Task Effects on Eye Movements During Reading

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The present study examined how proofreading and reading-for-comprehension instructions influence eye movements during reading. Thirty-seven participants silently read sentences containing compound words as target words while their eye movements were being recorded. We manipulated word length and frequency to examine how task instructions influence orthographic versus lexical–semantic processing during reading. Task instructions influenced both temporal and spatial aspects of eye movements: The initial landing position in words was shifted leftward, the saccade length was shorter, first fixation and gaze duration were longer, and refixation probability was higher during proofreading than during reading for comprehension. Moreover, in comparison to instructions for reading for comprehension, proofreading instructions increased both orthographic and lexical–semantic processing. This became apparent in a greater word length and word frequency effect in gaze duration during proofreading than during reading for comprehension. The present study suggests that the allocation of attentional resources during reading is significantly modulated by task demands.

Keywords: eye movements, reading, task effects, proofreading

The task the reader has in mind during reading is an important factor in governing how he or she processes and comprehends text. Online text processing is different, for example, when readers read for pleasure than when they read for study purposes (Shebilske & Fisher, 1983). How readers adjust their reading behavior according to task demands should be examined in order to better understand both skilled reading and the principles of eye movement control during reading (Radach & Kennedy, 2004). However, surprisingly little research has been conducted to examine how task instructions influence eye movements during normal reading. Previous studies have examined how overt or subvocal pronunciation (Heller, 1982; Hendriks, 1996), questions presented before reading (Rothkopf & Billington, 1979), a reading perspective (Kaakinen & Hyöna, 2005, 2007, 2008; Kaakinen, Hyöna, & Keenan, 2002, 2003), and reading instructions (Heller, 1982; Laycock, 1955; Radach, Huestegge, & Reilly, 2008; Shebilske & Fisher, 1983; Wotschack, 2009) affect eye movements during reading.

In the present study, we examined how proofreading instructions influence eye movements during reading of short and long compound words. The proofreading task required the readers to check the words for spelling errors, specifically, letter transpositions. During this kind of misspelling detection task, two processes have been hypothesized to occur (O’Connor & Forster, 1981). First, a lexical entry corresponding to the written word has to be accessed. Then, a careful orthographic check of the written word is performed: Each letter combination has to be checked against the correct word form, and a decision whether the word is misspelled or not has to be made. The checking process is terminated and a “misspell” decision is made as soon as a spelling error is detected. However, if there is no spelling error, the checking continues until all letter combinations within the word have been checked.

Because the proofreading task incorporates an extra postlexical checking process, the effects of proofreading instructions may appear relatively late in the eye movement records. On the other hand, task instructions may influence the scanning strategies adopted by the reader and may exert their influence during the early stages of word processing (Kaakinen & Hyöna, 2007). Kaakinen and Hyöna (2007) examined the influence of a reading goal on eye movements during reading of goal-relevant and goal-irrelevant sentences. Participants read a relatively long expository text describing various diseases; the task was to read the text in order to be able to tell other people facts about one of the diseases. The results showed that the reading goal influenced skip rates (an early measure of word processing) and gaze durations on words: Words in goal-relevant sentences were less likely to be skipped and attracted longer gaze durations than words in goal-irrelevant sentences did. Finally, words in goal-relevant sentences attracted more refixations than words in goal-irrelevant sentences did.

