third factor (12%) is attributed to the **lexical domain**, becoming more expressive with an increase in the word length and decrease in frequency. The fourth factor (9%) corresponds to **linear organisation**, characterized by high loadings on line position and enjambement. Crucially, **enumeration** is a unique factor (.844) that is not involved in any domains. Functioning independently, it might represent its distinct role as a stylistic and structural device in a poetic composition.

Figure 3 summarises the relations between factors, revealing negative link between abstract-significance continuum and the other factors and between affective control and lexical domain, as well as a positive association between lexical word properties and linear organisation.

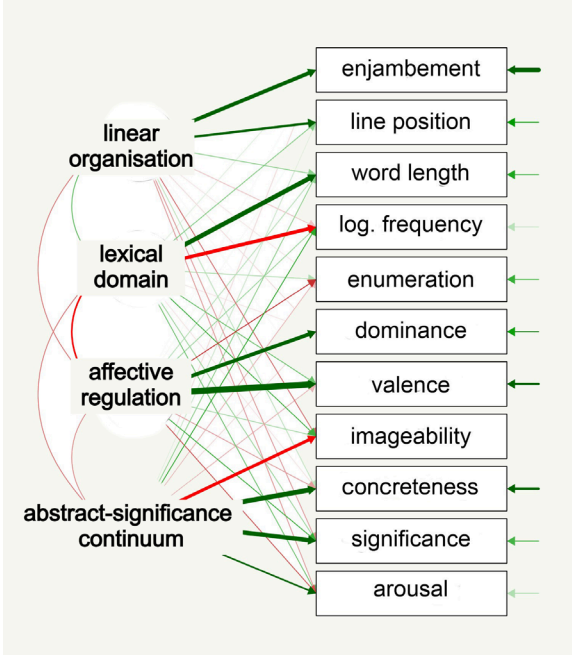

Figure 3. Path diagram of key factors (reduced model)

These patterns highlight core dimensions of poetic architectonics: **the key role of affective dimension and its supremacy over the lexical and linear factors**.

Discussion and conclusion

To explore the interplay of poetic elements in three Polish poems, I conducted Pearson's and polynomial correlation alongside exploratory component analyses. I analysed lexical, textual, affective, and poetic features of individual words and observed several meaningful relationships that deepen our understanding of poetic architectonics.

Q1. What are the correlations between lexical, textual, affective, and poetic features in selected poems?

First, the link between lexical word properties reflects the well-studied principle of least effort: high frequent words tend to be shorter, evidencing universality of this pattern and its independence from the language family and the text type.

Further, correlations between lexical word properties and affective norms vary from moderate to strong. High-frequency words used in selected poems tend to be more pleasant, dominant, significant, abstract and less imaginable, and more rationally processed. Partially, these relations reflect previous findings across languages (Imbir 2016; Moors et al. 2013; Warriner et al. 2013). Yet, the higher degree of abstraction and lower imageability, combined with mind-based processing may illustrate the specificity of the poetic content: **familiar words enhance textual accessibility while simultaneously engaging introspective reflection due to their lower vividness and abstractness.** This pattern may also be viewed in light of Wierzba et al.'s (2015) observation that low-frequency items tend to evoke more intense, mainly negative emotions such as sadness or fear. **The increased frequency of the lexicon in selected poems provokes rather not emotional but intellectual and cognitive engagement.**

More intriguing nuances emerged when examining relations between line position, lexical and poetic features. Less frequent words accumulate earlier in a line whereas short ones cluster near line closures and are less dominant. Furthermore, line final positions are frequently occupied by pre-enjambed items. This pattern plausibly reflects prosodic accentuation and attention guidance: **in declarative sentences, the middle of an utterance typically hosts the main intonational pitch** (Hirotani et al. 2006; Wysocka 2024), which in poetry often coincides with the caesura and receives the principal accentual stress of the verse (see Dłuska, 1970: 572–575). Line-final positions, where intonation typically declines, tend to contain shorter words. Likely functioning as prosodic organizing elements. They may induce a sense of closure or,

when pre-enjambed, create a spillover effect that guides the reader's attention into the next line.

The occurrence of **long, low-frequency words** in mid-line positions may illustrate a universal linguistic pattern: such words require greater cognitive effort to process (e.g. Berglund-Barraza et al. 2019), **are often semantically richer and thus placed in the middle of the line.** However, perceived significance increases for the high-frequent, abstract, and less imaginative words, revealing interplay between lexical and affective features in a poetic piece.

Enjambments reinforce this linguistic structuring, propelling the poem's rhythm and semantic flow across lines. As could be seen in the excerpt from Zagajewski:

Czy kochałyście? Czy umierałyście kiedyś,	Did you love? Have you ever been dying
w nocy, gdy wiatr otwiera okna i przenika	at night, when the wind opens windows and pierces
do chłodnego serca? Czy zaznałyście	the cold heart? Have you known
starości, czasu, przemijania? Żałoby?	old age, time, passing? Mourning?
Zagajewski "*Z życia przedmiotów*."	Literal translation D.F.

The excerpt illustrates how a dense network of phonological parallelisms combined with enjambment produces both cognitive tension and aesthetic cohesion. Enjambment increases cognitive effort by delaying syntactic closure, lowering reader's certainty and sense of control and adding semantic depth and fragmentarity to the poetic piece (Mastalski 2017; Norman 2020; Tsur 2015). Parallelisms reinforce phonological patterns, aiding anticipation, prediction, aesthetic liking and reward (Menninghaus et al. 2023; Obermeier et al. 2016; Wassiliwizki et al. 2017). Interrogative sentences are ended in the middle of a verse, creating the highest intonational (and emotional) peaks.

