

An Eyetracking Investigation into the Visuospatial Aspects of Reading Poetry

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Abstract

This study compared eye movements during the reading of authentic prose and poetry with and without enjambment presented in their original layout and in a manipulated layout. We hypothesised that we would find differences in reading patterns on the basis of the layout in which the text was presented. We indeed found differences in reading pattern between prose and poetry, poetry with and without enjambment and poetry with prospective and retrospective enjambment. Because the differences are a result of the visuospatial presentation of the text, this result is interpreted as evidence for readers' awareness of lineation in poetry.

Keywords: Eyetracking; reading; poetry; enjambment.

Introduction

Consider the following fragment of poetry, taken from the poem 'The Right of Way' from William Carlos Williams:

*Why bother where I went?
for I went spinning on the*

*four wheels of my car
along the wet road until*

*I saw a girl with one leg
over the rail of a balcony*

There are several ways in which the reader of this poem can structure the text. Take, for example, the last stanza: Is it 'a girl with one leg', or 'a girl with one leg over the rail of a balcony'? This ambiguity disappears if the same text is presented as prose:

Why bother where I went? For I went spinning on the four wheels of my car along the wet road until I saw a girl with one leg over the rail of a balcony.

Besides the interpretational possibilities, also the rhythm of the text changes. In the presentation as prose, there is no longer the pause after 'until' suggested by line break in the first fragment. Finally, the first fragment is easily recognized as a poem, while the second fragment could very well be taken from a novel.

This example illustrates that the visuospatial presentation of the text is an important aspect of poetry: Poetry is 'language in lines' (Hartman 1980). Not the width of the page or the screen determines where a line breaks, but rather the poet does. Lineation in poetry is no coincidence. This becomes especially manifest in the case of enjambments. An enjambment occurs when a line break does not coincide with a syntactic boundary. With enjambment, the pause, as suggested by the line break, divides a syntactic unit. This results in a conflict between the syntactic properties of the text and the visuospatial presentation of the text. In their processing and interpretation of the text, do readers conform to the syntactic boundaries, do they conform to the boundaries as suggested by the visuospatial presentation of the text, or are they sensitive to both types of information?

In poetry, a distinction can be made between two types of enjambment (Golomb 1979): prospective and retrospective. In the case of a prospective enjambment, the tension between the line as a poetic unit and the syntactic unit that spills over to the next line is already visible and recognizable at the end of the first line, as is the case in the second line of the cited fragment from Williams. In the case of a retrospective enjambment, the first line is a potentially syntactic complete one. Only when the reader continues, he realizes that the next line should be integrated with the previous line. An example of this kind of enjambment is found in the last two lines of the cited fragment. With prospective enjambment, the syntactic expectations of the reader are confirmed, as the next line continues with the expected completion of the incomplete syntactic unit. With retrospective enjambment, on the other hand, the syntactic expectations of the reader are not met, because the syntactic

phrase that was assumed to be complete turns out to be incomplete. Hence, readers should adjust their interpretation of the sentence. Because of the differences in syntactic expectations, it is reasonable to expect that these two types of enjambment are processed differently.

Reading is a complex cognitive process in which the reader constructs the meaning of a sentence. Apart from aspects of linguistic structure and aspects of sentence processing, in reading poetry an important role is played by the perception of the visuospatial presentation. Do readers perceive the significance of this visuospatial presentation? And if so, do they adjust their reading accordingly? In this study, we aim to shed more light on the process of reading poetry. Using eyetracking methodology, we aim to answer the following three research questions: (1) Do readers process poetry differently from prose?, (2) Do enjambments influence readers' processing of poetry?, and (3) Do prospective enjambments influence readers' processing of poetry differently from retrospective enjambments?

Earlier research on reading poetry suggests that readers indeed use textual information to decide whether they are dealing with a poem (Hoffstaedter 1987, Hanauer 1996). Furthermore, in one of the earliest empirical studies on reading poetry, Van Peer (1986) found evidence that readers notice *foregrounded* elements of poetry and remember the surface structure of these elements. Hanauer (1998) further investigated to which extent readers are sensitive to the visuospatial presentation of poetry. He found that when a poetic text is visuospatially presented as a poem, readers remember these texts better. Hanauer (2001) postulates two possible explanations for this effect. Firstly, it is possible that readers use the visuospatial presentation as a visual frame to recall the surface structure. Secondly, he suggests that the visuospatial presentation activates a genre specific processing. Evidence for such an explanation is provided by a study by Zwaan (1991, 1994) in which he shows that there are differences in reading time and surface representations depending on whether a text is presented as a newspaper article or a poem.