Previous research sheds little light on the time course of proofreading effects. Daneman, Reingold, and Davidson (1995) examined how homophone errors influence eye movements during proofreading instructions and compared these results to those from an earlier study (Daneman & Reingold, 1993) in which participants read the same materials with instructions to read for comprehension. Gaze durations and total fixation times on target words were longer during proofreading than during reading for comprehension, suggesting that proofreading may indeed influence postlexical processing of words. However, Daneman and Reingold
Spatial aspects of eye movements may also be influenced by proofreading instructions. Heller (1982) examined the execution of corrective saccades made after return sweeps (i.e., long saccades taking the eyes from the end of one line to the beginning of the next line) during proofreading and reading for comprehension. The number of corrective saccades increased during proofreading in comparison to reading for comprehension, suggesting that the optimal point of fixation was more difficult to reach during proofreading. In other words, the effective visual field may be smaller during proofreading than during reading for comprehension. Using the moving window technique, Osaka, Osaka, and Tsuji (1995) examined the size of the effective visual field during proofreading of Japanese text and compared the results to those from their earlier studies (Osaka & Oda, 1991). They concluded, based on the performance in the error-detection task, that proofreading decreases the size of the effective visual field. However, a closer look at their data reveals that the reading rates level for window sizes of four or more characters. This pattern is similar to that observed during normal reading of Japanese (e.g., Osaka & Oda, 1991).

Because the proofreading tasks emphasizes orthographic processing, the meaning of the words may not be fully processed during proofreading. Evidence for reduced processing of text meaning during proofreading is provided by Singer and Halldorson (1996), who found that certain types of causal inferences were not made when readers looked for spelling errors. On the other hand, the results of Levy and Begin (1984) indicate that proofreaders do not simply scan the text for spelling errors but also monitor comprehension. Their results showed that semantic inconsistency with the prior context slowed reading and reduced the number of detected spelling errors in sentences.

Even though it is often thought that semantic processing of words is automatic, it may be controlled by attention (e.g., Stolz & Besner, 1999). For example, professional proofreaders are immune to the Stroop interference effect and are capable of inhibiting automatic activation of word meanings (Asano & Yokosawa, 2007). Although processing the meaning of words is probably the default mode during normal reading, task instructions may decrease (or increase) the degree of semantic word processing (Radach et al., 2008). Word frequency has been shown to influence eye movements so that low-frequency words are looked at longer than high-frequency words (e.g., Rayner & Duffy, 1986). Radach et al. (2008) compared word frequency effects for those reading in preparation for comprehension versus word verification questions (a multiple-choice task). The word frequency effects were more pronounced in gaze durations and total viewing times (albeit the Word Frequency × Task interactions were nonsignificant) when readers expected comprehension questions rather than word verification questions. Radach et al. concluded that comprehension questions encourage a deeper level of processing than do word verification questions and that this results in greater word frequency effects. Eye movement studies on word search have also indicated that the word frequency effect is wiped out during word search (Rayner & Raney, 1996).

On the other hand, lexical processing may play a particularly important role in proofreading. The lexical entries of high-frequency words are more easily accessed than those of low-frequency words, and this difference may become especially apparent during proofreading. Previous research shows that during proofreading, spelling errors are harder to detect in high-frequency than low-frequency words (Holbrook, 1978), and in a misspelling decision task (with visually presented single words) letter transpositions in high-frequency words are more difficult to recognize than those in low-frequency words (O’Connor & Forster, 1981). Presumably, this is because less letter-level activation is needed for high- than low-frequency words to reach the recognition threshold. Moreover, lexical decision latencies are faster for wrongly spelled high-frequency than low-frequency words (Perea, Rosa, & Gómez, 2005), and eye-tracking studies suggest that normal reading is less disrupted by spelling errors in high- than low-frequency words (White & Liversedge, 2004).

Previous research has also shown that word length modulates the word frequency effects on eye movements (e.g., Bertram & Hyönä, 2003). Bertram and Hyönä (2003) examined (normal) reading of short and long compound words embedded in sentence contexts. They found that with short compound words, word frequency influenced the early eye fixation measures, whereas for long compounds the frequency effects emerged later. These results can be explained by visual acuity limitations: Whole word information cannot be extracted for long words on a single fixation, but two (or more) fixations have to be made in order to foveally inspect the entire word. Thus, whole word information becomes available later for long than for short words.