Metaphor's constituents are predictably more abstract and harder-to-imagine, leading to decreased significance. Thus, the embodiment of poetic metaphors in semantically multilayered and prosodically diverse structure may induce higher level of introspection, requiring greater cognitive effort to decode (Carston, Yan 2023; Płużyczka et al. 2024). This observation is supported by the tendency of metaphors to calm down thus provoking reflective thinking which is contrary to Citron and Goldberg (2014) observation of the increased emotional engagement while reading metaphors. Yet they did not consider poetic metaphors within the poetic context and applied limited metaphorical context, using taste-referential words only.

Enumerations involve low-frequency, short, and negatively valenced words that are less dominant and significant, and more automatically processed. These characteristics may indicate that **list-like structures are intended to amplify the atmosphere of the poem** (in this case, a negative one) and **to evoke rather automatic, unconscious** rather than reflective processing. For instance:

Jest wachlarz – gdzie rumieńce? Są miecze – gdzie gniew? I lutnia ani brzęknie o szarej godzinie. Szymborska "Museum"	The fan is there – but where is the blush? The swords are there – but where is the wrath? And not a lute resounds in the hour of grey. Literal translation D.F.

Here, the enumerated elements – *wachlarz*, *miecze*, *rumieńce*, *gniew* – may illustrate the ambiguity. On the one hand, they establish a melancholic and nostalgic tone, intensified by the rising intonation of the unreciprocated rhetorical questions. Punctuation marks and dashes may further slow down the reading pace (Geyer et al. 2020; Hirotani et al. 2006). On the other hand, the listed words form simple, two-word clauses that can be processed rapidly, recalling the rhythm of counting or nursery rhymes. The focal point and the most condensed image appears at the end of the stanza – *szara godzina* ("grey hour") – which absorbs and resolves the emotional tone of the preceding lines.

Overall, my findings reveal a nuanced interplay between lexical and affective variables in poetic structure: **the ambiguity of poetic meaning emerges through the counterbalancing of lexical affectivity and its dispersion within the poem** (see here also Aryani et al. 2016). Although this conclusion may seem self-evident, my analysis demonstrates that affective tone and semantic dynamics can be quantitatively captured through lexical analysis and subsequently explored qualitatively to uncover the poem's underlying architectonics. The observed relations underscores the value of multi-level analysis for understanding poetic architectonics.

Q2. In what hierarchical relations are the features? What factors are critical for poetic text analysis?

I employed Exploratory Factor Analysis to establish latent factors, underlying obtained correlations. The final model included 11 out of 15 variables included in the study: frequency, length, line position, valence, arousal, dominance, significance, concreteness, imageability, enjambement, and enumeration. Based on the model, the variables were clustered in four dimensions (see Table 3): *abstract-significance continuum* (explaining 28% of the variance), *affective control* (26%), *lexical domain* (12%), and *linear organisation* (9%). Abstract-significance continuum captures abstract, hard-to imagine concepts that are significant and emotionally intense. The lexical content of the selected poems appears to invite reflective reading, disrupting automatic processing and forming a *foreground trajectory of perception* (Jacobs 2015; Kuiken 2017). Such defamiliarisation (de-automatisation) complicates comprehension and may reduce the immediacy of imagery, yet it can also enhance aesthetic experience. Reflective poetry may evoke striking effects by challenging the reader to "solve the riddle", producing aesthetic pleasure or cognitive reward upon successful resolution (Miall, Kuiken 1994; Osowiecka, Kolańczyk 2018).

Perceived imagery, in turn, supports poetry appreciation and mood regulation and modulates absorption and the fluency of phrase and text processing (Kuzmičová 2014; Mak, Williams, 2021). When viewed in relation to other affective variables, *arousal* – reflecting the alternation between calmness and excitement – further illuminates the ruminative atmosphere of the poems: less imageable, more abstract, dominant, and mind-based lexemes are associated with greater calmness and peacefulness (see Figure 1). Overall, this continuum represents a semantic dimension rooted in abstract imagery and emotional intensity, which is the most vital for the composition of selected poems.

Affective control, which is another semantic dimension identified by EFA, encompasses valence and dominance. Variations in these features may regulate readers' affective responses and the sense of control, while potentially guiding attentional processes. It appears to be central to poetic language (Aryani et al., 2016; Gafni, Tsur, 2021; Ullrich et al., 2017). Word valence modulates processing speed – positive words are typically processed faster, whereas negative ones elicit slower responses (Gao 2022). Notably, negatively valenced artistic content can provoke heightened aesthetic appreciation and pleasure (Menninghaus et al., 2017). **Pleasant words anchor the poem's emotional clarity, asserting dominance and vividness.** In contrast, more excited words (high in arousal) drift toward abstraction, surfacing in lists and enjambements, where they stir intuitive, associative responses.

The *lexical domain* demonstrates a well-established inverse relationship between word frequency and length. While previous factors might represent semantic dimension of lexical content, being primary axes of variation, lexical domain reflects more constant crosslinguistic word properties (Kuperman et al. 2024). These fundamental psycholinguistic characteristics are associated with the age and education, vocabulary size, and print exposure (e.g. Guasch et al. 2023). Reactions to affective word properties may vary based on individual background, emotional state, or sensitivity, whereas responses to lexical characteristics are comparatively stable and highly predictable across individuals, reflecting more automatized perceptual processes. Thus, the lexical domain may represent the form through which semantics is embodied and shaped.

