

Measuring Beauty - EEG Measurements in Stylistics

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Abstract

The paper reports results from an EEG study in Reader Response Research. Two independent groups of subjects were confronted with a narrative, one with and one without pre-information about the plot. Based on the re-reading paradigm by Bortolussi and Dixon (2003) it was assumed that subjects with pre-information would show more attention during reception than readers without pre-information. Attention was operationalized both as amount and as posterior vs. frontal distribution of alpha waves in the EEG. Results confirmed the hypothesis, suggesting that, next to the plot, literary style exerts an influence on recipients' attention.

1. Why Applying Psychophysiological Measurements in Stylistics?

One of the guiding questions in the study of stylistics is the search for structural features that allow for an objective - or more precisely an intersubjective - analysis of beauty or quality in an artwork. For some scholars in the humanities, this question itself is already a provocation as it

suggests that humans do not have the freedom of choice about what to like and what to dislike. Obviously there are differences among humans regarding the judgment of a piece of art. There is no accounting for taste, so the saying goes, meaning that taste is subjective, based on personal preferences. So how can there be universals in aesthetics?

One approach towards universals in aesthetics has its roots in Russian Formalism and the Prague Linguistic School, and was later adopted in British stylistics. At the core of this paradigm is the idea that, next to content, it is style – that is, the way content is presented – that has a central place of its own in aesthetics. Victor Shklovsky claimed that by presenting something in a new and unfamiliar way, art de-familiarizes everyday experience in order to raise the recipient's awareness. In his concept, art has the potential to surprise its observer, guiding attention to the object itself and thus making its essence perceivable. According to Shklovsky art can bring the commonly ignored nature of an object to the fore again. In his own words, it can make a 'stone stony' (Shklovsky 1988: 20 [org. 1917]). Jan Mukařovský (1977 [org. 1940]) introduced a similar concept, establishing the term *aktualisace*, which was later translated as 'foregrounding' by Garvin (1964). Similar to Shklovsky's concept of estrangement (*priem ostranenije*), though more focused on linguistic aspects in literature, foregrounding is regarded as the art of bringing an experience into the fore by presenting it in a new and striking manner. Thus, the term foregrounding covers two interdependent yet distinguishable aspects: the structure of the presentation and its effect on the recipient. (For an overview see van Peer & Hakemulder 2006.) This double nature of the term foregrounding has long been ignored. In the realm of stylistics in particular, the focus of research has been solely on linguistic structure, with no consideration given to how readers react.

Recent research, however, has led to a combination of textual-based and recipient-based approaches, examining not only structure but also the impact

of textual features on the reader. Van Peer (1986), for example, presented two versions of a text to subjects. In the original version several passages contained aspects of foregrounding, that is, passages deviating linguistically from daily language use; in the manipulated version, the text was changed in a way that flattened these passages. Readers of either of these two versions were then asked to evaluate the text according to its emotional impact. The results revealed significant differences in the way the original and the manipulated versions were perceived, with readers of the original version evaluating the text as more striking and more pleasant. This research was repeated several times in a variety of settings, confirming that readers assess texts that deviate from familiar reception routines as aesthetically pleasing (e.g. Miall & Kuiken 1994; Hakemulder 2004; see also the special edition of *Language and Literature*, Vol. 16, No. 2, 2007).

While in general the relation between foregrounding and aesthetic experience can be accepted as well established, some questions remain unanswered. One issue is that the assessment and quantification of an aesthetic experience is not a trivial undertaking. Most approaches have tackled this problem straightforwardly, simply asking readers to rate their subjective impression on a scale from one to five. Though this introspective method is widespread and well accepted, it has the problem of data comparability. According to cognitive neuro-psychologists like Antonio Damasio or John LeDoux, emotional memory is closely connected to physical experience, which in turn is guided by the autonomous nervous system, a sub-branch of the human nervous system responsible for the regulation of essential functions of the body like blood pressure, digestion, or heart beat – functions that are not subject to deliberate control (cf. LeDoux 1995; Damasio et al. 2000). Part of the perception of fear, for example, is its physiological characteristics, including thumping of the heart, sweat on the palms, and a queasy feeling in the stomach. This close interdependency of body and mind makes it very difficult for humans to