Successful orthographic checking requires that each letter and letter combination of the word be compared to the word representation in the mental lexicon. The longer the word, the longer the checking process will take, because there are more comparisons to be made. Word length may thus have greater influence on eye movements during proofreading than during reading for comprehension. Previous studies indeed show that word length is an important factor in proofreading: Spelling errors are more difficult to detect in long than short content words (Niemi & Virjamo, 1986), and misspelled long words are judged to be more wordlike than misspelled short words (Holbrook, 1978). Presumably, spelling errors are harder to spot in long than short (content) words, because the overall letter-level activation fed to word detectors is greater when multiple letters appear in correct positions.

In the present study, we examined how readers adjust their reading behavior to meet task demands. To that end, we analyzed a number of eye movement measures in order to examine how task instructions influence temporal (fixation durations) and spatial (saccade amplitudes and fixation locations) aspects of eye guidance. To examine lexical–semantic and orthographic processing as a function of reading task, we also manipulated word frequency and word length, respectively. Participants read short and long low- and high-frequency compound words embedded in sentence context (Bertram & Hyönä, 2003) while their eye movements were being recorded. We expected proofreading instructions to increase fixation durations and fixation frequency as well as shorten saccade amplitudes. We were particularly interested in the time course of the task effects: whether the effects can be observed already in the earliest measures or only in the later indices of word processing. Moreover, we hypothesized that because proofreading emphasizes orthographic processing, word length effects would be more pronounced during proofreading than during reading for comprehension. As for the word frequency effects, we had two alternative hypotheses. If readers do not perform a full lexical–semantic
analysis of words during proofreading, frequency effects should be
greater during reading for comprehension than during proofread-
ing. However, if the orthographic checking process during proof-
reading depended on word frequency, word frequency effects
would be greater during proofreading than during reading for
comprehension.

Method

Participants

Thirty-seven students (6 male) from the University of Turku
participated in the experiment for course credit. The mean age of
the participants was 23.84 years (SD = 5.70); they were all native
speakers of Finnish (the language studied here) and had normal or
corrected-to-normal vision.

Apparatus

We used an EyeLink 1000 desktop mounted eye tracker man-
ufactured by SR Research (Mississauga, Ontario, Canada) to col-
lect the eye movement data (see http://sr-research.com/pdf/
technical.pdf). Sampling frequency was 1,000 Hz; only the right
eye was tracked. The stimuli were presented on a 21-in. CRT
screen with a screen resolution of 1,024 × 768 pixels and 150 Hz
refresh rate. Participants' responses were collected with a Cedrus
response box.

Materials

Materials were adopted from Bertram and Hyöna (2003). Target
words were 40 short (M = 7.5 characters) and 40 long (M = 12.8
characters) compound words. Word frequency was manipulated:
There were 20 high-frequency (HF, 23 occurrences/million) and
20 low-frequency (LF, 2.4 occurrences/million) long compounds
and 20 HF (22 occurrences/million) and 20 LF (2.3 occurrences/
million) short compounds. The HF and LF words were matched on
first-constituent, second-constituent, and bigram frequency; word
length; and first constituent length. The short compounds were
matched with the long compounds on all factors except constituent
and whole word length.

The target words were embedded in sentences (for details about
the materials, see Bertram & Hyöna, 2003). Experimental sen-
tences were divided into two blocks, so that there were 10 targets
for each of the four experimental conditions in both blocks. Half of
the participants read one block with the instructions to read for
comprehension, and the other half read the same block with the
instructions to find spelling errors. The target sentences were
mixed with 20 filler sentences in each block.

In the proofreading condition, the experimental sentences did
not contain spelling errors but the filler sentences did. Spelling
errors appeared in words in the middle of the filler sentences;
errors were letter transpositions (e.g., sieriamin instead of sierai-
min) that appeared in word-internal positions. In the comprehen-
sion condition, none of the sentences contained spelling errors.