The fourth factor is the *linear organisation* that captures structural alignment. By extending syntax beyond versification breaks, it creates tension and de-automatises perception (Tsur 2015), requiring more cognitive effort and enhancing foregrounding (Jakobs 2014; van Peer et al. 2021). It is a driven force for the poetic rhythm, and crucial for visuo-spatial layout, and semantic flow across poetic lines. While the affective dimension guides emotional engagement and the abstract significance continuum shapes imaginative word aspects, lexical properties contributes to processing fluency; linear organisation, meanwhile, plays a structural role, maintaining prosodic and rhythmic flow and organising content across lines.

Q 3. What do we learn about the structure of the poem based on analyses provided?

My methods complement impressionistic (introspective) poetic analysis by revealing how word properties shape a poem's affective content and architectonics across different psycholinguistic layers. All selected poems devoid metrical and rhyme regularities, rely heavily on foregrounded elements, reinforced through enjambments, punctuation marks, spatial layout. This likely provokes a reflective and more analytical comprehension process.

The descriptive analysis on between-poems differences showed that the poems differ in only one index: *dominance* (Figure 2). This reveals an intriguing interplay between lexical dominance, perceived experience, and the degree of emotional openness. Dominance reflects the reader's sense of emotional control (Aryani et al. 2016; Gafni, Tsur 2021) and is positively associated with valence, aligning with Jakobs' (2015), who suggests that dominance influences emotional regulation during reading. Further, Freddi et al.'s (2015) reported that dominance is encoded in syntactic class and sensitive to motion (including

embodied verbs), while valence is semantically rooted and more expressed in nouns. My findings may extend this observation: words with high dominance ratings mainly involve embodied cognition (e.g., *wiedzieć* (to see), *smakować* (to taste)), whereas low-dominant ones cluster around death or sadness (e.g., *umierać* (to die), *płakać* (to cry)), suggesting **a poetic polarity between loss and affirmation** (see Appendix Table 1a).

These narrative contrasts are evident in Zagajewski and Szymborska's poems. Both are reflective, structured into three stanzas, and use elliptic syntax and rhetorical questions to create a dialogic space. Yet *Zagajewski* condenses each verse into either one-word interrogatives – minor sentences that attract accentual stress and disrupt reading fluency – or fills lines with enumerations (often enjambed) that delay the intonational pause and smooth contextual flow. *Szymborska*, in turn, maintains a natural cadence, strengthening accents and deepening semantics through punctuation marks. *Herbert*'s poem, by contrast, presents a completed narrative event that constrains interpretation within the poet's world. He omits punctuation altogether, creating an uninterrupted narrative flow that reads as a monolithic image. However, new syntactic sentences often begin mid-line and are marked by capital letters, which likely attract the reader's attention through visual salience.

The descriptive analysis revealed moderately-to-strong differences between poems in dominance scores (Figure 4): **Zagajewski's poem was the least dominant**.

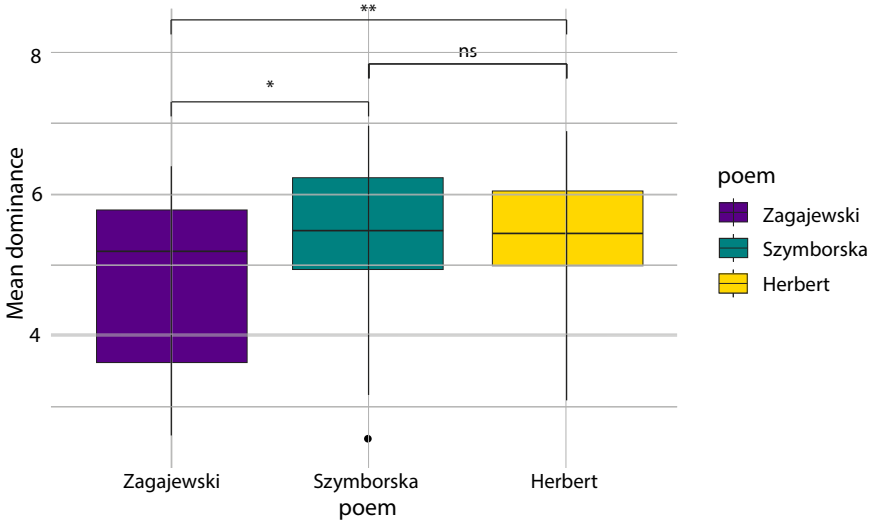

Figure 4. Comparison of the poems by dominance

This may result from its structural openness that invites personal interpretations. In contrast, **Szymborska's interior monologue and Herbert's politically-motivated** (the poem was written within deep communist period, 1956) **narratives use dominant language to assert interpretive control and emotionally anchor the reader**.

From the perspective of Johnson-Laird and Oatley (2022) simulation models, Szymborska's and Herbert's poems might reflect **a model of poetic content** where **readers experience basic and complex emotions**, engage with the protagonist, and are drawn into the poem's world through dominant lexicon. In contrast, Zagajewski's poem, rich in onomatopoeic features, rhyme, and prosodic shifts, allows **free-floating emotions and represents a mimetic model of poetic surface.** Larger, but statistically insignificant, fluctuations of valence, arousal, and origin scores (Table 2) indirectly support this conclusion, suggesting that Zagajewski's poem evokes greater emotional ambiguity and invites more automatic, affective processing.