This second explanation is further supported by a study by Fisher, Carminati, Stabler and Roberts (2003). They compared eye movements during the reading of authentic poems presented in their original layout and in a prosaic layout. When readers were faced with a poetry layout, they had slower reading rates, made more and longer fixations, and made shorter progressions and more and longer regressions compared to the prose layout.

Based on this literature, we expect to find longer fixations and more regressions for fragments presented as poetry compared to prose. Will there also be differences in reading processes between poetry without and with enjambment? An online ERP-study on the processing of comma's by Steinhauer and Friederici (2001) suggest that comma's can serve as visual cues for prosodic processing. Reading visual boundaries seems to involve the same processes as the perception of prosodic boundaries in spoken language. In the case of an enjambment, the prosodic boundary as

suggested by the line end conflicts with the syntactic unit. Research on the reading aloud of poetry by actors (Reuven 1998) shows that readers realize both continuing and separating cues when they encounter an enjambment. If they also do so in reading poetry silently, we expect longer fixations on the end of the line compared to prose, but not compared to poetry without enjambment, because in the latter case, both syntactic structure and visuospatial presentation allow for a pause. This contrasts with the case of an enjambment, where the incompleteness of the syntactic structure pulls the reader to the next line.

Because of the different syntactic expectations between poetry with prospective and retrospective enjambment, we expect to find differences in the related reading processes. With retrospective enjambments, the first line is a potentially complete one, so we expect retrospective enjambment to resemble end-stopped lines at the end of the first line. However, when readers proceed to the next line, they will realize that their expectation is not fulfilled, as the words on the next line are syntactically connected to the previous line. Thus, we expect readers to make more regressions from the first two words on the next line with retrospective enjambments compared to prospective enjambments, because readers have to revise their first interpretation.

Experiment

To investigate readers' processing of poetry, we conducted an eyetracking experiment. In this experiment, participants will read fragments of text presented on a computer screen. The fragments are formatted either as poetry or as prose. Furthermore, the fragments in the poetry condition differ with respect to enjambment. Eye-movements of the participants are recorded during reading

Materials and Design

In this experiment we used original as well as manipulated fragments. We selected original poetry fragments with and without enjambment from an anthology of young Dutch poets (Komrij, 2010). This choice of materials is motivated by the assumption that readers will probably not be familiar with these poems. This way, the reading process will not be influenced by some readers' familiarity with the materials. In addition, we selected extracts of prose from publications of some of these poets. We manipulated the selected fragments such that four versions of each extract were created: one prose version, and three poetry versions (without enjambment, with a prospective enjambment and with a retrospective enjambment). To illustrate these four conditions, consider the following translated examples from the poem 'Najaar' (Autumn) from Jan Willem Anker (in Komrij, 2010):

In the silence we please ourselves with little, weeds in the clearing of a garden, a sliver of morning light on a small folding chair.

Figure 1: Prose.

In the silence we please ourselves with little, weeds in the clearing of a garden, a sliver of morning light on a small folding chair.

Figure 2: Poetry with a prospective enjambment.

In the silence we please ourselves with little, weeds in the clearing of a garden, a sliver of morning light on a small folding chair.

Figure 3: Poetry with a retrospective enjambment.

In the silence we please ourselves with little, weeds in the clearing of a garden, a sliver of morning light on a small folding chair.

Figure 4: Poetry without enjambment (original).

Figure 1 shows the prose version we obtained by manipulating a fragment of poetry without enjambment. In poetry with a prospective enjambment (Figure 2), the line break does not coincide with a syntactic boundary. The reader will be able to detect this type of enjambment already at the end of the first line. In poetry with a retrospective enjambment (Figure 3), the line break and the syntactic boundary do not coincide either, but this will become clear only at the beginning of the second line. In poetry without enjambment, or end-stopped poetry (Figure 4), the line break coincides with a syntactic boundary.

