Measuring the Basic Affective Tone of Poems via Phonological Saliency and Iconicity

Arash Aryani
Freie Universität Berlin

Maria Kraxenberger
Max Planck Institute for Empirical Aesthetics, Frankfurt am Main, Germany

Susann Ullrich
Leipzig University

Arthur M. Jacobs
Freie Universität Berlin and Center for Cognitive Neuroscience Berlin, Berlin, Germany

Markus Conrad
University of La Laguna

We investigate the relation between general affective meaning and the use of particular phonological segments in poems, presenting a novel quantitative measure to assess the *basic affective tone* of a text based on foregrounded phonological units and their iconic affective properties. The novel method is applied to the volume of German poems "verteidigung der wölfe" (defense of the wolves) by Hans Magnus Enzensberger, who categorized these 57 poems as friendly, sad, or spiteful. Our approach examines the relation between the phonological inventory of the texts to both the author's affective categorization and readers' perception of the poems—assessed by a survey study. Categorical comparisons of *basic affective tone* reveal significant differences between the 3 groups of poems in accordance with the labels given by the author as well as with the affective rating scores given by readers. Using multiple regression, we show our sublexical measures of *basic affective tone* to account for a considerable part of variance (9.5%−20%) of ratings on different emotion scales. We interpret this finding as evidence that the iconic properties of foregrounded phonological units contribute significantly to the poems' emotional perception—potentially reflecting an intentional use of phonology by the author. Our approach represents a first independent statistical quantification of the *basic affective tone* of texts.

Keywords: phonological iconicity, foregrounding, sound-meaning in poetry, EMOPHON, neurocognitive poetics model

The discussion about an inherent relation between sound and meaning in language dates back to Greek antiquity with Plato's (1892) Cratylus dialogue. Despite such a long, and often controversial tradition (Genette, 1995), it is still an open question whether and to which extent the overall affective meaning of a text is (co-) determined by the specific use of sound in general, or of phonological units in particular. With the present study we aim to contribute to answering this question, with a special focus on the literary genre of poetry. We will present quantitative phonological analyses of poems, the affective impact of which we assessed via a rating study.

In general, linguistics and literary studies have not paid much attention to the relationship between sound and meaning. Usually considered to be opposed to the linguistic principle of arbitrariness (De Saussure, 1916/1983; Hockett, 1960), research on this topic often fell short, or only reached dubious reputation due to methodological and theoretical shortcomings. It is just recently that the potential relation between sound and meaning received increasing interest. Several recent studies suggest a connection between formal aspects of language and meaning with phonological iconicity as a general property that structures language in a supplementary

way (Christiansen & Monaghan, 2015; Perniss, Thompson, & Vigliocco, 2010; Perniss & Vigliocco, 2014; see Schmidtke, Conrad, & Jacobs, 2014, for a review) and might be important for early language development (Monaghan, Shillcock, Christiansen, & Kirby, 2014).[1] At the lexical level, results of earlier empirical studies already had provided support for a systematic relationship between phonological and lexical features of words, for example, attributes of conceptual meaning such as size (Huang, Pratoomraj, & Johnson, 1969; Sapir, 1929; Thompson & Estes, 2011) or shape (Köhler, 1929; Ramachandran & Hubbard, 2001; Westbury, 2005), lexical category (Farmer, Christiansen, & Monaghan, 2006, 2009), affective meaning (Myers-Schulz, Pujara, Wolf, & Koenigs, 2013; Ohala, 1994), including respective advantages for word learning (Nygaard, Cook, & Namy, 2009; Monaghan, Christiansen, & Fitneva, 2011).

Beyond the lexical level of language, and especially in relation to affective meaning and emotions (see Hsu, Jacobs, Citron, & Conrad, 2015a, for lexical affective effects during text reading), the literary genre of poetry seems to be of particular interest for the investigation of phonological iconicity (Albers, 2008; Aryani, Jacobs, Conrad, 2013; Auracher et al., 2010; Jakobson & Waugh, 1979/2002; Fónagy, 1961; Schrott & Jacobs, 2011; Tsur, 1992). Poetry can generally be understood as inherently concerned with the expression and elicitation of emotions (Lüdtke, Meyer-Sickendieck, & Jacobs, 2014; Meyer-Sickendiek, 2011; Winko, 2003) while being deeply rooted at the aesthetic and perceptual level in the domains of speech and sound (Jacobs & Kinder, 2015; Schrott & Jacobs, 2011; Wolf, 2005). Emphasis on phonological units such as syllables or phonemes through diverse stylistic devices, like onomatopoeia or figures of self-similarity and parallelisms as rhyme, meter or alliterations may serve as examples for the latter while the presence of meter and rhyme, for instance, has been shown to affect aesthetic appreciation, intensity of processing and emotional perception of lyrics and poems (Menninghaus et al., 2014; Obermeier et al., 2013; Bohrn et al., 2012b, 2013).

Considering two major principles of the poetic genre, that is, the prominence of sound properties and expressed or perceived emotions, several empirical studies offer first affirmative evidence for a relation between affective meaning and occurrence of specific phonological units in poetry. In a comparative analysis of Old Egyptian hymns and lamentations together with hymns and ballads by Johann Wolfgang von Goethe, plosive sounds were found to occur significantly more frequently in hymns of both sources, whereas nasals were more frequent in lamentations and ballads (Albers, 2008). Similarly, cross-linguistic studies report a higher frequency of the plosives /p/, /b/, /t/, and /d/ in poems rated as happy versus a higher frequency of nasals in poems perceived as sad; with consistent results for German, Chinese, Russian and Ukrainian participants and poems (Auracher et al., 2010). Likewise, German and Brazilian participants found plosives to be more appropriate in a pleasant context (for instance a wedding) than the nasals /m/, and /n/, which seemed to be more suitable to express sad feelings (for instance in the context of a funeral; Wiseman & van Peer, 2003). Some other studies draw exclusively on the works of a single author: Miall (2001) compared passages from Milton's "Paradise Lost" that either dealt with depictions of Hell or Eden. Passages about Hell were found to contain significantly more front vowels and hard consonants than passages about Eden while the latter contained more medium back vowels. Analyzing the phono-

logical material of the poetic works of Edgar Allan Poe, Whissell (2011) reported that Poe used "pleasant, sad, and soft sounds" more frequently than sounds that were categorized as "active." Note that these results are based on inductive phonoemotional classification, that is, on the tendency of single phonemes to appear more often or more seldom in English words with known emotional meaning, derived from a rating study (Whissell, 2000).

However, despite these preliminary indications of a relation between sound and meaning in poetry—and of fundamental interest for our present undertaking—no systematic empirical research so far has offered an independent statistical measure to quantify the affective tone of texts or poems based on the given phonemic material. So far, research merely observed the presence or absence of single phonemes or classes of phonemes, resulting in statistical reports of categorical distinctions regarding the phonemic inventory of different poems. Furthermore, taken together, most studies arrived at contradictory results concerning phonemes under observation as well as the affective meaning associated with them. For instance, Wiseman and van Peer (2003); Albers (2008); and Auracher et al. (2010) assigned the plosives /t/, /b/, /d/, and /p/ to the affective category of happiness. Fónagy (1961) attributed /t/ to aggressive poems, whereas according to Whissell (1999) plosives like /t/, /b/, and /d/ tend to be more dominant in unpleasant words and stand in a negative correlation with pleasantness.