remember emotions and actively recall them. The word ‘sadness’ is completely abstract to the feeling it describes, as it lacks a physiological component. While we can describe a past emotional experience, for example by telling it to others, its simple reference has little potential to evoke the feeling itself, neither for the one who describes it nor for the one who hears the description. This inability to consciously access emotions poses a serious problem for scientific research. Assessing emotions using scales in order to quantify a current state requires the ability to compare the momentary feeling to a previous one. If, however, the memory of an emotional experience is not consciously accessible, it is not possible to compare it to the current state. This is even more so for attention or concentration. For example, asking the reader of this paper to assess on a scale from 1 to 10 how attentive he is at the moment compared to a past reading experience – say one week ago – is problematic. This is especially the case as attention, in fact, is not a single process but rather a series of interdependent but separated cognitive processes, some with only limited conscious access.

Alternative approaches try to assess cognitive or emotional effects directly, observing the physical reaction itself rather than asking for it. Hoorn, for example, measured event related potentials (ERP) – electrophysiological responses in the brain – to aesthetic experiences, discovering a significant reaction on the N400 after the presentation of semantic and structural deviation in poems (Hoorn 1997). The N400 is a negative voltage deflection in the EEG occurring approximately 400 ms after the onset of a stimulus. In neuro- and psycholinguistics an increase in the N400 is traditionally related to semantic incongruity, an effect first described by Kutas and Hillyard (1980). An increase in the N400 denotes a focalization of the subjects’ attention towards an unexpected stimulus. In his experiment, Hoorn manipulated poems in such a way that semantic and phonological deviations were combined. He found, surprisingly, that in

addition to the predicted effects of semantic deviation, structural deviation – i.e., the absence of rhyme where it would have been expected – also increased the N400. In particular the combination of semantic and phonological deviation intensified the effect on the reader. One way to interpret Hoorn’s results is to assume predictive inferences during language processing on various linguistic levels, including, for example, phonological information (see also Hanauer 2001: 120-121).

Similarly, I found that narrative foregrounded passages in a text elicited a series of psychophysiological reactions on the part of readers (Auracher 2007). According to Genette (1980), there are two perspectives from which a story is told. One is the *narrative perspective*: that of the person who tells, or *narrates*, the story. The other is the perspective as seen through the eyes of a *focal* character, or protagonist. Conflicts between narrative perspective – that is the perspective of the story teller – and the empathic point of view – that is the *focalization* through the eyes of one of the protagonists – tend to confuse the reader and thus require a special kind of concentration. To test the effects of deviation between *narrative perspective* and *focalization* I assessed emotional and attentive reactions using various physiological indices, including heart rate variability, skin conductance, and vasoconstriction of the peripheral blood vessels, each of which reflects aspects of arousal and attentive orientation. Results of the experiment clearly indicate that narrative foregrounding enhances the involvement of the reader in the story, fostering a mutual reinforcement between emotional participation with and mental focusing on the fate of the protagonists.

2. Research Question and Operationalization

Though the amount of empirical research done in the field clearly gives support to Shklovsky’s claim that the “process of perception is an aesthetic end in itself” (1988: 20), the aforementioned limits in assessing textual effects on readers has prevented research from observing the reading

process as such. While research has repeatedly observed the interaction between a specific stylistically deviated passage and the reaction it provokes on the part of the reader, we have few insights into the interplay between these passages and the text they are embedded in. Two partly conflicting hypotheses are conceivable, depending on the sort of attention that foregrounding elicits.

One is that stylistically foregrounded passages within a text function as a sort of wake up call for the readers by surprising them and thereby drawing their attention to the form of the text itself (van Peer & Hakemulder 2006). This account would predict that readers, metaphorically speaking, stumble over linguistically deviating passages and that this pulls their attention toward a fancy and inventive way of expressing some new aspect of an otherwise already familiar object.