A third of the poetry fragments is presented with end-stopped lines, a third is presented with a prospective enjambment and a third with a retrospective enjambment. Furthermore, the fragments differ with respect to their original format before manipulation, which was either prose, poetry without enjambment or with prospective or retrospective enjambment (we labeled this as *item group*). Twelve experimental lists were created. The order in which the items were presented was determined semi-randomly (i.e., allowing no more than four consecutive items in the same condition). Each list consisted of 70 text fragments (20 presented as prose, 20 as poetry without enjambment, 15 as poetry with prospective enjambment and 15 as poetry with retrospective enjambment), with no list containing more than one version of an item.

Participants

The participants were 31 undergraduate students from the Faculty of Arts from the University of Groningen (6 male, age-range 18-27, average 21;4. All were native speakers of Dutch with normal or corrected vision.

Procedure

Participants were tested in the Eye Lab of the University of Groningen. To record their eye movements during reading, we used a Tobii T120 eyetracker (sampling at 120 Hz). The participants sat facing the eyetracking monitor at approximately 65 cm distance. They were instructed to read each fragment as they would normally read prose or poetry. After each fragment, they had to answer an evaluation question (“How beautiful do you think this fragment is?”) on a scale from 1 to 5. At the beginning of each trial, a fixation mark (a cross) appeared on the screen. When participants fixated on the mark for at least 1 second, a red square appeared around the mark and the experimental item was presented on the screen. When the participants had finished reading the item, they were instructed to push the space bar, and the evaluation question appeared on the screen. They were instructed to try to avoid blinking during the reading of the fragments to avoid blink related disruptions of the eye-tracking data. After 35 trials, the participants had the opportunity to take a short break. The test items were preceded by a practice trial of three items. In the second part of the experiment, participants carried out a memory task, in which they had to complete incomplete versions of the fragments they had read earlier. These fragments were cut off at the line end. For reasons of space, we will not report on the results of the evaluation questions and memory task here.

Results

We will focus on three eye-tracking measures: *proportion of regressions*, *first pass gaze* (i.e., the time spent in a region for the first time without having read any later material) and *first pass total gaze* (which equals the first pass gaze plus all fixations and saccades following regressive eye movements). We examined reading behavior at the final two words of the first line (*pre-target* and *target*), and the first two words of the following line (*post1* and *post2*) in the poetry condition, which were compared to their counterparts in the prose condition (where no line break is present). Consider for example the fragment in Figure 1: the words of interest would be ‘ourselves’ (*pre*), ‘with’ (*target*), ‘little’ (*post1*) and ‘weeds’ (*post2*).

We will limit our discussion of the results to 1) effects of *genre* (comparison between poetry and prose) and 2) interaction effects of *genre* and *enjambment* (comparison between poetry without and with prospective and retrospective enjambment). For a complete overview of the results, see Koops van 't Jagt (2011).

Before the line break: *pre-target* and *target*

We found main effects of *genre* on the prefinal (*pre*) and final word (*target*) of the first line. Average gaze durations on *pre* and *target* are longer for poetry compared to prose ($F(1,17) = 12.13, p=.003$) and $F(1,17) = 7.90, p=.012$, respectively). The mean gaze duration for *pre* in poetry is 278 ms, while in prose the mean gaze duration is 232 ms. This pattern is the same for *target* (mean gaze poetry = 264 ms vs. mean gaze prose = 229 ms). Furthermore, we found that readers make more regressions back to previously read text from the prefinal word (*pre*) of the first line in poetry (mean proportion = .16) compared with their counterparts in prose (mean proportion = .12, $F(1,28) = 6.16, p=.019$). We also found an interaction effect of *genre* and *enjambment* on first pass total gaze ($F(2,34) = 3.24, p=.05$). This interaction was most likely caused by the fact that *retrospective* enjambment showed the largest difference between poetry and prose (mean total gaze poetry = 297 ms, mean total gaze prose = 238 ms) as compared to fragments with *prospective* enjambment (mean total gaze poetry = 276 ms, mean total gaze prose = 290 ms).