Procedure

In the beginning of the experiment, the eye tracker was cali-
ibrated with a 9-pt calibration scheme. The comprehension condi-
tion started the experiment: Participants were instructed to read the
sentences for comprehension and to respond to occasionally ap-
ppearing comprehension questions by pressing the yes or no button
on the response box. Before the proofreading condition, partici-
pants were informed that some of the sentences included a spelling
error, and they were instructed to indicate whether each sentence
included an error by pressing the yes or no button on the response
box. The tasks were performed in this order to avoid carryover
effects: If the proofreading task had been performed first, readers
might still be looking for spelling errors when asked to read for
comprehension.

A fixation point was presented at the beginning of each sen-
tence. When the participant fixated the point, the experimenter
started the trial. The sentences were presented slightly above the
center of the screen with white Courier New 18-pt font on a black
background. One character subtended approximately 0.5 degree of
visual angle. Long sentences were broken into two lines (target
words always appeared on the first line); double spacing was used.
The sentence was presented on the screen until the participant
pressed the continue button. Presentation order of the sentences
within each condition was randomized. In the comprehension
condition, the 20 filler sentences were followed by a comprehen-
sion question requiring a “yes” or “no” response. In the proofread-
ing condition participants responded after every sentence, indicat-
ing whether the sentence included a spelling error after first
pressing the continue button. The experimental session lasted for
approximately thirty minutes.

Results

Participants performed the tasks very accurately. The mean
number of errors made on the 20 comprehension questions during
the comprehension task was 1.27 (SD = 1.12); in the proofreading
task participants missed on average only 2.70 (SD = 2.40) of the
20 spelling errors. Fixations shorter than 50 ms were removed
from the data. We first report overall task effects on sentence
reading followed by the analyses of eye behavior on target words.

Overall Task Effects

Participants made on average 20.62 fixations (SD = 7.66)
during the proofreading trials and 16.31 fixations (SD = 4.94)
during the comprehension trials. The mean saccade length was
6.78 character spaces (SD = 1.64) in the proofreading task and
8.64 character spaces (SD = 1.94) in the comprehension task, and
the mean fixation duration was 229 ms (SD = 30) in the proof-
reading task and 211 ms (SD = 31) in the comprehension task,
respectively. In other words, in comparison to reading for com-
prehension, proofreading increased the number of fixations,
shortened the saccade amplitude, and lengthened the mean fixation duration,

\[ t(36) = 5.40, p < .001 \]
\[ t(36) = 9.65, p < .001 \]
\[ t(36) = 4.43, p < .001 \]

Eye Behavior on Target Words

We analyzed the data for the target words with analyses of
variance using both participants \((F_p)\) and items \((F_i)\) as random
factors. In the by-participants analyses, reading task (comprehen-
sion vs. proofreading), word length (short vs. long) and word
frequency (low vs. high) were within-participants factors. In the by-items analyses, task was a within-item factor and word length and word frequency were between-items factors. We analyzed initial landing position, first fixation duration, intraword saccade length (between the first and second fixation), refixation probability (i.e., the probability of making more than one fixation on the word during the first-pass), gaze duration, and rereading time (i.e., time used to reread the word after exiting it). The means and standard deviations are presented in Table 1.

Initial landing position. Initial fixations landed further into long than short words, $F(1, 36) = 491.20, p < .001; F_{2}(1, 76) = 99.52, p < .001$. Moreover, reading task influenced the initial landing position: Readers tended to fixate closer to word beginning during proofreading than during comprehension, $F(1, 36) = 25.27, p < .001; F_{2}(1, 76) = 53.47, p < .001$. None of the other effects were significant, largest $F(1, 36) = 2.51, p = .12$, for the main effect of frequency.

First fixation duration. Short compound words attracted longer first fixations than did long compound words, $F(1, 36) = 33.00, p < .001; F_{2}(1, 76) = 34.44, p < .001$. Moreover, there was a main effect of word frequency, $F(1, 36) = 11.43, p = .002; F_{2}(1, 76) = 6.63, p = .012$, indicating that LF words produced longer first fixations than HF words did. The first fixation durations were overall longer in the proofreading than the comprehension condition, $F(1, 36) = 20.82, p < .001; F_{2}(1, 76) = 49.01, p < .001$. No significant interactions were observed ($Fs < 1$).