The Present Study

In the following, we focus on three types of theoretical and methodological limitations and shortcomings of previous studies while presenting a new approach to overcome these deficiencies concerning

(a) an adequate statistical operationalization of affective sound at the sublexical level,

(b) a theoretical framework regarding literary communication (considering the emotional classification of poems by both readers and author), and

(c) the varying and often insufficient operational definitions of emotion and affective meaning.

To that end, we formulate an interdisciplinary framework that draws on literary theory, (psycho-)linguistics as well as psychology of emotions, and aim to develop a novel statistical measurement quantifying the *basic affective tone* of a poem.

Previously used operational definitions of the sound component within an assumed relation between sound and meaning appear insufficient. Among other things, this may be responsible for discrepancies of results of previous studies mentioned in preceding text. To date, most available research concentrated on the mere or rational frequencies of occurrence of single phonemes or classes of phonemes. This seems appropriate when the attribution of a poem to certain binary emotional categories is used as the independent, and the phonological material as the dependent variable. An example for this procedure is Albers (2008), where an ascription to the emotional categories of sadness and happiness was based on

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[1] To refer to the phenomenon of a sound−meaning relationship in this context, we use the term *phonological iconicity* (Aryani et al., 2013; Schmidtke et al., 2014), especially to focus on the relation between phonemes or clusters of phonemes and meaning.

the poetic form (ballad vs. hymn) and on the content of every single poetic line while the variance of phonemic material (in this case the frequencies of nasals vs. plosives) was treated as dependent variable. However, such a strategy might face general problems in detecting systematic signals, because the specificity of poetic language may alter the general distribution of the phonological data to be analyzed. As we will argue, not the absolute frequency of occurrence of a certain phonological unit within a poem, but rather its deviant occurrence—compared with prosaic language—might be most relevant to capture the *basic affective tone* of a poem. This represents an important methodological issue that has, to our knowledge, not been considered before. Our focus on deviant elements within a text is justified by the notion of a de-automatization of the reading process, often called *foregrounding* (Garvin, 1964; Jacobs, 2015a, 2015b; Lüdtke et al., 2014; Miall & Kuiken, 1994; Mukarovsky, 1932/1964; van Peer, 1986; see Hakemulder, 2004 for a short overview; and Sanford & Emmott, 2012 for a broader discussion on the topic). Foregrounding refers to the stylistic device of defamiliarization as well as the general deviation between prosaic and poetic language (Jakobson, 1960; Mukarovsky, 1964; Shklovsky, 1917/2012). Our explicit consideration of foregrounding draws on the notion of figure-ground elements in Gestalt psychology (Rubin, 1921; van Holt & Groeben, 2005), standing in line with the assumption that deviation within literary texts always refers and relates to the standard concerning linguistic rules and norms, or literary conventions and canons (Iser, 1976/1994). Differences between poetic and prosaic language use can be based on the dominance of the poetic function including the focus on the message itself (Jakobson, 1960). Consequently, this determining function of the poetic genre influences all linguistic constituents of poetry and particularly its sound (Jakobson & Waugh, 1979/2002), that is, the phonological structures and their units: phonemes and syllables.

Empirical results support the notion that literary foregrounded and hence deviating elements provoke a more intensive and extensive cognitive processing (van Peer, 1986) and deeper emotional experience (Miall & Kuiken, 1994). Furthermore, at the level of functional neural correlates and substrates, Bohrn et al. (2012b) found that foregrounding leads to an enhanced activation in affect-related regions (orbitofrontal cortex, amygdala) and also increases cognitive processing demands (see also Hsu, Jacobs, Altmann, & Conrad, 2015b).

Therefore, in the present study, we focus on salient phonological units as a potential source influencing readers' affective perception of a poem. To extract such salient units, potentially used as foregrounded elements, we use the statistical model developed and validated by Aryani et al. (2013). This model compares the frequency of occurrence of a phonological unit in a given text with an expected value based on a probabilistic model to assess deviations from standard language use (see Method section for details).

A further methodological advancement of our approach is that we capture the *basic affective tone* in an independent and in a quantitative manner; based on a novel method focusing on apparent general sound to meaning correspondences within the German language. This method enables us to predict the affective load of phonological structures in a single poem without the necessity of further comparisons. For this, we utilize previous findings on the relationship between the meanings of single words at the micro- and macrolevel. We extended related approaches (Heise, 1966) and defined a *sublexical*

affective value (SAV) for each syllabic unit (i.e., onset, nucleus, or coda) in the German language. These values are based on the average ratings of emotional valence and arousal of words in which a certain syllabic unit occurs. Importantly, to determine the *basic affective tone* of a text, we focus on those syllabic units (and their SAVs) that can be considered foregrounded elements.

Another critical point of present approaches to phonological iconicity is that research on the contribution of phonological features to affective meaning in poetry lacks an inclusive theoretical model that would allow for considering not only the poems, but also readers and author and their emotional classification of poems. Hitherto, research has either concentrated solely on the textual constituents (e.g., Albers, 2008) or put these in relation with results from survey studies (e.g., Auracher et al., 2010). Only a few studies have also paid attention to the poets—after all the creators of their stimuli—and where this was the case, only theoretical treatises or critical writings were considered (e.g., Whissell, 2002, 2011).

To surmount these critical points within an extensive approach, we use Jakobson's model of language function (Jakobson, 1960)—an extended version of Bühler's (1934) organon model—as theoretical starting point guiding our argumentation and methodological procedure. In particular, we refer to the basic constitutive factors of communication (i.e., the addresser, the addressee, and the self-referential message) that can also be seen as main contributors to literary communication (see Figure 1). In extension of Jakobson's model, and in accordance with the Panksepp-Jakobson hypothesis of the neurocognitive poetics model (NCPM; Jacobs, 2015a, 2015b; Jacobs et al., 2015), we further consider these in regard to the encoding and decoding of emotions in texts (Kraxenberger, 2014).

The following two main considerations were crucial for the selection of poems we used as stimuli. First, the author's emotional classification of his own poetic works would provide an independent variable that would—also statistically—"empower" our investigation. Second, we decided to work with contemporary poems; underrepresented or missing in previous empirical research on phonological iconicity (Schmidtke et al., 2014).
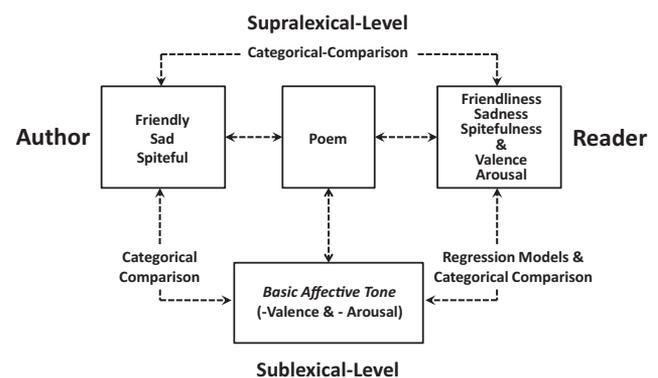
Figure 1. The detailed procedure of analysis of poems based on Jakobson's model of language function, that is, the communication between sender (the author, left side) and receiver (the reader, right side) through the message (poem, center). The ascription of a certain theme (affective meaning) to a text, understood as a form of metaperception, is formed at both the supralexical (top) and the sublexical (bottom) level of language. Our measurement of the *basic affective tone* is purposed to capture the latter.