The competing hypothesis, which I presented in Auracher (2007), argues for an integrative function of form and content. While traditionally it is claimed that foregrounded passages block themselves from being easily processed, and therefore demand greater mental effort (e.g. Miall & Kuiken 1994, 2002), in the aforementioned experiment I was able to demonstrate that foregrounding, instead, enhances the involvement of the reader in the text. The results of my research suggest that readers of linguistically deviating language actually get pulled into and ‘lost’ in the text, and experience emotions such as suspense. This perspective argues for a more constant, flow-like attention, where a single passage does not necessarily re-orient the reader’s focus. Thus, in contrast to what the term ‘foregrounding’ actually suggests, linguistically deviating expressions do not come to *the fore* of the readers’ attention but rather function as a sort of backstage support to keep the attention on the reading and on the development of the story line.

To test which of these two slightly conflicting approaches is better suited to explain the effect of foregrounding, I conducted an experiment based on

the re-reading paradigm, described by Bortolussi and Dixon (2003). In their book *Psychonarratology*, Bortolussi and Dixon claim that texts with what they call higher quality allow readers to discover new aspects during their second or third readings – aspects that were hidden behind the story line during the first reception. According to the re-reading paradigm, repeated perception of linguistically pleasing texts is still able to captivate recipients by drawing their attention to the narrative form. In contrast to the popular view that pleasure when consuming fiction arises from the wish to learn more about the protagonist's fate, the re-reading paradigm suggests that pleasure actually increases when reading the same text a second or third time, even though all the dramatic developments and solutions have already been revealed to the recipient. So how can it be that readers enjoy a story even after the question of who-done-it has already been answered?

From a stylistic point of view this paradox can be, and has been, explained by the assumption that during the second reading recipients' attention is focused on previously unnoticed details, such as passages that contain some form of foregrounding. Readers find pleasure in solving the meaning of unfamiliar formulations, and thereby getting new perspectives on an otherwise familiar matter. However, apart from the stylistic explanation of the re-reading paradox, the phenomenon has also received some attention in the field of art philosophy. In a paper on the "paradox of suspense," Noël Carroll (1996) points out a weakness in conventional theories on suspense. While traditionally suspense is regarded as the result of an information gap, which causes readers to search for a resolution (e.g. Sternberg 2001: 117; Cupchik 2004), Carroll claims that this view cannot accommodate the fact that readers – or viewers – experience suspense even after repeated reception. If uncertainty were a necessary condition for suspense, he asks, then how can it be that those, who already know what will happen at the end – because they've seen or read it before – can still feel suspense (Carroll 1996: 71)?

Carroll's explanation for this counterintuitive observation is that readers have a sense for 'right and wrong,' preferring the former and disliking the latter: "Where a morally righteous outcome is imperilled to the point where it is improbable, our concern for the morally right can be transformed into suspense" (Carroll 1996: 84). That is to say, the recipient becomes aroused not so much due to uncertainty about the future, but rather due to an intuitive desire for moral or social correctness. Thus, whenever the storyline tends towards a non-preferred outcome, an emotional reaction is evoked, which raises the level of arousal (see also Prieto-Pablos 1998).

In addition to Carroll's and Prieto-Pablos's arguments, I would suggest that narrative style also increases the emotional involvement of the reader. I argue that it is not so much the storyline itself that provokes a moral arousal, but the way the storyline is revealed to the reader. A skillful author is able to employ language that allows the reader to *feel* the plight, the happiness, and the wishes and hopes of the protagonist. Thus, readers suffer and cheer with the characters, even if the plot itself is actually already known. While Carroll and Prieto-Pablos limit the effect of the re-reading paradox to texts containing scenes that violate the reader's moral standards, I would predict that any narrative which is able to open to the reader the inner life of a protagonist – his feelings, hopes, fears, thoughts, etc. – can absorb the reader into the story and elicit empathic feelings.

Empirical support for the re-reading paradigm comes from a research study in which subjects were asked to assess their aesthetic satisfaction while reading the recently picturized story "Der Vorleser" by Bernhard Schlink (van Peer et al. 2007). Stunningly, results revealed that subjects who had read the book previously valued their second-time reading experience significantly higher than did subjects who were encountering the story for the first time. However, while this clearly suggests that re-reading has the potential to involve and please recipients, it gives no insight into the *how*. Hence, with respect to the two approaches towards poetic language outlined

above, the question arises as to whether subjects in particular valued the experience of focusing on and processing single passages in the text, which were previously unnoticed, or whether they got absorbed in the plot and perceived linguistic form only secondarily, hidden behind the story line.