Intraword saccade length. Not surprisingly, the saccade lengths were shorter in the short than the long words, $F(1, 29) = 22.12, p < .001; F_{2}(1, 76) = 85.06, p < .001$. The amplitudes were also shorter in the proofreading than the comprehension task, $F(1, 36) = 50.72, p < .001; F_{2}(1, 76) = 55.23, p < .001$. None of the other effects were significant, largest $F(1, 29) = 2.64, p = .12$, for the three-way interaction.

Refixation probability. Long words were more likely to attract a refixation than were short words, $F(1, 36) = 140.00, p < .001; F_{2}(1, 76) = 191.13, p < .001$. The main effect of word frequency was significant only in the by-participants analysis, $F(1, 36) = 5.37, p = .026; F_{2}(1, 76) = 1.83, p = .181$. As for the effects of reading task, proofreading increased the likelihood of refixating a word, $F(1, 36) = 58.28, p < .001; F_{2}(1, 76) = 91.81, p < .001$. A significant Reading Task × Word Length interaction indicated that proofreading amplified the word length effect, $F(1, 36) = 11.73, p = .002; F_{2}(1, 76) = 12.82, p = .001$.

Gaze duration. Long words attracted longer gaze durations than short words did, $F(1, 36) = 240.98, p < .001; F_{2}(1, 76) = 118.64, p < .001$, and gaze durations were longer for LF than for HF words, $F(1, 36) = 57.94, p < .001; F_{2}(1, 76) = 22.18, p < .001$. A two-way interaction between word length and word frequency suggests that the frequency effect was more prominent for the long than the short words, but the interaction was significant only in the by-participants analysis, $F(1, 36) = 12.31, p < .001; F_{2}(1, 76) = 2.48, p = .12$. As for the effects of reading task, the proofreading instructions increased gaze durations on words, $F(1, 36) = 75.20, p < .001; F_{2}(1, 76) = 286.55, p < .001$. A significant Reading Task × Word Length interaction indicated that the word length effect was greater in the proofreading than in the comprehension task, $F(1, 36) = 30.32, p < .001; F_{2}(1, 76) = 19.81, p < .001$. Moreover, there was a significant two-way interaction between reading task and word frequency, suggesting that the frequency effect was more prominent in the proofreading than the comprehension task, $F(1, 36) = 5.57, p = .024; F_{2}(1, 76) = 5.16, p = .026$.

Rereading time. Long words were reread for a longer time than short words were, $F(1, 36) = 10.26, p = .003; F_{2}(1, 76) = 6.71, p = .011$. The main effect of word frequency was significant only in the by-participants analysis, $F(1, 36) = 8.72, p = .006; F_{2}(1, 76) = 2.51, p = .117$. The main effect of reading task failed to reach significance, $F(1, 36) = 1.24, p = .274; F_{2}(1, 76) = 3.31, p = .073$. Finally, the word frequency effect was greater in the comprehension than the proofreading task; however, the two-way interaction between task and word frequency was significant only in the by-participants analysis, $F(1, 36) = 4.75, p = .036; F_{2}(1, 76) = 2.23, p = .139$. Follow-up comparisons showed that the word frequency effect was not significant in the proofreading task, $t_{1}(36) = 0.19, p = .847, t_{2}(78) = 0.14, p = .887$, but was

Table 1
Means (Standard Deviations) of the Eye Movement Measures as a Function of Task, Word Length, and Word Frequency