The chosen volume, "verteidigung der wölfe" (defense of the wolves) by the German poet Hans Magnus Enzensberger, first published in 1957, consists of 57 German poems that are mainly written in unrhymed, free verse.[2,3] Enzensberger's poems represent a compliant and suitable set of stimuli not only because of the temporal proximity between text and readers, but also because all poems of "verteidigung der wölfe" are categorized by the poet himself into three distinctive affective categories: friendly poems (*freundliche Gedichte*), sad poems (*traurige Gedichte*), and spiteful (or angry) poems (*böse Gedichte*). This affective categorization of the poems by the author is not understood to be sarcastic or cynical (Walser, 1999). Note that these affective categories are of considerable importance, notably for literary studies, since the affective categorization of the poems by Enzensberger allows drawing on classical rhetoric and aesthetics, especially in regard to Friedrich Schiller's poetic tripartite of elegy, idyll, and satire (Grimm, 1981; Schiller, 1795/1981). This leads ultimately to a functional distinguishability of the respective poems and in particular when considered in terms of generic categorization as "kinds of emotions" (Watanabe-O'Kelly, 1981).

Most studies on phonological iconicity vary in terms of their interpretative construction as well as operationalization of emotion or affective meaning in text. In our understanding, a text or a poem implies a "general affective meaning" that is inscribed at all levels of language, including the phonological one. Herewith, we are not referring to fine-grained, possibly altering affective experiences while reading a poem, which can rely on both, dynamic shifts in its plot and depiction, or subjective reading experience. Rather, the general affective meaning denotes the overall theme of a text and constitutes the emotional metaperception of the poem in form of appraisals, that is, the perception of the poems by their readers as rather positive or negative, rather arousing or calming, and so forth, hence representing a principle of affective attribution by the reader (Lüdtke et al., 2014). For the present study, we tried to capture these attributions of the reader via semantic differentials (Osgood, 1952; Osgood, Suci, & Tannenbaum, 1957) in a rating study (see Method section for details) on the dimensions of valence and arousal. These affective dimensions allocate emotions in a bidimensional space and are used by influential dimensional models of affect (e.g., Bradley & Lang, 1999; Recio et al., 2014; Russell, 1980; Wundt, 1896/2014). Because of its applicability to expressed and perceived emotions, or psychological construction in general (Russell, 2009), we used this approach to operationalize the general affective meaning of the poems in our study (see also Auracher et al., 2010). Our operationalization and measurement of the affective load of phonological structures, the *basic affective tone* that is understood to potentially reflect a part of the general affective meaning at the phonological level, is, accordingly based on the same dimensional approach.

To sum up our intentions: With this study we present a novel quantitative measure of the *basic affective tone* of poems. We hypothesize that this measure can capture significant sublexical contributions to the general affective meaning of a poem, and, in consequence, that sound in poetry can contain a semantic, affective function reflecting the poet's intentions and influencing readers' perception of the general affective meaning of a poem (see Figure 1).

Method

In what follows, we first describe the method for measuring the *basic affective tone*. The method consists of (a) calculation of SAVs for each syllabic unit in German language; (b) extraction of foregrounded phonological units from each poem—or any digitally available text, in general—based on a probabilistic model developed in a previous study (Aryani et al., 2013); and (c) quantification and statistical evaluation of the *basic affective tone* of the text submitted to the model based on the previous steps. Further, we describe (d) the procedure of our rating survey assessing the general affective meaning of the poems.

Sublexical Affective Values (SAVs) of Syllabic Units

To investigate the potential emotional load of single phonological units, we pursued a systematic analysis of a normative database comprising 5,300 German words. This database extends the first normative database providing ratings on emotion scales for German words (Võ et al., 2009; Võ, Jacobs, & Conrad, 2006) that has been validated in numerous behavioral and neuroscientific studies (Conrad, Recio, & Jacobs, 2011; Jacobs et al., 2015; Kuchinke et al., 2005). The word entries therein were rated by at least 20 subjects for (a) emotional valence varying from negative (-3) to positive ($+3$) and (b) emotional arousal varying from low (1) to high (5) based on a dimensional model of affect (Bradley & Lang, 1999; Russell, 1980; Wundt, 1896/2014).

On the basis of the apparent general sound to meaning correspondences within a language, and by following the idea that affective meaning of language units (at the macrolevel) covaries with phonological structure (at the microlevel; Heise, 1966; Lamb, 1964), we encoded all words in the database according to presence or absence of certain phonological units to calculate a SAV for each unit.

For the following reasons, we opted for syllabic units (i.e., onsets, nuclei, and codas) instead of single phonemes as presumably most effective sublexical units regarding SAVs: Research in psychoacoustics has shown that iconic characteristics of sound may be bound to a different linguistic level than the one of single phonemes, for example, to the dynamic shift within words' first two frequency components (Myers-Schulz et al., 2013), fundamental frequency (Bänziger & Scherer, 2005), and spectral center of gravity (Sauter, Eisner, Calder, & Scott, 2010). As boundaries between syllables often mark interruptions of the ongoing stream of speech within words, syllabic structure offers a most basic segmentation device for phonological word forms, and several empirical reports for different languages have shown that phonological syllabic units serve as functional units of language processing even during silent reading (see, e.g., Conrad, Carreiras, Tamm, & Jacobs, 2009; Conrad, Grainger, & Jacobs, 2007; Conrad & Jacobs, 2004). Accordingly, and also because of the contradictory results reported

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[2] Enzensberger, born in 1929, is praised to be one of Germany's most important poets (Astley, 2006). He published numerous volumes of poems that have been translated into several languages.

[3] Within the German poetic tradition, one would rather speak of "unbound verses" (*ungebundene Verse*), which are typical for the 20th century and are neither rhymed nor follow antiquated strophic forms.

in previous studies, rather than using single phonemes, we calculated SAVs for more complex sound clusters arising from a syllabic definition of phonological units, that is, syllabic onsets, nuclei, and codas. Note that these syllabic components are the most effective sublexical units mediating visual word recognition (Nuerk, Rey, Graf, & Jacobs, 2000) based on which orthographic−phonological information is organized during the reading process (Jacobs, Rey, Ziegler, & Grainger, 1998).

Therefore, we segmented all 5,300 words into syllabic units (in phonological form). For the calculation of the SAV of each syllabic unit, we considered all words in the database, in which the syllabic unit appeared at least once in every word. Valence and arousal values for each single syllabic unit (Figure 2A) were calculated averaging emotional valence and arousal ratings of all those words a syllabic unit occurred in. Resulting values were then standardized with respect to the calculated values of all existing units and their frequency of occurrence in the words list. These standardized values were then assigned to corresponding syllabic units as their SAVs for both affective dimensions of valence and arousal.