The re-reading paradigm would seem to be ideal for the research question of the current experiment, as the focus of the research is on the effect of linguistic form. Presenting the content and outcome of the text prior to the actual experiment ensures that subjects do not focus primarily on the search or desire for solution of a dramatic situation. The attention of the reader is not captured by the discrepancy between what has been told and what is still ambiguous because it lies ahead in the development of the story (compare Sternberg 2001: 117). Rather, it seems plausible to assume that subjects who already know the story line and outcome focus more on the way the content is presented. In other words, their attention is drawn from the narrative to the narration. However, depending on the way readers process linguistic style, different predictions about the variability of attention in the course of reception can be made. A traditional perspective on foregrounding would predict that subjects who were previously informed about the content would focus on thus-far unnoticed details in content and language and, therefore, actually show more attention during the perception than subjects hearing the story for the first time. At the same time, focusing on details would cause readers to stumble over single linguistically-deviating passages that are striking or pleasing, producing a high fluctuation or variability in attention. On the other hand, attention based on suspense, caused by emotional involvement of the reader, as suggested by Carroll, would argue for a constant, flow-like attention curve with only slight variability. Moreover, Carroll's theory does not argue for any difference in attention during the first and the second reception. Hence, there is no reason to assume an increase in attention when subjects have previously been informed about the story line.

In what follows I outline the results of research conducted at the clinical

center of the University of Leipzig. Subjects listened to parts of the story “Super-Frog Saves Tokyo” by Murakami Haruki, read by Joachim Król in a German translation. While one group of subjects was given a short summary of the story line to read prior to the experiment, the other group received a short biography of the author instead. Before the presentation of the story and during the listening, an Electro Encephalogram (EEG) was recorded. Attention was measured as the amount and distribution of alpha waves in the EEG. The data were analyzed with respect to two questions: First, whether pre-information about the plot affected the level of sustained attention during perception; and second, whether pre-information about the plot affected the variability of sustained attention during perception. Both questions will be addressed by comparing the overall level and variability of awareness or wakefulness of the two subject groups: namely, the subjects who already knew about the plot before listening to the story, and those who had no advance information. I will briefly give an overview of recent developments in the operationalization of sustained attention with the help of EEG measurements and then describe the research setting and the results before interpreting the outcome.

3. Method: Indication of Attention in the EEG

Research on attention has a long tradition within psychology and medicine. Still, it is one of the most difficult-to-grasp phenomena in neurophysiology. Particularly problematic is the conceptualization of attention. Starting with William James the assumption has been that attention is actually not a single, clear-cut phenomenon but rather a series of more or less related processes in the brain, all regulated by different neural networks, which have to be carefully distinguished (for an overview see Raz & Buhle 2006). James himself divided attention into two components: (1) its involuntary, reactive, and event-related orientation, and (2) its deliberate, long-term focus on a task, often referred to as vigilance (James 1890; see

also Öhman et al. 2000: 539). Later, Posner (Posner & Boies 1971; Posner & Petersen 1990) proposed an influential model of attention that divides it into three sub-modes, which are today usually referred to as ‘executive’, ‘orienting’, and ‘alerting’. While *executive* and *orienting* both roughly describe the process of selecting one stimulus out of a stream of multi-modal stimuli, *alerting* “vaguely defines the ability to increase and maintain response readiness in preparation for an impending stimulus” (Raz & Buhle 2006: 5). Applying this to the research on foregrounding, the event-related reactions in the studies of Hoorn (1997) refer to the *selection* process of attention. However, it remains unclear what effect foregrounding exerts on the *maintenance* of attention.