<table>
<thead>
<tr>
<th>Measure</th>
<th>Task</th>
<th>Target word</th>
<th>Long</th>
<th>Short</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>HF</td>
<td>LF</td>
<td>HF</td>
</tr>
<tr>
<td>Initial landing position (char)</td>
<td>Proofreading</td>
<td>4.18 (0.61)</td>
<td>3.97 (0.81)</td>
<td>3.08 (0.62)</td>
</tr>
<tr>
<td></td>
<td>Comprehension</td>
<td>4.54 (0.72)</td>
<td>4.44 (0.94)</td>
<td>3.66 (0.79)</td>
</tr>
<tr>
<td>First fixation duration (ms)</td>
<td>Proofreading</td>
<td>220 (37)</td>
<td>227 (49)</td>
<td>241 (48)</td>
</tr>
<tr>
<td></td>
<td>Comprehension</td>
<td>199 (27)</td>
<td>206 (35)</td>
<td>220 (31)</td>
</tr>
<tr>
<td>Refixation probability</td>
<td>Proofreading</td>
<td>0.93 (0.05)</td>
<td>0.94 (0.06)</td>
<td>0.66 (0.14)</td>
</tr>
<tr>
<td></td>
<td>Comprehension</td>
<td>0.84 (0.10)</td>
<td>0.85 (0.10)</td>
<td>0.49 (0.15)</td>
</tr>
<tr>
<td>Intraword saccade length (char)</td>
<td>Proofreading</td>
<td>3.40 (0.78)</td>
<td>3.42 (0.88)</td>
<td>2.76 (0.80)</td>
</tr>
<tr>
<td></td>
<td>Comprehension</td>
<td>4.14 (0.79)</td>
<td>3.98 (0.92)</td>
<td>3.40 (1.04)</td>
</tr>
<tr>
<td>Gaze duration (ms)</td>
<td>Proofreading</td>
<td>684 (234)</td>
<td>825 (277)</td>
<td>469 (167)</td>
</tr>
<tr>
<td></td>
<td>Comprehension</td>
<td>455 (122)</td>
<td>536 (172)</td>
<td>341 (105)</td>
</tr>
<tr>
<td>Rereading time (ms)</td>
<td>Proofreading</td>
<td>174 (220)</td>
<td>200 (233)</td>
<td>160 (165)</td>
</tr>
<tr>
<td></td>
<td>Comprehension</td>
<td>140 (135)</td>
<td>184 (169)</td>
<td>109 (112)</td>
</tr>
</tbody>
</table>

Note. HF = high frequency; LF = low frequency; char = character; ms = milliseconds.
clearly significant in the comprehension task, \( t_1(36) = 3.66, p = .001, t_2(78) = 2.04, p = .045 \).

**Discussion**

The present study examined task effects on eye movements during reading of compound words by comparing proofreading to reading for comprehension. In order to study how task instructions influence orthographic and lexical–semantic processing, we manipulated target word length and frequency. It should be noted that the analyzed target sentences did not contain any spelling errors in the proofreading condition, so the observed task effects are genuine and not reflective of responses to spotted spelling errors.

The main finding of the present study is that the task effects emerged very early on in the eye movement record and that they were pervasive in that both temporal and spatial aspects of eye movements were affected. The sentence-level analyses showed that, in comparison to reading-for-comprehension instructions, proofreading instructions increased the number and duration of fixations and shortened the mean saccade amplitude. Word-level analyses indicated that, in comparison to reading for comprehension, proofreading caused a leftward shift in initial landing positions and shortened intraword saccade lengths. Moreover, first fixation and gaze durations were longer and readers were more likely to make a refixation on the word during proofreading than during reading for comprehension. These results suggest that task instructions influence the scanning strategy the reader adopts and are in line with results of previous studies that have examined eye movements during proofreading (Daneman et al., 1995; Heller, 1982; Osaka et al., 1995). These findings compare favorably with those of Kaakinen and Hyöni (2007), who also obtained early effects of reading goal on eye movements during reading.

The present results demonstrate that task instructions modulate the effects of word length and word frequency on eye fixations during reading. The word length effect was greater in proofreading than reading for comprehension, as indicated by a significant interaction between task and word length in gaze duration and in the probability of refixating the word. These effects are readily accounted for by the view that proofreading emphasizes orthographic processing. Readers seem to check the orthography of the word serially (bigram by bigram or trigram by trigram); the longer the letter string, the more time this checking process takes. This was supported by regression models computed for the gaze duration of item means, with word length used as a predictor. The models showed that during normal reading a one-letter increase in word length resulted in a 26-ms increase in the predicted gaze duration, \( F(1, 78) = 116.00, p < .001, f(78) = 10.77, p < .001 \), whereas during proofreading the increase was 49 ms, \( F(1, 78) = 98.20, p < .001, f(78) = 9.91, p < .001 \).