Extraction of Salient Phonological Units

As the *basic affective tone* is directly dependent on phonological features of texts, each poem to be analyzed was converted into phonetic notation by using the German text-to-speech synthesis system MARY (Schröder & Trouvain, 2003). To phonemize the text automatically, MARY works with an extensive lexicon dealing with known words and a letter-to-sound conversion algorithm dealing with unknown words. All 57 texts—in a phonemized form—were screened for salient phonological segments using EMOPHON (Aryani et al., 2013; see Figure 2B). EMOPHON's measure of phonological salience is based on the deviation of the observed frequency of occurrence of particular phonological syllabic units in a given text from their respective expected frequencies: salient units, potentially being used as foregrounded elements, are those occurring significantly more frequent than could be expected on the basis of the SUBTLEX-DE linguistic corpus (Brysbaert et al., 2011)—a database that presumably best represents prosaic, everyday speech. The exact method of detecting salient units is described in detail by Aryani et al. (2013).

The *Basic Affective Tone* as a Function of the SAVs of Salient Phonological Units

To quantify—and further submit to inferential statistical tests—the *basic affective tone* of a text, we focused on its salient syllabic units and combined them with their respective SAVs. We first calculated a weighted mean value of SAVs of these salient units used overproportionally in a given text. For instance, if the syllabic units s_1, s_2 . . . , s_n are detected by EMOPHON as
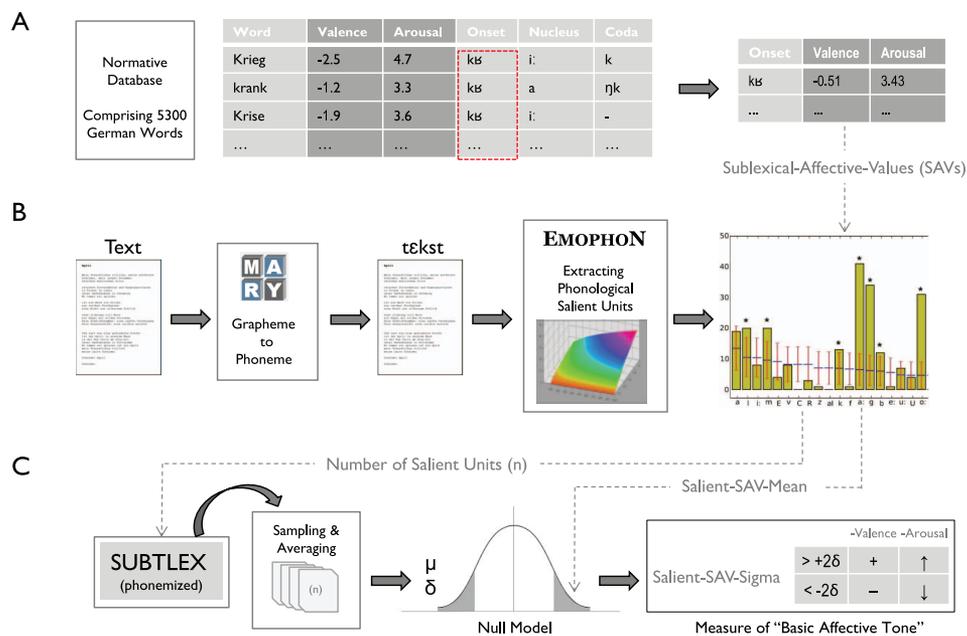

Figure 2. Calculation of sublexical measures of the *basic affective tone* for a given text. Panel A: Sublexical affective values (SAVs) of all syllabic units are calculated on the basis of the average ratings of words containing a certain syllabic unit (see example of /kʁ/). Panel B: A given text is phonemized using the G2P-software MARY and its salient syllabic units are subsequently extracted via a probabilistic model integrated in the "EMOPHON." Panel C: The *basic affective tone* of the text is calculated on the basis of the mean of SAVs for salient units. This mean value (Salient-SAV-Mean) is compared against an exhaustive distribution of random samples with matching numbers of units, to test for significance of deviations concerning SAVs—finally represented by Salient-SAV-Sigma. See the online article for the color version of this figure.

salient, the corresponding mean value of SAVs of these salient units (henceforth, *Salient-SAV-Mean*) for this text—in the case of arousal—would be as follows:

$$Salient\text{-}SAV\text{-}Mean(arousal) = \frac{\sum_{i=1}^{n} num(s_i) \times SAV, aro(s_i)}{\sum_{i=1}^{n} num(s_i)}$$

Where $num(s_i)$ is the number of a specific salient syllabic unit in the whole text, and SAV, $aro(s_i)$ is the corresponding SAV (for arousal) of this unit.

To set a frame for interpretation of specific results, we test each *Salient-SAV-Mean* value for a given text against a null model. For this, we empirically calculated the distribution of the null model as a function of the number of salient units in each text. We therefore randomly pulled numerous chunks of syllabic units—with the same length as the sum of all salient units in a text—from the same corpus used in EMOPHON (i.e., SUBTLEX-DE). For each random sample, the mean of SAVs of the including syllabic units (for both valence and arousal) was calculated. We repeated this sampling-and-averaging process, with replacement, 1 million times to ensure that the number of samples is representative for a larger population of syllabic units and to obtain a good proxy of the null model (a procedure similar to the Mantel test). On the basis of the acquired data, the corresponding mean (μ) and standard deviation (δ) of the average SAVs of all samples (1 million measures) were then calculated for each text (Figure 2C). These acquired values of mean and standard deviation of the null model provide the possibility to interpret every specific value of the *Salient-SAV-Mean* of each text. Note that the overall mean values of the null models (for each text) were very close to nil because of the previous standardization of SAVs. We next divided the *Salient-SAV-Mean* of each text by the corresponding standard deviation of the null model, calculated in the prior step, thereby obtaining two parameters (valence, arousal), each of which indicates the distance of the respective mean value of SAVs of salient units (*Salient-SAV-Mean*) from nil in the form of n × δ. When comparing these parameters with the conventional confidence interval defined as $2 \times \delta$,[4] it can be seen at a glance whether, and to what extent, the factor *Salient-SAV-Mean* deviate from an expected value determined by the null model. We refer to these novel parameters as *Salient-SAV-Sigma* (*-valence*, *-arousal*) representing statistical measures of the *basic affective tone* of a text at the sublexical level.

Because the SAVs of each syllabic unit are based on emotion ratings of the words comprising these units, our *Salient-SAV-Sigma* statistical measures may correlate—at least to some degree—with the mean affective values of the words composing a text. To eliminate potential resulting problems of circularity, we calculated two additional control measures to control for this possible confound in all further analyses: For this purpose, we repeated the whole procedure for each poem, using this time all syllabic units of each poem, rather than only the salient units extracted by EMOPHON. The resulting control measures, named *Control-SAV-Sigma* (one for valence and one for arousal), which are based on the mean of SAVs of all syllabic units in a text, should help to clarify whether any potential effect of our *Salient-SAV-Sigma* measures would have occurred without referring to phonological salience or whether an effect might have been driven by lexical affective values of words contained in the text. In the following group- and regression-analyses of the poems, these two control measures (i.e., *Control-SAV-Sigma-valence* and *-arousal*) are used as checkups for the two *Salient-SAV-Sigmas*, which we use to operationalize the *basic affective tone* of texts. We then attempt to predict the general affective meaning—assessed by subjective ratings—as well as the author-based categories.