Overall, my mixed-methods analysis highlights how affective variables interact with formal devices such as enjambment, enumeration, or rhythmicity. These interactions reveal structured contrasts – between openness and control, abstraction and concreteness – that deepen poetic engagement. My findings offer a framework for future studies in empirical poetics in various languages. Later, the observations will be examined within empirical study to explore how the observed relations modulate reading behaviour and cognitive reactions.

Limitations

The main limitation of the study lies in the limited availability of Polish affective norms. The norms derived from Imbir (2016) covered only 121 words, which constrained the factor analysis and required choosing a less statistically robust but more interpretable model. Therefore, the findings should be treated cautiously and regarded as indicative tendencies.

It should be noted that the solution for Factor 2 produced a Heywood case (a loading exceeding 1.0 for Valence), suggesting some instability in this factor, likely due to the small number of variables loading onto it. Therefore, interpretations regarding this factor should be treated with caution.

Second, the analyses were based on three poetic texts, which limits generalisability but simultaneously demonstrates the distinctiveness of each poem and the potential of the proposed method to capture such uniqueness.

Finally, functional and repeated lexemes were retained as integral to poetic prosody and structure, though their uneven frequency may have influenced

the results. Despite these constraints, the approach complements traditional literary and introspective analyses of Polish poetry.[3]

References

Aryani, Arash; Kraxenberger, Maria; Ullrich, Stefan; Jacobs; Arthur M.; Conrad, Marcus 2016. Measuring the basic affective tone of poems via phonological saliency and iconicity. In: *Psychology of Aesthetics, Creativity, and the Arts* 10(2), 191–204. https://doi.org/10.1037/aca0000033

Beaugrande, Robert-Alain de; Dressler, Wolfgang 1982. *Introduction to Text Linguistics*. London, New York: Longman.

Beck, Judith; Konieczny, Lars 2021. Rhythmic subvocalization: An eye-tracking study on silent poetry reading. In: *Journal of Eye Movement Research* 13(3):5. https://doi.org/10.16910/jemr.13.3.5

Berglund-Barraza, Amy; Tian, Fenghua; Basak, Chandramalika; Evans, Julia. L. 2019. Word Frequency Is Associated With Cognitive Effort During Verbal Working Memory: A Functional Near Infrared Spectroscopy (fNIRS) Study. In: *Frontiers in human neuroscience* 13(433). https://doi.org/10.3389/fnhum.2019.00433

Betancourt, Ángel-Armando; Guasch, Marc; Ferré, Pilar 2024. What distinguishes emotion-label words from emotion-laden words? The characterization of affective meaning from a multicomponential conception of emotions. In: *Frontiers in Psychology* 15:1308421. https://doi.org/10.3389/fpsyg.2024.1308421

Blohm, Stefan; Wagner, Valentin; Schlesewsky, Mathias; Menninghaus, Winfried 2018. Sentence judgments and the grammar of poetry: Linking linguistic structure and poetic effect. In: *Poetics* 69, 41–56. https://doi.org/10.1016/j.poetic.2018.04.005

Brickey, Alyson 2022. Aesthetic Unrest: "Howl" and the Literary List. In: Barton, Roman Alexander; Böckling, Julia; Link, Sarah; Rüggemeier, Anne (eds.), *Forms of List-Making: Epistemic, Literary, and Visual Enumeration*. London: Palgrave Macmillan, 171–187. https://doi.org/10.1007/978-3-030-76970-3_8

[3] I thank Dr. Łukasz Wróbel for the support in the preparation of the current paper, valuable pieces of advice, and insightful conversations we had together. I also thank my supervisor Monika Płużyczka for their constant support, kind words, and engagement in my scientific activities. This work was not possible without your participation.

Brysbaert, Marc; Warriner, Amy Beth; Kuperman, Victor 2014. Concreteness ratings for 40 thousand generally known English word lemmas. In: *Behavioral Research* 46, 904–911. https://doi.org/10.3758/s13428-013-0403-5

Carston, Robin: Yan, Xinxin 2023. Metaphor processing: Referring and predicating. In: *Cognition* 238, https://doi.org/10.1016/j.cognition.2023.105534

Citron, Francesca M. M.; Goldberg, Adele E. 2014. Metaphorical Sentences Are More Emotionally Engaging than Their Literal Counterparts. In: *Journal of Cognitive Neuroscience* 26(11), 2585–2595. https://doi.org/10.1162/jocn_a_00654

Delente, Éliane 2024. A Temporal and Dynamic Approach to Enjambments in French Versified Poetry from the 17th to the late 19th Century Studia In: *Studia Metrica et Poetica* 11.2, 45–78. https://doi.org/10.12697/smp.2024.11.2.02

Dłuska, Maria 1970. Wiersz, *Studia i rozprawy*, t. 1. Kraków: Wydawnictwo Literackie.

Ehret, Katharina 2018. Kolmogorov complexity as a universal measure of language complexity. https://www.christianbentz.de/MLC2018/Ehret.pdf (Accessed November 7, 2025).