The word frequency effect in gaze duration was more pronounced during proofreading than during reading for comprehension. This result suggests that even though proofreading instructions emphasize orthographic processing, lexical–semantic processing is not shut off during proofreading. In contrast, it seems that the orthographic checking process during proofreading is dependent on the lexical properties (frequency) of the word: A spell check is completed faster for high- than low-frequency words.

It should be noted that our experimental materials consisted of relatively long words, which may have somewhat exacerbated the word length and frequency effects during proofreading. In long words, the latter part of the word does not fit within the fovea during the first fixation (which typically fell on the word beginning), and the reader needs to make a second (or third) fixation on the word. The orthographic checking process can be successfully performed only when the whole word information is available. Whole word information becomes available relatively late for long words, and the checking process is delayed. Moreover, it takes longer to access the lexical entry for the low- than the high-frequency words, which also delays the initiation of the checking process. The use of relatively long words as materials may thus have increased the magnitude of the word length and frequency effects during proofreading.

Our results closely replicate the findings of compound word reading reported by Bertram and Hyöni (2003, Experiment 2), whose materials we used. Use of compound words may have further strengthened the observed word length effects in proofreading. For compound words in which the first constituent is not typically predictive of the full word form, the full word form becomes available only when the reader refixates the word. For long monomorphemic words, word beginnings are more informative (Hyöni, Niemi, & Underwood, 1989), and the full word form may become available earlier than for the compound words (we thank Denis Drieghe for noting this).

Whether readers can process more than one word during one fixation is currently one of the most debated topics in eye movement research. Our study, together with the results of Radach et al. (2008), suggests that this depends on the task the reader is performing. We suggest that readers “zoom in” their attentional resources during proofreading in comparison to reading for comprehension. In other words, we think that the task instructions influence the attentional span during reading: Readers process the (orthography of the) words more in a serial fashion during proofreading, thus reducing the amount of information available from the upcoming words. However, we do acknowledge that the present results provide only preliminary evidence for this claim.

To date, the current models of eye movement control during reading have emphasized the role of local, relatively low-level factors (apart from contextual predictability), such as the limitations set by the functioning of the visual and oculomotor system

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1 A reviewer pointed out that the task effects may reflect an order effect: The proofreading task was always performed after the reading-for-comprehension task. It is possible that the participants were more accustomed to the task and/or the eye tracking equipment during proofreading. However, most measures showed longer processing times for proofreading than for reading for comprehension, suggesting that there is no practice effect. We also analyzed the data separately for the trials of the first and second half of the comprehension task to see whether eye movement behavior changed during the experiment. However, none of the interactions involving order were significant (Fs < 1).

Another question is whether participants developed a strategy for proofreading. In order to examine this possibility, we analyzed the data separately for the first and second half of the trials of the proofreading task. The main effect of order was not significant, \( F(1, 36) = 2.94, p = .095 \); moreover, none of the interactions involving order were significant (Fs < 2).
and the word identification processes (but see Reichle, Warren, & McConnell, 2009). However, as the present study demonstrates, the reading task plays a significant role in how readers visually inspect the text. Task effects (and effects related to text difficulty) may be modeled by gain control models (see Rayner, 1978). A global adjustment is made to all eye movement parameters on the basis of task (or text) difficulty, so that the strength of local, word-level effects is modulated accordingly. We assume that modulations in word-level effects are likely to be associated with (or even mediated by) fluctuation in attentional span. Such mixed models have not yet been implemented.

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Received October 23, 2009
Revision received June 4, 2010
Accepted June 7, 2010