Rating of the Poems on Emotion and Affective Dimensions

To assess the perceived emotionality of poems by the reader, we conducted an online survey for subjective ratings of each poem's content (i.e., the general affective meaning or overall theme) in regard to (a) affective valence and arousal (matching our sublexical dimensions) and (b) the three emotion categories created by the author. We asked participants to give their subjective rating on the following affective scales: Valence, which is measured on a 7-point rating scale ranging from -3 (*very negative*) to $+3$ (*very positive*); Arousal, which is measured on a 5-point rating scale ranging from 1 (*very calming*) to 5 (*very arousing*); Friendliness, which is measured on a 5-point rating scale ranging from 1 (*not friendly at all*) to 5 (*very friendly*); Sadness, which is measured on a 5-point rating-scale ranging from 1 (*not sad at all*) to 5 (*very sad*); and Spitefulness, which is measured on a 5-point rating-scale ranging from 1 (*not spiteful at all*) to 5 (*very spiteful*).[5]

A total number of 252 German native speakers (173 female) between the ages of 17 and 76 years ($M = 35.9$, $SD = 12.1$) participated in this study.[6] Each poem was rated on average by more than 17 participants on each scale (minimum = 15, $SD = 1.7$). All poems were presented pseudorandomly. Poems that were familiar to participants were excluded from the individual survey to eliminate the mere-exposure effect (Zajonc, 1968, 2001).

Results

In the following, we report our results considering the main components of literary communication according to our extension of Jakobson's model of language functions (see Figure 1). Analyses address relations between emotional evaluations of the readers at the one hand, and of the author Enzensberger at the other, as well as potential contributions/correlations of the *basic affective tone*, derived from potentially foregrounded and affect-loaded phonological units, to such evaluations. In doing so, we first focus on the relation between author and reader in regard to their classification/evaluation of the poems, followed by analyses of respective relations with the textual, sublexical measures of *basic affective tone* (i.e., *Salient-SAV-Sigma*). Technically, categorical comparisons (used for author-related as well as reader-related analyses) will be combined with regression models (reader-related analyses).

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[4] The confidence interval is originally defined as $\mu \pm 2 \times \delta$, where μ stands for the mean and is equal to zero in this case.

[5] To measure arousal, we combined verbal anchors with a nonverbal pictorial assessment, that is, SAM (Bradley & Lang, 1994)

[6] For our rating study, we used a more recent edition of "verteidigung der wölfe" which, in contrast to the first edition, is not exclusively written in lower-case letters but represents the standard German orthography.

Ratings of the Poems

Mutual linear correlations between ratings on different dimensions are displayed in Table 1. As to the classical general dimensions of the bidimensional affective space, the rating scores for valence and arousal are correlated negatively ($r = -.7$), indicating that the more negative a poem, the more arousing it tends to be—which is in line with a recent account of the general relation between the two affective dimensions for German words (Schmidtke et al., 2014). But valence and arousal ratings also showed tight correlations with ratings for the more specific emotion ratings: As could be expected, spitefulness ratings increased with arousal ($r = .73$) but decreased with valence ratings ($r = -.77$), whereas friendliness ratings displayed the opposite relation to the two affective space dimensions ($r = -.73$ for arousal and $r = .89$ for valence). Rating scores for sadness were tightly but inversely correlated with valence ratings ($r = -.62$), whereas only a rather weak correlation with arousal was given ($r = .38$) suggesting sadness to be an emotion with a somewhat fuzzy positioning in the affective space—presumably involving both calm and excited features.

Sad/friendly/spiteful categories and ratings (author–recipient). We next used the author's tripartite classification of the poems as a categorical independent variable and ran analyses of variance (ANOVAs) to analyze differences of subjective ratings between the three groups. Poems were originally categorized by the author as spiteful ($n = 17$), friendly ($n = 19$), and sad ($n = 21$). Means and standard deviations of ratings for the different categories are shown in Table 1 (see also Figure 3A, top). ANOVAs revealed significant effects of the author-based affective category on each of the rating variables, $Fs(2,54) > 10.6$, $ps < .001$. Post hoc comparisons revealed that the differences in the rating scores were almost always consistent with the intended categorization by the author: the friendly poems (as categorized by the author) were rated significantly friendlier than the sad and the spiteful poems, $t(38) = 3.45$, $p < .001$; $t(34) = 4.42$, $p < .001$, respectively. The sad poems were rated as significantly sadder than the friendly poems, $t(38) = 5.67$, $p < .001$, but not than the spiteful poems. The rating scores for spitefulness were significantly higher for the spiteful poems than for the friendly, $t(35) = 4.82$, $p < .001$, and the sad poems, $t(37) = 3.53$, $p < .001$.

The categorical analyses also reproduced the affective author-based categories in terms of valence and arousal (Figure 3A, bottom): Friendly poems were rated more positive in valence than

sad, $t(38) = 3.92$, $p < .001$, and spiteful poems, $t(37) = 5.26$, $p < .0001$. The two latter categories did not significantly differ in valence. Regarding arousal, there was a significant effect of the poem's category, with spiteful poems being rated as more arousing than sad, $t(36) = 2.52$, $p = .014$ or friendly poems $t(34) = 4.6$, $p < .0001$, and sad poems more arousing than friendly ones, $t(38) = 2.25$, $p = .028$.

Basic Affective Tone of the Poems

To test how the author categories and emotion ratings relate to the sublexical phonological level, we conducted various analyses on our measurements of the *basic affective tone* of these poems (i.e., *Salient-SAV-Sigmas*). First, we compared respective values across the three author-based affective categories (Figure 1, bottom) as well as each time two reader-based categories of valence and arousal. Second, we attempted to predict the rating scores for these poems via regression analyses and categorical comparisons (Figure 1, bottom-right) to explore whether and to which degree our sublexical measures of the *basic affective tone* could significantly explore variance of, or predict ratings on emotion or affective scales.

Sad/friendly/spiteful categories and *basic affective tone* (author−text). ANOVA results on *Salient-SAV-Sigmas* for poems from different categories assigned by the author (see Figure 3B, top) showed a significant effect of category on the sublexical measure of arousal, $F(2,54) = 4.04$, $p = .02$, but neither on that of valence, nor on any of the control measures that were used to control for potential circularity or a confound between lexical and sublexical values, $1.4 > Fs(2, 54) > 0.4$. The post hoc comparisons of the sublexical measure of arousal indicated significantly higher means for the spiteful and sad poems compared with friendly poems: spiteful > friendly, $t(34) = 2.52$, $p = .014$; sad > friendly, $t(38) = 2.4$, $p = .02$, but not between spiteful and sad ones, $t(36) = .25$, $p = .8$.