Fechino, Mirion; Jacobs, Arthur M.; Lüdtke, Jana 2020. Following in Jakobson and Lévi-Strauss' footsteps: A neurocognitive poetics investigation of eye movements during the reading of Baudelaire's 'Les Chats'. In: *Journal of Eye Movement Research* 13(3): 4. https://doi.org/10.16910/jemr.13.3.4

Fokin, Danil; Blohm, Stefan; Riekhakaynen, Elena 2022. Reading Russian poetry: An expert-novice study. In: *Journal of Eye Movement Research* 13(3): 7. https://doi.org/10.16910/jemr.13.3.7

Freddi, Sebastien; Esteban, Jose; Dru, Vincent 2015. Emotions and language about motion: Differentiating affective dominance with syntax from valence with semantics. In: *Consciousness and Cognition* 38, 22–37. https://doi.rog/10.1016/j.concog.2015.09.010

Gafni, Chen; Tsur, Reuven 2021. Studying Emotive Effects in Poetry by Quantifying Open-Ended Impressions. In: *Empirical Studies of the Arts* 39(2), 216–242. https://doi.org/10.1177/0276237420984718

Gao, Chinhai; Guo, Cheng 2018. The Experience of Beauty of Chinese Poetry and Its Neural Substrates. In: *Frontiers in Psychology* 9 (1540). https://doi.org/10.3389/fpsyg.2018.01540

Gao, Chuanji; Shinkareva, Svetlana. V.; Peelen, Marcus V. 2022. Affective valence of words differentially affects visual and auditory word recognition. In: *Journal of experimental psychology: General* 151(9), 2144–2159. https://doi.org/10.1037/xge0001176

Geyer, Thomas; Günther, Franziska; Müller, Hermann. J.; Kacian, Jim; Liesefeld, Heinrich Rene; Pierides, Stella 2020. Reading English-language haiku: An eye-movement study of the 'cut effect.' *Journal of Eye Movement Research* 13(2). https://doi.org/10.16910/jemr.13.2.2

Glicksohn, Joseph; Goodblatt, Chanita. 2021. Empirical Studies of Poetic Metaphor In: Kuiken, Donald; Jacobs, Arthur M. (eds.), *Handbook of Empirical Literary Studies.* Berlin, Boston: De Gruyter, 121–145. https://doi.org/10.1515/9783110645958-006

Grabska-Gradzinska, Iwona; Kulig, Andzrej; Kwapien, Jarosław; Drozdz, Stanisław 2012. Complex network analysis of literary and scientific texts. In: *International Journal of Modern Physics C* 23(07), 1250051. https://doi.org/10.1142/S0129183112500519

Greene, Roland; Cushman, Stephen; Cavanagh, Clare; Ramazani, Jahan; Rouzer, Paul 2012. The *Princeton Encyclopedia of Poetry and Poetics.* Princeton: University Press.

Guasch, Marc; Boada, Roger; Duñabeitia, Jon Andoni; Ferré, Pilar 2023. Prevalence norms for 40,777 Catalan words: An online megastudy of vocabulary size. In: *Behavioral Research* 55, 3198–3217. https://doi.org/10.3758/s13428-022-01959-5

Guasch, Marc; Ferré, Pilar; Fraga, Isabel 2016. Spanish norms for affective and lexico-semantic variables for 1,400 words. In: *Behavioral Research* 48, 1358–1369. https://doi.org/10.3758/s13428-015-0684-y

Hanauer, David 1998. The genre-specific hypothesis of reading: Reading poetry and encyclopedic items. In: *Poetics* 26, 63–80. https://doi.org/10.1016/S0304-422X(98)00011-4

Hirotani, Masako; Frazier, Lyn; Rayner, Keith 2006. Punctuation and intonation effects on clause and sentence wrap-up: Evidence from eye movements. In: *Journal of Memory and Language,* 54(3), 425–443. https://doi.org/10.1016/j.jml.2005.12.001

Holyoak, Keith. J.; Stamenković, Dušan 2018. Metaphor comprehension: A critical review of theories and evidence. In: *Psychological Bulletin* 144(6), 641–671. https://doi.org/10.1037/bul0000145

Hu, Li-Tze; Bentler, Peter M. 1999. Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. In: *Structural Equation Modeling,* 6(1), 1–55. https://doi.org/10.1080/10705519909540118

Hugentobler, Katharina Gloria; Lüdtke, Jana 2021. Micropoetry Meets Neurocognitive Poetics: Influence of Associations on the Reception of Poetry. In: *Frontiers in Psychology* 12, 737756. https://doi.org/10.3389/fpsyg.2021.737756

Imbir, Kamil 2016. Affective Norms for 4900 Polish Words Reload (ANPW_R): Assessments for Valence, Arousal, Dominance, Origin, Significance, Concreteness, Imageability and, Age of Acquisition. In: *Frontiers in Psychology* 7, 1081. https://doi.org/10.3389/fpsyg.2016.01081

Jacobs, Arthur. M. 2015. Neurocognitive poetics: methods and models for investigating the neuronal and cognitive-affective bases of literature reception. In: *Frontiers in Human Neuroscience* 9(186). https://doi.org/10.3389/fnhum.2015.00186

Jakubíček, Miloš; Kilgarriff, Adam; Kovář, Vojtěch; Rychlý, Pavel; Suchomel, Vít 2013. The TenTen corpus family. In: *7th International Corpus Linguistics Conference CL*, 125–127. https://www.sketchengine.eu/wp-content/uploads/The_TenTen_Corpus_2013.pdf (accessed December 8, 2025)

Jared, Debra; O'Donell, Katrina 2016. Skilled adult readers activate the meanings of high-frequency words using phonology: Evidence from eye tracking. In: *Memory and Cognition* 45, 334–346. https://doi.org/10.3758/s13421-016-0661-4

JASP Team 2025. *JASP* (Version 0.19.3) [Computer software]. https://jasp-stats.org/

Johnson-Laird, Philip N.; Oatley, Keith 2022. How poetry evokes emotions. In: *Acta Psychologica* 224, 103506. https://doi.org/10.1016/j.actpsy.2022.103506

Just, Marcel Adam; Carpenter, Patricia A. 1980. A theory of reading: From eye fixations to comprehension. In: *Psychological Review* 87(4), 329–354. https://doi.org/10.1037/0033-295x.87.4.329