After the line break: *post1* and *post2*

Main effects of *genre* were found on *post1* and *post2*. On the first word after the line break (*post1*), readers' first pass gaze is longer in the poetry condition (mean=456 ms), compared to prose (mean=269 ms, $F(1,15) = 24.68, p=.004$). This pattern was also found for total gaze duration (poetry: mean=467 ms; prose: mean=302 ms, $F(1,15) = 31.91, p=.002$), and for regressions (poetry: mean proportion=.01; prose: mean proportion=.11, $F(1,28) = 63.56, p<.001$). The main effect of genre on regressions was qualified by an interaction between genre and enjambment that was marginally significant ($F(2,54) = 50.44, p=.07$). Follow-up analyses suggested that this trend toward an interaction was due to the larger effect of genre in fragments with enjambment (poetry: mean proportion = .02; prose: mean proportion = .13) as compared to fragments without enjambment (poetry: mean proportion = .00; prose: mean proportion = .06); there was no difference between retrospective and prospective enjambment.

At the second word after the line break (*post2*), the main effects of genre were marginally significant, suggesting a trend for both first pass gaze and total gaze to be longer for poetry than for prose (mean gaze poetry = 278 ms, mean gaze prose = 245 ms, $F(1,15)=3.45; p=.083$; mean total gaze poetry = 301 ms, mean total gaze prose = 283 ms, $F(1,15)=3.47; p=.082$). The genre-effect in first pass gaze was qualified by a significant interaction between genre and enjambment ($F(2,30)=5.82; p=.007$). Follow-up analyses showed that this was most likely due to the presence of a genre effect for fragments with enjambment (poetry: mean gaze = 300 ms; prose: mean gaze = 234 ms) and the absence thereof in fragments without enjambment (poetry: mean gaze = 234 ms; prose: mean gaze = 251 ms); prospective and retrospective enjambments did not differ ($p>.78$).

Discussion

In this section, we return to the three research questions raised in the introduction.

Processing of poetry

Our first question was whether readers process poetry differently from prose. The results of this study suggest that there are indeed differences between reading text fragments that, because of their visuospatial properties, appear to be fragments of prose and text fragments consisting of the same words that, because of their visuospatial properties, appear to be fragments of poetry. Both at the end of the first line and at the beginning of the next line, main effects of *genre* were found. Readers fixated longer on the prefinal and the final word of the first line (i.e., *pre* and *target*) compared to their counterparts in the prose fragments. Furthermore, they made more regressions back to previous words compared to their prose counterparts. At the first (and in some cases second) word on the next line of poetry (i.e., *post1* and *post2*), readers also fixated longer compared to prose. However, they made fewer regressions back to previous words compared to prose.

So we found a number of differences between reading poetry and reading prose. There are several ways to interpret these findings. Firstly, it is possible that readers realize, based on the visuospatial properties of the text, that they are dealing with poetry, as a result of which they adjust their reading strategy. As poetry is often characterized by a non-conventional use of formal aspects of language such as rhyme, meter and alliteration, readers may take the line break as an indication that they should not only focus on the interpretation of the sentences, but should also consider the formal aspects of the text. For this reason, they may pay more attention to the words surrounding a line break in poetry than in prose.

Secondly, it is conceivable that readers interpret a line break in poetry as an intentional signal by the poet. The poet deliberately chose to place a line break at a particular position and not at some other position, and may have done so to bring about a particular effect in the reader. If readers are aware of this intentional act by the poet, this may influence the way they read poetry.

And thirdly, it might be the case that the reading process is influenced by the form of the text in itself. That is, it is conceivable that words at a line boundary evoke a different reading pattern than words in the middle of a sentence. In that case, the longer fixations and the smaller proportion of regressions are caused merely by the location of the word relative to the other words of the text.

When the line break does not coincide with a syntactic boundary

In addition to the general differences between reading poetry and reading prose, we also looked in more detail at the way people read poetry by distinguishing between fragments with and without enjambments. Do enjambments

influence readers' processing of poetry? To answer this question we have to determine whether the observed differences between prose and poetry are the same for fragments with and without enjambment.