To further test whether phonological salience—as operationalized by the EMOPHON —was a crucial factor underlying these results, we conducted a one-way analysis of covariance (ANCOVA) with category as between-subjects factor (sad, friendly, and spiteful) and *Control-SAV-Sigmas* (control measures based on all rather than only on salient phonological units) as covariates. Similar to the ANOVA results, there was a significant effect of category on the sublexical measure of arousal (*Salient-SAV-Sigma-Arousal*) after controlling for *Control-SAV-Sigma-Arousal*, $F(2, 54) = 18.6$, $p < .0001$, but not on the sublexical

Table 1

Means and Standard Deviations of Ratings on the Five Affective Dimensions for Poems From Three Different Author-Based Categories and Pearson Product–Moment Correlation Coefficients (r) Between Rating Scores of the Five Affective Dimensions

Affective category							r				
Friendly (n = 19)		Sad (n = 21)		Spiteful (n = 17)		Rating dimensions					
M	SD	M	SD	M	SD		Arousal	Valence	Spitefulness	Friendliness	Sadness
3.21	.32	3.41	.32	3.64	.17	Arousal		−.70	.73	−.73	.38
−.32	.74	−1.06	.52	−1.37	.5	Valence			−.77	.89	−.62
1.88	.41	2.11	.63	2.71	.45	Spitefulness				−.74	.33
2.09	.61	1.58	.45	1.40	.26	Friendliness					−.45
2.00	.35	2.63	.3	2.51	.39	Sadness					

A

Subjective Ratings on a 5-Point Scale (Mean)
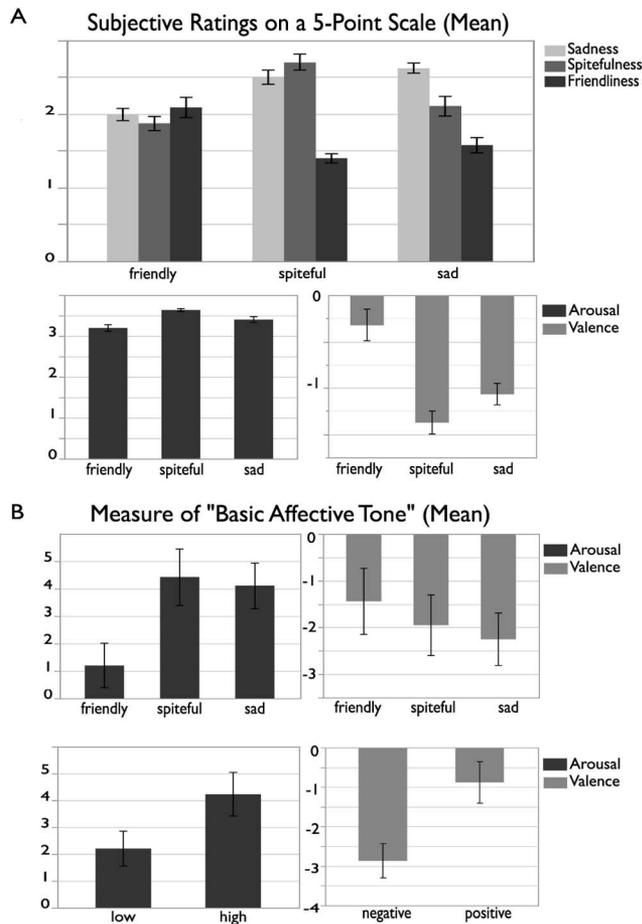

B

Measure of "Basic Affective Tone" (Mean)

Figure 3. Panel A: Rating scores on five affective dimensions for three author-based categories. Panel B: The *basic affective tone* of arousal and valence as measured by Salient-SAV-Sigma for the author-based categories (top) as well as the reader-based categories of valence and arousal (bottom). The *y*-axis represents the mean of Salient-SAV-Sigmas for each category.

measure of valence (*Salient-SAV-Sigma-Valence*) after controlling for *Control-SAV-Sigma-Valence*, $F(2, 54) = .98$, $p = .38$.

Valence and arousal categories and *basic affective tone* (text–recipient). In addition to the preceding author-based categorization, we defined two new categorical variables based on median splits concerning the subjective ratings for affective valence and arousal. Thus, we divided the poems twice into each two groups with two levels: valence (positive vs. negative) and arousal (high vs. low) with almost the same number of poems in each category (valence: 28 positive vs. 29 negative; arousal: 29 high vs. 28 low). These comparisons should provide optimal contrasts for the exploration of relations between sublexical measures of the *basic affective tone* and ratings of affective impact of each poems as a whole—as independent and dependent variables relate to the same dimension.

To examine these relations, we conducted several one-tailed *T* tests testing the following predictions concerning two sublexical measures (together with two control measures); that is, we expect a higher valence of *basic affective tone* for the positive as com-

pared with the negative group, and higher arousal for the high versus the low group.

T tests on two sublexical measures (i.e., *Salient-SAV-Sigma-Arousal, Salient-SAV-Sigma-Valence*) and the two control measures (i.e., *Control-SAV-Sigma-Arousal, Control-SAV-Sigma-Valence*) revealed effects for our measures of the *basic affective tone* based on salient syllabic units but not for the control measures (Figure 3B, bottom). The sublexical predictor of valence (*Salient-SAV-Sigma-Valence*) was significantly higher in the positive group than in the negative group, $t(55) = 2.92$, $p = .002$. A categorical comparison between the arousal levels reveals a similar pattern: The sublexical measure of arousal (*Salient-SAV-Sigma-Arousal*) was significantly higher in the high group than in the low group, $t(55) = 1.93$, $p = .029$. No significant differences were detected for either the control measure of sublexical arousal or of valence (*Control-SAV-Sigma-Arousal* and *–Valence*) when comparing between the two respective levels of these dimensions: arousal, $t(55) = .95$, $p = .34$; valence, $t(55) = .37$, $p = .71$.

Again, we conducted a one-way ANCOVA with category as between-subjects factor (valence: positive vs. negative; arousal: high vs. low) and *Control-SAV-Sigmas* as covariates to control for their potential contribution to effects of the sublexical measures of *basic affective tone* (*Salient-SAV-Sigmas*). Results revealed, again, similar main effects of category for valence, positive > negative, $F(1, 55) = 3.72$, $p = .0002$ (one-tailed) and arousal, high > low, $F(1, 55) = 1.69$, $p = .047$ (one-tailed) on the corresponding *Salient-SAV-Sigmas,* this time after controlling for *Control-SAV-Sigmas*. These results indicate that distributions of perceived valence and arousal of poems at the whole text level mirror our sublexical measures of the *basic affective tone* (Figure 3B, bottom).