In the research literature sustained attention is often closely related to *arousal* or *alertness*, terms that refer to a state of raised awareness and cognitive capability (Oken et al. 2006). In an attempt to operationalize degrees of awareness, several models have been suggested for classifying distinct steps in the transition from high to low arousal, distinguishing, for example, between wakefulness (A), drowsiness (B) and sleep (C). Within the EEG, the level of attention can be discerned from the relative percentage of certain wave frequencies per time window. In other words, brain waves, distinguished according to frequency (the time the wave needs from its maximum to its minimum), are measured and analyzed to assess the momentary state of awareness. The dominant frequencies in a state of relaxed wakefulness are alpha waves (8 to 12 Hz) and beta waves (12 to 30 Hz). Experiments have shown the relative alpha power in the EEG and its frontal to posterior distribution to be a good index for the measurement of sustained attention. By using the relation between occurrence of alpha waves and wakefulness, Hegerl and colleagues developed an algorithm that calculates the percentage of alpha waves in the brain to automatically deduce the state of alertness (Hegerl et al. 2008). In their model, a share of 50% and more of alpha power per two-second time window in the EEG is

rated as *alpha dominated* (wakefulness = A). A1, the state of highest alertness, is allocated to measurements with more alpha power in the posterior (back) of the head than in the anterior (front). A2 is characterized by an equal distribution of alpha power from posterior to anterior, and A3, the state of wakefulness with the lowest level of alertness, is characterized by a dominant anterior alpha power. In contrast, a state of drowsiness or sleepiness (B) is observed when the beta power is greater than 50% (see table 1).

In the research described here, the Hegerl algorithm was used to operationalize subjects' current state of awareness. Each two-second segment in the EEG received a value from 3 to 0 according to the attentive state of the subject (A1 = 3; A2 = 2; A3 = 1; B = 0). The sum of the values for ten segments (20 seconds) was calculated and subtracted from a baseline to eliminate individual differences. The baseline value was deduced during a pre-experimental period in which subjects had to rest with eyes closed while their EEG was recorded. The results were plotted on a graph to show alertness levels during listening. This procedure was done for both subject groups: the group that had previously read a summary of the story line (Group A), and the group that had instead received a short biography of the author (Group B).

Table 1: Operationalization of vigilance in the EEG.

EEG-vigilance states			
Transition from wakefulness to sleep	Loomis et al. (1938)	subdivided by	
Alertness	A	Bente (1964)	Dominant α -activity
Relaxed wakefulness			A1: α -activity, posterior accentuation A2: equally distributed α -waves A3: frontal maximum α -rhythm
Drowsiness	B	Roth (1961)	Dissolving α -activity B1: fast low voltage β -activity

Table by Hegerl et al. (2007).

With respect to the aforementioned re-reading paradigm, it was expected that subjects of both groups would show vigilance levels above zero during reception, indicating increased attention while listening compared to resting. However, by comparing the total level and the variability across the two groups, some insights were expected that would reveal how narrative style is processed. A stylistic theory assumes that readers who know the story line already have more mental resources to muse about foregrounded passages, which previously were not noticed. Hence, the stylistic approach would predict a higher total level of attention and a higher level of variability for Group A (with pre-information) when compared to Group B (without pre-information). On the other hand, attention evoked by suspense would cause smaller differences between the groups, as the reason for the involvement of readers into the text has – according to Carroll – not changed. That is, following Carroll’s argument, Group A would show less difference in variation and total level of attention when compared to Group B.

4. The Research Setting

4.1 Subjects

All subjects were students of the University of Leipzig in Germany. Their mother tongue was German, ensuring that results would not be distorted due to language reasons. The subjects received an allowance of 15 Euros for their participation. Altogether 8 subjects participated, 4 for each group. However, due to strong artifacts during the experiment, one subject of the experimental group (Group A) was not included in the analysis. The subjects were between 20 and 27 years of age (average age of 23 for both groups). The majority of the subjects were female (5); only one subject per group was male. No subject claimed to have known the story prior to the experiment and only one subject stated that she had heard of the author, though she had never read any of his works (Group A). All subjects assessed the story as “barely interesting” when asked after the experiment and only

one subject claimed that she would read this or other stories by the author later (Group A). Three subjects had participated in other EEG experiments before (2 in Group B and 1 in Group A).