Justino, Julia; Kolinsky, Regine 2023. Eye movements during reading in beginning and skilled readers: Impact of reading level or physiological maturation? In: *Acta Psychologica* 236, 103927. https://doi.org/10.1016/j.actpsy.2023.103927

Kuiken, Donald; Douglas, Shawn 2017. Forms of absorption that facilitate the aesthetic and explanatory effects of literary reading. In: Hakemulder, Frank; Kuijpers, Moniek; Tan, Ed S.; Balint, Katalin; Doicaru, Miruna M. (eds.), *Narrative absorption*, 217–249. Amsterdam, Philadelphia: John Benjamins Publishing. https://doi.org/10.1075/lal.27.12kui

Kuiken, Donald; Jacobs, Arthur M.. (eds.) 2021. *Handbook of Empirical Literary Studies.* Berlin, Boston: De Gruyter.

Kulawik, Adam. 1994. *Poetyka: wstęp do dzieła literackiego [An introduction to the literary work]*. Warszawa: Antykwa.

Kuperman, Victor; Dambacher, Michael; Nuthmann, Antje 2010. The effect of word position on eye-movements in sentence and paragraph reading. In: *Quarterly Journal of Experimental Psychology* 63(9), 1838–1857. https://doi.org/10.1080/17470211003602412

Kuperman, Victor; Schroeder Sascha; Gnetov, Daniil 2024. Word length and frequency effects on text reading are highly similar in 12 alphabetic languages. In: *Journal of Memory and Language* 135, 10449. https://doi.org/10.1016/j.jml.2023.104497

Kuzmičová, Anežka 2014. Literary Narrative and Mental Imagery: A View from Embodied Cognition. In: *Style* 48(3), 275–293. http://www.jstor.org/stable/10.5325/style.48.3.275

Lang, Peter J. 1980. Behavioral treatment and bio-behavioral assessment: computer applications. In: Sidowski, Joseph B.; Johnson, James Harding; Williams, Thomas Arthur (eds.), *Technology in Mental Health Care Delivery Systems*, 119–137. Norwood, NJ: Ablex.

Lexical Computing CZ s.r.o. (n.d.) *SketchEngine V. 2024.* Sketch Engine. https://www.sketchengine.eu/ (accessed August 12, 2024).

Linders, Guido. M.; Louwerse, Marc. M. 2023. Zipf's law revisited: Spoken dialog, linguistic units, parameters, and the principle of least effort. In: *Psychonomic bulletin & review* 30(1), 77–101. https://doi.org/10.3758/s13423-022-02142-9

Lotman, Juri 1972. *Analiz poeticheskogo teksta. Struktura stikha. [Analysis of the poetic text. The structure of verse]*. Moskva: Prosveshchenie.

Lüdtke, Jana; Kaakinen, Johanna K.; Jacobs, Arthur M. 2021. Contextual Meaning-Making in Reading: The Role of Affect. In: Kuiken, Donald; Jacobs, Arthur M. (eds), *Handbook of Empirical Literary Studies,* 39–63. Berlin, Boston: De Gruyter. https://doi.org/10.1515/9783110645958-003

Mak, Marloes, Willems, Roel M. 2021. Mental Simulation during Literary Reading. In: Kuiken, Donald; Jacobs, Arthur M. (eds), *Handbook of Empirical Literary Studies*. Berlin/Boston: De Gruyter, 63–85. https://doi.org/10.1515/9783110645958-004

Mastalski, Arkadiusz Sylwester 2023. O przerzutni. [On Enjambment]. In: *Zagadnienia Rodzajów Literackich* 66(1), 157–180. https://doi.org/10.26485/ZRL/2023/66.1/13

McLaughlin, Harry G. 1969. SMOG grading-a new readability formula. In: *Journal of Reading* 22, 639–646.

Menninghaus, Winfried; Wallot, Sebastian 2021. What the eyes reveal about (reading) poetry. In: *Poetics* 85, 101526. https://doi.org/10.1016/j.poetic.2020.101526

Menninghaus, Winfried; Wagner, Valentin; Hanich, Julian,; Wassiliwizky, Eugen; Jacobsen, Thomas; Koelsch, Stefan 2017. The Distancing-Embracing model of the enjoyment of negative emotions in art reception. In: *Behavioral and Brain Sciences* 40:e347. https://doi.org/10.1017/S0140525X17000309

Menninghaus, Winfried: Wagner, Valentin; Schindler, Ines; Knoop Christine A.; Blohm, Stefan; Frieler, Klaus; Scharinger, Mathias 2023. Parallelisms and deviations: two fundamentals of an aesthetics of poetic diction. In: *Philosophical Transaction Royal Society* 379 (1895), 20220424. https://doi.org/10.1098/rstb.2022.0424

Miall, Davis S.; Kuiken, Donald 1994. Foregrounding, defamiliarization, and affect: Response to literary stories. In: *Poetics* 22, 389–407. https://doi.org/10.1016/0304-422X(94)00011-5

Moors, Agnes; Houwer, Jan D.; Hermans, Dirk; Wanmaker, Sabine; Schie, Kevin; Van Harmelen, Anne-Laura; De Schryver, Maarten; De Winne, Jeffrey; Brysbaert, Marc 2013. Norms of valence, arousal, dominance, and age of acquisition for 4,300 Dutch words. In: *Behavioral Research Methods* 45, 169–177 https://doi.org/10.3758/s13428-012-0243-8

Nodus Labs 2012. *Types of Networks: Random, Small, Scale-Free*. https://noduslabs.com/radar/types-networks-random-small-world-scale-free/ (Accessed August 27, 2025).