Multiple regression analyses (text–recipient, further evidence). We performed several multiple-regression analyses exploring how affective qualities of particular salient phonological units, as reflected in our sublexical measures of the *basic affective tone*, correlate with rating scores of each of the five emotion scales (Figure 1, bottom). These analyses reveal which, if any, sublexical measure significantly predicts participants' ratings on each of these emotion and affective scales. We used forward stepwise multiple regression with the minimum corrected Akaike information criterion (AIC) as stopping rule. This method appears a good choice for a screening procedure aiming to identify the most influential predictor among a set of competing intercorrelated predictors—leaving only residual variance to be explained by additional predictors after the strongest one has entered the regression model. The results (see Table 2) confirm that the sublexical measures, that is, measures of the *basic affective tone* based on salient phonological units, account for a considerable part of variance of ratings in all affective dimensions; that is, from 9.5% for sadness to 22% for spitefulness. The sublexical measure of arousal (*Salient-SAV-Sigma-Arousal*) appeared as the best measure of *basic affective tone* with the best potential to predict affective impact, as it was the sole significant predictor of emotion rating scores in four out of five models. It is important to note that the sublexical control measures did not reach significance in any of the models (except the one for arousal, see next paragraph) which stresses the importance of phonological salience for the *basic affective tone* and rules out the possibility of a confound between our sublexical predictors and lexical values (emotional connota-

Table 2
Results of Multiple Regression Models for the Prediction of Ratings on Five Affective Dimensions

Dimension	Estimate	Step	p	R^2	Simple r	Partial r[a]
Sadness:						
Salient-SAV-Sigma-Arousal	.03	1	.0190	.09	.30[*]	.25
Control-SAV-Sigma-Valence	0	2			.07	
Control-SAV-Sigma-Arousal	0	3			.13	
Salient-SAV-Sigma-Valence	0	4			−.04	
Spitefulness:						
Salient-SAV-Sigma-Arousal	.07	1	.0002	.22	.47[***]	.22
Control-SAV-Sigma-Arousal	0	2			.39[**]	
Control-SAV-Sigma-Valence	0	3			−.01	
Salient-SAV-Sigma-Valence	0	4			−.19	
Friendliness:						
Salient-SAV-Sigma-Arousal	−.05	1	.001	.17	−.42[**]	−.27
Control-SAV-Sigma-Valence	0	2			−.11	
Salient-SAV-Sigma-Valence	0	3			.16	
Control-SAV-Sigma-Arousal	0	4			−.19	
Arousal:						
Salient-SAV-Sigma-Arousal	0.007	1	.49	.04	.22	.09
Control-SAV-Sigma-Valence	.08	2	.03	.06	.10	.29
Salient-SAV-Sigma-Valence	−.04	3	.03	.13	−.18	−.28
Control-SAV-Sigma-Arousal	0	4			.08	
Valence:						
Salient-SAV-Sigma-Arousal	−0.08	1	.0006	.19	−.44[***]	−.24
Control-SAV-Sigma-Valence	0	2			−.06	
Salient-SAV-Sigma-Valence	0	3			.18	
Control-SAV-Sigma-Arousal	0	4			−.26[*]	

Note. *Salient-SAV-Sigma (-Valence, -Arousal)* = Novel parameters representing statistical measures of the *basic affective tone* of a text at the sublexical level; *Control-SAV-Sigma (-Valence, -Arousal)* = Control measures calculated on the basis of the whole phonemic inventory of a text to examine the potential of a circularity problem.
[a] Partial correlations are calculated based on the predictors that entered the stepwise regression model.
[*] $p < .05$.   [**] $p < .01$.   [***] $p < .001$.

tions of words used in the poems) holding responsible for the effects of *basic affective tone*.

Note that the model for arousal ratings differs a bit from the pattern described in preceding text, as a combination of the sublexical measure of valence and the corresponding control measure accounted for more variance than the sole sublexical measure of arousal. It is worth pointing out that in this model, when considering the bivariate or direct correlation between the dependent variable (i.e., the rating scores of arousal) and each single predictor, the sublexical measure of arousal has still the largest correlation with the rating scores when compared to other predictors. That is, the control measure of valence is added to the model because of its accounting for the residuals, acting as a suppressor variable and not necessarily because of its own association with the rating scores. Note also that the control measure explains less variance than the measure based on salient phonological units and their valence also in this model.

Moreover, when considering the estimated slopes of the models, or the respective correlation coefficients, it becomes obvious that significant sublexical predictors in each model invariably display the expected direction of correlation with the criterion of the ratings, which was also previously revealed by the correlations between different rating scores themselves (see Table 1): Valence and friendliness are negatively correlated with arousal, so the estimated slopes are in both cases negative, whereas perceived spitefulness and sadness increase with both arousal ratings and sublexical measures of *basic affective tone*.

Similarly, the estimated slope for the sublexical measure of valence in the arousal model is negative and hence in accordance with the negative correlation between valence and arousal for the whole poems.

Discussion

In this article, we present a novel method for quantifying the *basic affective tone* of a text. The method is based on salient phonological units that might be used as foregrounded elements to produce or enhance affective and aesthetic effects during reading experience. For our analyses, we focused on the three contributing factors of communication—based on Jakobson's model of language function—that can also be applied to literary communication, that is, author, reader and the text. By choosing the poems of Enzensberger's "verteidigung der wölfe," which the author himself assigned to three affective categories (friendly, sad, and spiteful), we were able to incorporate considerations about the author as a factor for statistical analyses. On the recipient side, we conducted an extensive rating study to assess readers' judgments on three affective, author-based dimensions friendliness, sadness, and spitefulness, together with the dimensions of valence and arousal constituting the affective space of influential psychological emotion models (e.g., Barrett, 2006; Lang, 1995).

Results for the subjective ratings were—to a high extent—in accordance with the author's own categorization: The rating scores of the poems in the related category (e.g., rating scores of friend-

liness for the category of friendly poems) were always significantly higher than for the other two categories except for ratings on sadness in the sad condition differing significantly only from the friendly but not from the spiteful category, though displaying a respective tendency also in the latter case. This particular finding is better readable when considering the interrelation between the author-based affective categories and more general emotion dimensions: The sad and spiteful poems of "verteidigung der wölfe" might not represent totally distinct but partially overlapping categories in a bidimensional affective space (poems from both categories received on average comparably negative valence ratings), which is an assumption that receives further support from the rather disperse relation between sadness and arousal ratings across all poems. The respective partial difficulties to differentiate between the two categories (otherwise clearly distinctive concerning our results on spiteful and friendliness rating dimensions) become particularly understandable when considering the content of the poems (the sad poems mourn the loss of nature and the ideal, whereas the spiteful poems reject and ridicule nature and the ideal), drawing here on the two categories of elegy and satire of Schiller's poetic tripartite (Grimm, 1981).

Furthermore, because the two factors of author and reader are, naturally, related to the text, we focused especially on the latter exploring to which extend the use of phonological units determines the affective qualities of a literary text as perceived by the reader or created by the author. On the basis of a probabilistic model developed in a previous study (Aryani et al., 2013), we detected deviations between observed frequency and expected frequency of syllabic units in a given text, thereby extracting salient phonological units that appear significantly more often than expected. In a second step, emphasizing the sound properties of poetic language, we calculated SAVs for each syllabic phonological unit, extending previous research on sound-meaning correlations (e.g., Heise, 1966) to a systematic analysis of a normative database comprising more than 5,300 German words. On the basis of phonological salient units in a given text and their respective SAVs for valence and arousal, we developed a method to quantify the *basic affective tone* of a given text. This method includes a mean of inferential statistics, because it determines the extent to which the mean of SAVs of salient phonological units in a text exceeds a corresponding confidence interval that is derived from a corpus of 25 million words representing everyday language use (SUBTLEX, Brysbaert et al., 2011). The outcome of this method is a quantitative measure that allows making a statement—in terms of the level of significance—concerning the *basic affective tone* of a text based on affective valence and arousal at the level of salient syllabic phonological units. In doing so, our approach follows the notion that not poetic deviation by itself but the relation between deviating and standard distributed phonological units, between foreground and background elements, influences emotional reading experience (Jacobs, 2011, 2015a, 2015b). This consideration of both poetic and prosaic language and an explicit focus on quantitative differences concerning SAVs of salient, foregrounded units overcomes shortcomings of other studies that usually used either categorical affective values derived from rated word lists (e.g., Whissell, 2000, 2011) or, with an exclusive focus on poetic stimuli, do not take into account prosaic language at all.