4.2 Material Used

For the experiment, the short story *Super-Frog Saves Tokyo*, written by Murakami Haruki, was chosen. This Kafkaesque story has a sudden beginning, confronting the reader with Mr. Katagiri, who returns home from work to find in his kitchen a talking frog, the size of a man, who offers him some tea and asks him to sit down. The frog explains that Tokyo faces a devastating earthquake with thousands of casualties if Katagiri refuses to help prevent this catastrophe. The section of the story that was presented to the subjects ends here. Subjects of Group A – but not of Group B – were previously informed about further developments in the story and hence knew that, though Katagiri agrees to help the frog, he ends up in the hospital and therefore fails to keep his promise. It is important to note that neither within the section presented to the subjects, nor anywhere else in the story, does the plot elicit any kind of suspense. It does not contain a dramatic situation or describe any scenes that are arousing due to their content. The story flows quietly rather than accentuates, and even the most absurd situation, such as a giant frog appearing in the kitchen and predicting a devastating earthquake, is described as if it were rather normal. Hence, the plot itself does not give any reason for the reader to feel aroused by violation of a moral or social standard.

The story was published in the book *After The Quake* (2002), in which Murakami grapples with the aftermath of the 1995 earthquake that struck Kobe (original: 神の子どもたちはみな踊る, 2000, German translation: *Nach dem Beben*, 2003). Due to the sensitivity of EEG measurements to movement, the text was played to the subjects via an audio book, read by the German actor Joachim Król (published by Universal Music, 2004).

4.3 Measurements

Data were collected from 31 electrodes for the EEG and 2 extra electrodes to capture ocular activity (eye movements). Recordings were made with a resolution of $0.0715\mu\text{V}$ and a sample rate of 1000 Hz. During the recordings a high-cut-off filter was set at 280 Hz. An additional notch software filter was used for the detection of artifacts during the evaluation of the data. Recordings and analysis of the data were conducted with the software programs *Brain Vision Recorder* and *Brain Vision Analyzer* respectively.

For the analysis, the relative occurrence of alpha waves was compared between the front and back part of the brain. To this end, activity at the temporal-parietal lobes was used as a reference and subtracted from activity recorded at the frontal electrodes and from activity recorded at the electrodes at the back part of the head (occipital). The percentage of alpha waves per time segment was assessed with a Fast-Fourier-Transformation. As described above, segments with more than 50% of alpha waves were labelled as A-sections, indicating a high degree of attention in comparison to B-sections. Afterwards, the percentage of alpha waves posterior and anterior was compared and each section was labelled as A1, A2, A3, or B according to the relative distribution of alpha power (table 1). For the comparison between the two groups, the allocated values per label were summed over 10 segments, each representing a two-second window (i.e., per 20-second episode).

4.4 Research Setting

Subjects were informed about the research setting beforehand via email. The experiment itself took about 30 to 40 minutes. All experiments were conducted at the University of Leipzig. Prior to the experiment, subjects were shown all the equipment and the measurement method was explained. The goal of the research was revealed after completion of the experiment,

upon request. Before the actual experiment started, subjects were asked to rest for ten minutes with eyes closed while recordings were taken. This served two purposes: first, the participants had a chance to get used to the electrodes and the unfamiliar surroundings; second, the data collected during this acclimatization period were used as a reference to normalize all values for inter-subjective comparability.

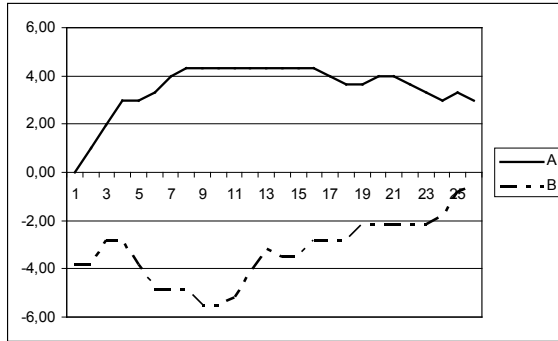
The reading of the story started without warning and was played to the subjects using two loudspeakers placed in front of them and connected to a computer in an adjacent room. The presentation took about 9 minutes (i.e., 26 episodes). Prior to the experiment, subjects were asked about their current physical/mental condition – e.g., whether they were tired, felt any pain, were nervous, etc. After the experiment the participants filled in a questionnaire asking them about their impression of the text.