Norman, Boris J. 2020. Bor'ba stikhotvornoi stroki s predlozheniem v poeticheskom tekste [Conflict between the Line and the Sentence in a Poetic Text]. In: *Izvestia. Ural Federal University Journal* 22(3), 198–210. https://doi.org/10.15826/izv2.2020.22.3.053

Obermeier, Christian; Kotz, Sonia A.; Jessen, Sarah, Raettig, Tim; Koppenfels, Martin; Menninghaus Winfried 2016. Aesthetic appreciation of poetry correlates with ease of processing in event-related potentials. In: *Cognitive Affect Behavioral Neuroscience* 16, 362–373. https://doi.org.10.3758/s13415-015-0396-x

Osowiecka, Małgorzata; Kolańczyk Alina 2018. Let's Read a Poem! What Type of Poetry Boosts Creativity? In: *Frontiers in Psychology* 9, 1781. https://doi.org/10.3389/fpsyg.2018.01781

Opara, Karol R. 2014. Grammatical rhymes in Polish poetry: A quantitative analysis. In: *Digital Scholarship in the Humanities* 30(4), 589–598. https://doi.org/10.1093/llc/fqu029

Parker, Adam J.; Slattery, Timothy J. 2025. Frequency and predictability effects for line-final words. In: *Journal of Experimental Psychology: Human Perception and Performance* 51(1), 92–112. https://doi.org/10.1037/xhp0001245

Płużyczka, Monika; Kakimova, Ainur; Medhakar, Akshay 2023. Processing and appreciation of literary metaphors in English as a foreign language: An eye-tracking study. In: *AILA Review.* https://doi.org/10.1075/aila.23024.plu

Pszczołowska, Lucylla 2001. *Wiersz polski: zarys historyczny [Polish verse: A historical outline]*. Wrocław: FUNNA.

R Core Team 2025. *R: A language and environment for statistical computing*. Vienna: R Foundation for Statistical Computing. https://www.R-project.org/ (Accessed 25 March 2025).

Rayner, Keith; Chace, Kathrin; Slattery, Timothy J; Ashby Jane 2006. Eye Movements as Reflections of Comprehension Processes In: *Scientific Studies of Reading* 10(3), 241–255, https://doi.org/10.1207/s1532799xssr1003_3

Scott, Brian 2025. The SMOG Readability Formula, a Simple Measure of Gobbledygook. https://readabilityformulas.com/the-smog-readability-formula/ (Accessed April 12, 2025).

Sole, Ricard; Valverde Sergi 2004. Information Theory of Complex Networks: On Evolution and Architectural Constraints. In: Eli Ben-Naim, Hans Frauenfelder, Zoltan Toroczkai (eds.), *Complex Networks* (*Lecture Notes in Physics* 650). Berlin, Heidelberg: Springer, 189–207. https://doi.org/10.1007/978-3-540-44485-5_9

Taherdoost, Hamed; Sahibuddin, Shamsul; Jalaliyoon, Neda 2014. Exploratory Factor Analysis: Concepts and Theory. In: Jerzy Balicki (ed.), *Advances in Applied and Pure Mathematics* (*Mathematics and Computers in Science and Engineering Series* 27). Gdansk, London: WSEAS Press, 375–382. https://hal.science/hal-02557344/document

Tsur, Reuven 2015. Free Verse, enjambment, irony: A case study. In: *Style* 49(1), 35–45. https://doi.org/10.5325/style.49.1.0035

Ullrich, Susann; Aryani, Arash; Kraxenberger, Maria; Jacobs, Arthur M.; Conrad, Marcus 2017. On the Relation between the General Affective Meaning and the Basic Sublexical, Lexical, and Inter-lexical Features of Poetic Texts – A Case Study Using 57 Poems of H. M. Enzensberger. In: *Frontiers in Psychology* 7, 1–19. https://doi.org/10.3389/fpsyg.2016.02073

van Peer, Willie; Sopčák Paul; Castiglione, Davide; Fialho, Olivia; Jacobs, Arthur M.; Hakemulder, Frank 2021. Foregrounding. In: Donald Kuiken and Arthur M. Jacobs (eds.), *Handbook of Empirical Literary Studies*. Boston: De Gruyter, 145–176. https://doi.org/10.1515/9783110645958-007

van 't Jagt, Ruth Koops; Hoeks, John C.J.; Dorleijn, Gillis Jan; Hendriks, Petra 2013. Look before you leap: How enjambement affects reading of poetry. In: *Scientific Study of Literature* 4, 3–24. https://doi.org/10.1075/ssol.4.1.01jag

Vedder, Ulrike 2022. Poetological Lists: Writing-Scenes in Contemporary Literature. In: Barton, Roman Alexander; Böckling, Julia; Link, Sarah; Rüggemeier, Anne (eds.), *Forms of List-Making: Epistemic, Literary, and Visual Enumeration*. London: Palgrave Macmillan, 209–225. https://doi.org/10.1007/978-3-030-76970-3_10

Warren, Tessa; White, Sarah J.; Reichle, Erik D. 2009. Investigating the causes of wrap-up effects: Evidence from eye movements and E–Z Reader. In: *Cognition* 111(1), 132–137. https://doi.org/10.1016/j.cognition.2008.12.011

Warriner, Amy Beth; Kuperman, Victor; Brysbaert, Marc 2013. Norms of valence, arousal, and dominance for 13,915 English lemmas. In: *Behavioral Research Methods* 45, 1191–1207. https://doi.org/10.3758/s13428-012-0314-x;