The results of comparisons between the author-based affective categories revealed that differences between these categories—as

evident in subjective ratings of emotional valence and arousal—could also be detected at the sublexical level. We could show, for instance, that our sublexical measure of the *basic affective tone* of the poems in regard to affective arousal is higher for the groups of spiteful and sad poems in comparison to the friendly poems. However, corresponding results for the sublexical measure of the *basic affective tone* in regard to affective valence did not differ significantly between the author-based affective categories. Therefore, the affective dimension of arousal seems to be more influential in constituting the *basic affective tone* at the sublexical level than at the valence level because of its predictive power concerning the affective perception and evaluation of the whole text or poem. With respect to further results we report subsequently, that is an interesting outcome.

As our approach to quantifying the *basic affective tone* of texts is based on the two dimensions of arousal and valence, we next divided the poems into two affective categories that are based on the median of their rating scores on arousal (contrasting a high-versus a low-arousing category) and valence (contrasting a positive versus a negative valence category). For each contrast, we could show that the respective *basic affective tone* differs significantly and in the expected direction between groups, whereas corresponding sublexical control measures did not display significant effects. Taken together, these findings clearly support the importance of phonological salience regarding the *basic affective tone* of poems.

The overall results of the regression analyses confirm these findings: Our sublexical measures—and, again, not the control measures—significantly predict participants' ratings on each of our five emotion rating scales, suggesting that affective attributions of particular phonological structures influence the text's emotional perception by the reader reflected in the rating scores. The percentage of explained variance of the author-based affective dimensions is 9.5% for the prediction of sadness, 17.7% for friendliness, and 22.5% for spitefulness.

When we took a closer look at our sublexical measures in the regression models, it became, again, obvious that the sublexical predictor of arousal (*Salient-SAV-Sigma-Arousal*) was almost always (in four of five cases) the best or the only significant predictor of the rating values. Our study, in line with a number of studies on the acoustic properties of emotional speech, hence provides support for an acoustic arousal dimension that claims that acoustic properties of speech provide vocal cues to the level of arousal, over and above valence (Bachorowski, 1999; Bänziger & Scherer, 2005, see also Sauter et al., 2010). Also, it has already been argued that vocal sounds primarily convey the arousal state of the sender (Bachorowski, 1999). This seems to be plausible when considering the psychological difference between valence and arousal. Arousal is related to a physiological state of being reactive to stimuli; it causes alertness and readiness and involves more automatic and perceptual reactions, which in turn could be reflected in the vocal behavior of the sender and acoustic features of speech and written language. Valence, however, involves higher order, cognitive and evaluative processes (e.g., Briesemeister, Kuchinke, & Jacobs, 2014; Briesemeister, Kuchinke, Jacobs, & Braun, 2015; Jacobs et al., 2015; Recio et al., 2014) and might not be easy to detect at such a basal level as the phonological one. On the basis of our results, we therefore argue that at the sublexical level the affective dimension of arousal might be more suitable for

measuring the *basic affective tone* than the affective dimension of valence.

The overall results of our study also support Jakobson's assumption that within poetry phonological "structures, particularly powerful at the subliminal level, can function without any assistance of logical judgment and patent knowledge both in the poet's creative work and in its perception" by the reader (Jakobson, 1970, p. 261). Our statistical operationalization provides strong evidence for the importance of sound and supports the idea about a relation between sound and meaning as proclaimed by scholars and poets throughout history.

Although the *basic affective tone* may, on one hand, be understood as a stylistic device determining the "tone color" of a text at a holistic level, our statistical operationalization of *basic affective tone* offers, on the other hand, the possibility of capturing a variety of more specific stylistic devices or investigating the effects of intonation patterns at higher levels of analysis (e.g., sentences, verses). Being based on overproportionally used—and thus salient—units in a text, the measure of *basic affective tone* may relate to all kinds of stylistic devices bearing on sound-patterning in the form of both simple repetitions (e.g., alliteration, assonance, and consonance) or at a higher level of design (e.g., chiasmus and envelope). As such sound patterns—when artfully employed—not only shape order in a text but help to emphasize its meaning, the *basic affective tone* may, therefore, in certain cases relate to secondary semantic effects (cf. Neuhäuser, 1991) achieved through stylistic devices.

Surely, this study represents only a first step in investigating the *basic affective tone* of formed language. To be able to make statements about the actual influence of the *basic affective tone* on the reader, future research should consider the possibility to work in an experimental setting with texts that have been systematically manipulated at the sublexical level of language. A possible example for such manipulation could be the alternation of rhetorical features such as rhyme that lead to phonological recurrences (cf. Menninghaus et al., 2015).

Because our approach is based on the information in written texts read silently by participants, the question arises how the affective load of phonological units, as reflected in our statistical measure, the *basic affective tone*, can affect reader's perception. The answer lies in the process of automatic phonological and prosodic recoding of written words in silent reading (see Jacobs & Grainger, 1994, for an overview, and Jacobs et al., 1998, for a formal model) that should play an even more important role in poetry reception (Jacobs, 2011; Schrott & Jacobs, 2011). Research on visual word recognition in the last 2 decades has indeed provided accumulating behavioral, computational, and neuroimaging evidence that during silent reading phonological information is automatically generated from the printed word providing an early and major constraint for lexical access (e.g., Braun et al., 2009; Conrad et al., 2007, 2009, 2010; Ziegler & Jacobs, 1995; Ziegler et al., 2000, 2001).

Although the results of this study are so far restricted to Enzensberger's "verteidigung der wölfe," we want to note that our statistical quantification of the *basic affective tone* can by all means be applied to any other text form beyond the poetic genre. Especially the analyses of texts that are intended to elicit a certain affective impact in the reader, such as advertisements, political speeches or manifests, seem to be of special interest for future

research. It is also worth mentioning that the here presented method is not limited to a specific language, rather it can easily be extended to any language for which comparable databases and corpora necessary to apply the method are accessible.

Finally, we suggest to use the here presented approach as a complementary method for sentiment analysis of written texts or transcribed speeches. So far, computer-assisted text analysis usually link the occurrence of certain words in a given text to the text's emotional content by using predefined keywords or word clusters. These methods, however, miss to consider the sound component of language. Our approach represents a possibility for future sentiments analysis and opinion miming by expanding such approaches by an analysis of the *basic affective tone*.

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