5. Results

Results clearly point toward an integration rather than a separation of linguistic style and content. The relatively small variability of the attention curve for the experimental group compared to the control group argues for the absorption of the reader in the story and against the theory that in the second reading attention is oriented solely toward the stylistic dimension. When comparing the level of sustained attention over time, standard deviation for the test group is much smaller, indicating a constant awareness while listening. Moreover, subjects of the experimental group actually showed a higher overall level of sustained attention as indicated by the relative percentage of posterior accentuated alpha activity during listening when compared to the control group. Although, due to the small sample size, no inferential statistical analysis was conducted, the consistency of the results across all participants clearly suggests a relation between the experimental situation and attention.

The experimental group (Group A) shows consistently higher values per

Figure 1: Development of awareness indicated by the EEG for experimental (A) and control (B) group during listening.



reading point (20-second episode) than the control group (Group B) (figure 1). Even more surprising, the graph of the control group is mostly below zero. As the values show the difference between the level of wakefulness during listening and the level of wakefulness during the acclimatization phase before the actual experiment, positive values indicate increased attention while negative values denote decreased attention. One possible explanation for this unexpected result is a habituation effect. It is a general tendency for humans to show a higher level of arousal in the first couple of minutes after attachment of the electrodes due to the unfamiliar environment. Then, in the course of the experiment, subjects become accustomed to the situation and tend to get drowsier. This could indeed be the case for Group B, whose values are consistently below zero, showing their average arousal level to have been higher during acclimatization (before the actual experiment started) than during the actual experiment. In contrast, the wakefulness for Group A rises with the beginning of the reception and stays on a relatively high level throughout the experiment, with only a slight decline after seven minutes (episode 22). The average difference between the two groups is around 5 points. Moreover, Group B shows a higher

variability (standard deviation over all mean values per episode), indicating a strong fluctuation in attention during reception (see table 2 in the appendix).

Comparing the graphs of both groups, it is noticeable that the awareness of Group A consistently rises from the beginning of the story until episode 9 (i.e., about 180 seconds after stimulus onset). In contrast, awareness of Group B drops after a short initial rise and reaches a minimum after 200 seconds. This difference suggests that Group A, but not Group B, was primed to consciously pay attention to the story after reading a story summary. In contrast, subjects of Group B seemed to lose interest in the story after only a couple of seconds. However, during the second half of the listening period, the attention of Group B rises again, as if subjects of Group B needed some time to get into the story before becoming interested.

6. Interpretation of the results and outlook

The question of “why readers cry over the fate of Anna Karenina” (van Peer) might be as old as fiction itself. What makes us suffer with protagonists, even though we know that they are fictitious, not real, and have never – really – suffered? One possible answer is that recipients do not actually fear *for* the characters, but *with* them. Oatley, for example, suggests that readers internally simulate the actions and feelings of the protagonist (Oatley 1992, 1994). He argues that readers are in the position of very close observers, who can thus directly experience intimate and emotional moments of protagonists.

“If, in real life, we were in a café when an angry brawl started, or in a basement and overheard a plan to rob a bank, or in a bedroom when a couple undressed each other eager to make love, we would be affected by the perceptions, which would then arouse emotions in us. In the same way, in the novel or the movie the writer has arranged for

us to be in the café, in the basement, or in the bedroom, at just the right time and with the right point of view to make these scenes vivid.”

(Oatley & Gholamain 1997)

Noël Carroll suggests another explanation: that it is a feeling for correctness that is responsible for our empathic reactions to fictional characters. It violates our moral standards when, for example, innocent victims are cut in half by a buzz saw, and so we want them to be rescued to reconfirm our world view. Carroll (1996) uses this reasoning to explain what he calls the “paradox of suspense”: the question of why suspense can be experienced even when the plot is already known to the recipient. He argues that recipients’ involvement in and attention to a story is not so much due to the wish to fill an informational gap – to find out how the story ends – but to an arousal evoked in an emotional response to the observed.

Both of these approaches to what I call the ‘paradox of fiction’ have one aspect in common: readers or viewers react to the situation itself, and not so much to its meaning within the development of the story. It is not necessarily the expectation of what will come that keeps the recipient absorbed, but his or her participation in the observed event. Both the finding that readers feel suspense even when they already know the outcome of a story, and the difficult-to-explain phenomenon of readers or viewers empathizing with fictional characters in the first place, can be explained by *empathic contagion*, i.e. a transfer of feelings from the protagonist to the reader.