The observed differences between prose and poetry indeed show a distinct pattern for poetry with and without enjambment. When we consider the final two words of the line (*pre* and *target*), we observed differences between prose and poetry without enjambment in *total gaze* and *proportion regressions*, whereas we found no, or at least a much smaller, difference between prose and poetry with enjambment. However, when we consider the first two words of the next line (*post1* and *post2*), we see a different picture. While we found a longer *gaze* on *post2* for fragments with enjambment compared to prose, we did not find such an effect for fragments without enjambment. Furthermore, the difference between prose and poetry regarding the proportion of regressions from *post1* is much smaller for poetry without enjambment compared to poetry with enjambment. So with respect to the final two words of the first line, we found a distinct pattern for prose and poetry without enjambment, but a similar pattern for prose and poetry with enjambment. With respect to the first two words of the next line, the pattern is the other way around: a distinct pattern for prose and poetry with enjambment, but a similar pattern for prose and poetry without enjambment.

The absence of any differences between prose and poetry with enjambment for *pre* and *target* suggests that readers read a sequence of words that forms a syntactic unit at the same pace, irrespective of whether a line break divides the unit (as with enjambment) or whether the unit does not contain a line break (as with prose). Apparently, in case of a conflict between the information provided by the syntactic structure of the sentence and the information provided by the visuospatial presentation of the text, syntactic structure wins. Instead of being stopped by the line break, the gaze of the reader is pulled toward the next line. Whereas a line break leads to longer fixations and more regressions before the break if the line break coincides with a syntactic boundary, as we saw in our earlier comparison of poetry without enjambment to prose, a line break does not have this effect if it occurs within a syntactic unit (as in the case of poetry with enjambment). When reading a fragment of poetry with enjambment, the reader's gaze is not influenced by the visuospatial effects of the line break but rather is pulled toward the end of the syntactic unit on the next line.

Does that mean that readers fail to notice the tension between the syntactic unit and the line end in the case of an enjambment? The observed differences between prose and poetry with enjambment on the first two words of the next line (*post1* and *post2*) suggest otherwise. After they have encountered the line break, readers looked longer at the first words of the next line. This may be because they had to integrate the information about the presence of a line break in their interpretation of the text. Also, readers make fewer regressions back to the previous line, indicating that they treat the line break as an actual boundary that cannot easily

be crossed. Thus, readers do seem to show effects of the presence of a line break in their online processing of enjambment.

Prospective versus retrospective enjambments

In the above discussion, we did not distinguish between prospective and retrospective enjambments. However, it is possible that prospective enjambments influence readers' processing of poetry differently from retrospective enjambments. As mentioned above, the absence of any differences between prose and poetry with enjambment could be caused by the fact that the relevant words form a syntactic unit. However, with retrospective enjambments, the first line is a potentially complete one. Based on this, one would expect that the reading measures on the final two words of a line of poetry leading to a retrospective enjambment resemble that of poetry without enjambment.

When we compare poetry without enjambment with poetry with a prospective enjambment, we found that readers fixated longer on the prefinal word of the first line (*pre*) in case of poetry without enjambment compared to poetry with a prospective enjambment. However, with poetry with a retrospective enjambment, this difference is the other way around. Furthermore, the proportion of regressions from the final word of the first line (*target*) is smaller for poetry with a prospective enjambment compared to poetry without enjambment, whereas there is no difference between poetry without enjambment and poetry with a retrospective enjambment. Because of the different patterns of fixation and regression with prospective enjambments and retrospective enjambments, it is safe to conclude that the absence of a slowdown in reading pace in the case of prospective enjambments is caused by the incomplete syntactic phrase on the first line.

We expected readers to make more regressions from the first two words of the next line with retrospective enjambments, and fixate on these words longer compared to prospective enjambments. However, our results do not confirm these hypotheses. Readers do not look back from the first two words of the next line to previously read text more often with retrospective enjambments. In addition, no differences between prospective and retrospective enjambments regarding gaze were found on these locations. There are a few possible explanations for the absence of this difference. Firstly, it may be the case that a difference will be manifest further down the line. That would explain why the possible extra processing in the case of a retrospective enjambment is not visible at the first two words of the next line.

Secondly, it is possible that readers do not recognize a retrospective enjambment as such. In that case, the visual boundary as presented by the line end is taken for granted, that is, it is not perceived as potentially meaningful or important. That would mean readers did not have to revise their first interpretation.

Conclusions

This study investigated readers' processing of texts that were presented either as prose or as poetry with or without enjambment. We conclude that readers process poetry differently from prose. Furthermore, enjambments influence readers' processing of poetry. Finally, we found differences in readers' processing of prospective and retrospective enjambments.

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