Wassiliwizky, Eugen; Koelsch, Stefan; Wagner, Valentin; Jacobsen, Thomas; Menninghaus, Winfred 2017. The emotional power of poetry: Neural circuitry, psychophysiology and compositional principles. In: *Social Cognitive and Affective Neuroscience* 12(8), 1229–1240. https://doi.org/10.1093/scan/nsx069;

Watkins, Marley W. 2018. Exploratory Factor Analysis: A Guide to Best Practice. In: *Journal of Black Psychology* 44(3), 219–246. https://doi.org/10.1177/0095798418771807;

Wierzba, Małgorzata; Riegel, Monika; Wypych, Marek; Jednoróg, Katarzyna; Turnau, Paweł; Grabowska, Anna; Marchewka, Artur 2015. Basic Emotions in the Nencki Affective Word List (NAWL BE): New Method of Classifying Emotional Stimuli. In: *PLoS ONE* 10(7): e0132305. https://doi.org/10.1371/journal.pone.0132305

Wysocka, Marta 2024. Intonation of declarative, imperative and interrogative sentences in the perception of adult female users of Polish. In: *Prace Językoznawcze* 26(4), 111–127. https://doi.org/10.31648/pj.10591

Xue, Shuwei; Lüdtke, Jana; Sylvester, Teresa; Jacobs, Arthur M. 2019. Reading Shakespeare sonnets: combining quantitative narrative analysis and predictive modeling – an eye tracking study. In: *Journal of Eye Movement Research* 12(5), 2. https://doi.org/10.16910/jemr.12.5.2

Zeileis, Achim; Hothorn, Torsten 2002. Diagnostic Checking in Regression Relationships. In: *R News* 2(3), 7–10. https://journal.r-project.org/articles/RN-2002-018/ (Accessed November 26, 2025).

Zipf, George Kingsley 1949. *Human behavior and the principle of least effort*. Cambridge, Mass.: Addison-Wesley.

Appendix

Table A1. Extremes of dominance and related affective properties

	word	dominance	valence	arousal	significance
lowest	przegrać (to lose)	2.52	2.98	5.18	4.4
	umierać (to die)	2.62	1.78	6.5	4.48
	lęk (pain)	2.78	2.40	6.04	3.54
	cierpienie (suffering)	2.79	2.06	6.84	3.68
	wstyd (shame)	2.80	2.06	5.08	4.02
highest	korona (crown)	7.1	6.12	4.22	6.54
	miecz (sword)	6.92	5.20	4.42	5.74
	ojciec (father)	6.84	6.56	4.04	4.86
	bardzo (very)	6.64	6.16	4.44	4.40
	mieć (to have)	6.54	6.00	4.20	5.90

Table B1. The comparison between KMO indices for EFA models

Kaiser-Meyer-Olkin Test		
	MSA_reduced	MSA_full
Overall MSA	**.602**	.604
log freq.	.582	.584
word length	.550	.552
text position	–	.481
line position	.650	.645
valence_M	.600	.601
arousal_M	.567	.570
dominance_M	.611	.614
significance_M	.570	.578
concreteness_M	.646	.648
imageability_M	.598	.598
enjambement	.606	.607
enumeration	.838	.826

Table B2. The comparison between additional indices for EFA models

Additional fit indices						
	RMSEA	RMSEA 90% confidence	SRMR	TLI	CFI	BIC
reduced model	.221	.199 – .244	.033	.531	.856	181.197
full model	.113	.089 – .138	.017	.854	.965	—11.882

Note*: **RMSEA** – calculates how well the model will fit the population covariance matrix; penalizes the model complexity (p ≤ .05 excellent; p ≤ .08 acceptable); **SRMR** – standardized differences between observed correlations and model-calculated correlations (p ≤ .05 excellent; p ≤ .08 acceptable); **TLI** compares constructed model with the null (independence) model, penalizing complexity (> .95 good, > .97 excellent); **CFI** compares constructed model with a null model (> .95 good, > .97 excellent); BIC is an information criterion while comparing different models (the lower BIC score, the more balanced the model)

Table B3. The comparison between factor characteristics for EFA models

Factors characteristics (full model)

		Unrotated solution			Rotated solution		
	Eigenvalues	SumSq. Loadings	Proportion var.	Cumulative	SumSq. Loadings	Proportion var.	Cumulative
Abstract significance continuum	3.047	2.852	.238	.238	2.374	.198	.198
Affective regulation	2.858	2.650	.221	.459	1.952	.163	.360
Lexical domain	1.409	1.014	.084	.543	1.451	.121	.481
Linear organisation	1.050	.798	.067	.610	1.132	.094	.576
Lexical importance	1.020	.452	.038	.647	.847	.071	.646

Factor Characteristics (reduced model)

		Unrotated solution			Rotated solution		
	Eigenvalues	SumSq. Loadings	Proportion var.	Cumulative	SumSq. Loadings	Proportion var.	Cumulative
Abstract significance continuum	3.043	2.779	0.253	0.253	2.437	0.222	0.222
Affective regulation	2.850	2.576	0.234	0.487	1.983	0.180	0.402
Lexical domain	1.409	0.993	0.090	0.577	1.522	0.138	0.540
Linear organisation	1.024	0.743	0.068	0.645	1.146	0.104	0.644

Note. Unrotated solution explains most of the variance in the data by identifying underlying dimensions; rotated solution transforms unrotated observations, "structurising" and simplifying the structure of the variance