Neither of these theories has a place for the influence of literary style. But, as Bortolussi and Dixon (2003) point out, it is rather unlikely that narrative style has zero influence on the recipient. Intuitively one would assume that the way a story is presented exerts a strong influence on readers’ reaction to a story. Scholars such as van Peer (1986) and Miall & Kuiken (1994, 2002) argue that stylistically foregrounded passages attract readers’

attention, drawing them away from the content and towards the form of presentation. Thus, from this perspective, the effect of re-reading results from the focus on details in the story that were previously unnoticed.

The current experiment provides some support for both views. Recipients who were already informed about the outcome of a story still showed a high level of arousal during reception. They also had only slight fluctuation in their attention curve during reception, as would be predicted if recipients' sole focus was on previously unnoticed or unrevealed details. However, neither Oatley's nor Carroll's theory can accommodate the fact that reception after the content of the plot was already revealed actually resulted in higher arousal than when readers had no advanced information. This in turn would rather argue for a stylistic approach, as it is suggested by van Peer or Miall and Kuiken.

Taken together, these results argue for the idea that the linguistic realization of a plot is able to foster involvement of readers in a text, but not – as is sometimes argued – to draw readers away from the content and re-orient their focus solely on the linguistic form or style. Writing fiction, one might claim, is the art of expressing the unutterable with words. Readers of fiction do not just want to be *informed* about the feelings of a protagonist; they want to be empathically involved. One characteristic of language is its ability to abstract and categorize impressions by denoting them. The function of good narrative style hence may lie in its potential to implicitly transfer feelings, that is, to give readers access to the feelings of a protagonist, to enable them to vicariously *experience* those feelings. To this end, readers' attention must be drawn to the implicit connotative aspects of language in order to reveal the meaning behind words – meaning which words can denote or signify but not directly express. Any kind of stylistic foregrounding – applying phonetic, semantic, syntactic or pragmatic features – would in this perspective function as bridge between denotation and connotation.

Certainly this theory requires further research and a better understanding of language processing in general. However, psychophysiological measurements during reading clearly seem to be a valuable method for learning more about the interaction between text and recipient.

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Appendix

Table 2: Results per episode - Group A vs. Group B.

<u>20" Episode</u>	<u>seconds</u>	<u>Group A</u>	<u>Group B</u>	<u>20" Episode</u>	<u>seconds</u>	<u>Group A</u>	<u>Group B</u>	
1	20	-0,01	-3,83	14	280	4,32	-3,50	
2	40	0,99	-3,83	15	300	4,32	-3,50	
3	60	1,99	-2,83	16	320	4,32	-2,83	
4	80	2,99	-2,83	17	340	3,99	-2,83	
5	100	2,99	-3,83	18	360	3,65	-2,83	
6	120	3,32	-4,83	19	380	3,65	-2,17	
7	140	3,99	-4,83	20	400	3,99	-2,17	
8	160	4,32	-4,83	21	420	3,99	-2,17	
9	180	4,32	-5,50	22	440	3,65	-2,17	
10	200	4,32	-5,50	23	460	3,32	-2,17	
11	220	4,32	-5,17	24	480	2,99	-1,83	
12	240	4,32	-4,17	25	500	3,32	-0,83	
13	260	4,32	-3,17	26	520	2,99	-0,50	
						Mean	3,49	-3,26
						StdDv	1,08	1,35

要 約

美しさを測る

——文体論 (stylistics) におけるEEG測定 ——

本稿はリーダースポンスリサーチ(RRR)における脳波スタディー (EEG study) の結果報告である。

二つの被験者グループに同一のテキストが与えられ、一つのグループには始めに、その物語の筋書き（プロット）についてもインフォメーションが与えられる。ポートルーシーとディクソン(Bortolussi and Dixon, 2003)のリリーディング パラダイム(re-reading paradigm)を基に、筆者はプレインフォメーションを与えられたグループの方が、そうでないグループよりテキスト受容の際の注目度 (attention) が増すと仮定する。そしてこの注目度を測る際、EEGを使用し、アルファ波が脳の前頭部と後頭部にどの程度現れるかにより、それを測定可能な形にした。その結果、仮定は検証され、物語のプロットだけでなく文体も読者の注目度に影響を及ぼすことを示唆している。