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# Critical reading effort during text revision

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This study concerns one of the processes involved in written verbal production: text revising. Our aim was to experimentally test the specificity of reading for revision as compared to reading for comprehension, and to determine the cognitive cost of initiating and performing critical-reading processes. A two-session experiment was conducted on students who had to perform a comprehension task and a revising task on a text presented in its basic version, or in a version containing either syntax errors or spelling errors. An analysis of the cognitive effort associated with critical-reading and comprehension-reading processes, and of the participants' comprehension and revising performance, showed that critical reading was more effortful than comprehension reading. It showed also that critical reading was more effortful for the text version with syntax errors than with spelling mistakes. In addition, the working memory span of the readers/revisers had a different impact on effort and performance, depending on the type of errors in the text (spelling or syntax).

Revising is regarded as a fundamental process in all models of written text production (Alamargot & Chanquoy, 2001; Flower & Hayes, 1980; Hayes, 1996; Kellogg, 1994; Roussey & Piolat, 2005). It requires going back over the text at least once for evaluation purposes, and making changes in the text to correct whatever problems were detected during the evaluation (Kellogg, 1996; Piolat, 1998; Roussey, 1999). According to Hayes, Flower, Schriver, Stratman, and Carey (1987; see also Flower, Hayes, Carey, Schriver, & Stratman, 1986), this basic cognitive architecture can be broken down into various subprocesses (task definition, evaluation, strategy selection, text and/or text-plan modification) which require knowledge—thoroughly described later by Berninger and Swanson (1994)—and which lead to the construction of mental representations.

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One of the questions raised in studies of these cognitive architectures concerns how revising processes are activated. Initially, Hayes and Flower (1980) postulated a system of largely automated condition-action rules and an automatically triggered correction process capable of interrupting other writing processes at any time. In Hayes's (1996) updated version of the cognitive architecture of writing, text revising is seen as a "control structure" equipped with a "task schema". The task schema controls three fundamental processes (reflection, text processing, and text production), all of which utilise working memory resources and long-term memory. Reflection involves mostly deliberate processing (problem solving and decision making). At any point in the writing process, the task schema can be activated in two ways. It can be mobilised intentionally, during deliberate evaluation of the text relative to the goals the writer has set. It can also be activated automatically, at the same time as other text-production processes are being carried out. This occurs when problems are detected at surface text levels, and corrections are made via procedures that have become automated through practice.

In this view, revision can be considered as a complex process that weighs heavily on the writer's limited attentional capacities (McCutchen, 1996). The allocation of attentional resources in the writer's working memory (Baddeley, 1996, 2000) constitutes a critical constraint, as Bereiter and Scardamalia (1987) suspected, and as a number of authors have shown using an experimental paradigm designed to measure the cognitive effort devoted to the various writing processes (Glynn, Britton, Muth, & Dogan, 1982; Kellogg, 2001; Levy & Ransdell, 1995; Olive & Piolat, 2005; Piolat, Roussey, Olive, & Amada, 2004; Ransdell, Levy, & Kellogg, 2002), including text revision (Levy & Ransdell, 2001; Olive, Kellogg, & Piolat, 2002; Piolat, Olive, & Kellogg, 2005). Despite the general theoretical consensus regarding the processes and knowledge involved in the revising process and the operations carried out, experimental studies that have measured the cognitive cost of intentional processing during text revising are scarce (for a review, see Roussey & Piolat, 2005).

In order to approach the question of the intentional triggering of the revising process, one must be able to operationalise the study of reading for revision or "critical reading" as it was theorised in 1996 and reemphasised in 2004 by Hayes. In other words, we have to determine experimentally what contexts trigger problem detection. From the theoretical standpoint, this implies paying particular attention to the role of reading in text monitoring (for a complete review of work on comprehension and reading for revision, see Hacker, 1994). Reading to "review" a text requires treating the text in a very different way than in reading for comprehension (Hayes et al., 1987). Reading for comprehension is a process of constructing a representation of the text's meaning by integrating many sources of knowledge (e.g., word patterns, grammatical structures, factual knowledge, and beliefs about the writer's intents; Just & Carpenter, 1987). Consequently, when readers are reading for comprehension, they do not attend to text problems. Furthermore, when they have problems in understanding a text, they try to solve those problems and then forget them. Hayes (1996) noted that retrospective reports about text difficulties tend to be very incomplete.

In reading for revision, individuals read not only to build a representation of the text's meaning, but also, and more importantly, to find problems likely to have an impact on the writer's rhetorical goals or on the representation of the text's content built later by the person reading the text (Hayes, 1996; Kellogg, 1994; Levy & Ransdell, 1995). This problem-detection process requires a critical reading of the text at various linguistic levels. In short, during reading for revision, the reader/reviser must aim for a larger and more complex set of goals than those involved in simple reading in view of understanding (Butterfield, Hacker, & Albertson, 1996). For Hayes (1996), revising rests on more elementary text-interpretation and critical-thinking processes, not all of which are in effect during comprehension reading. This idea is the crux of Hayes's 2004 proposals.

In the present study—where our goal was to experimentally test these claims about the triggering and functioning of revising processes and about the specificity of the processes involved in reading for revision as compared to reading for comprehension—the following questions were raised:

1. Are comprehension-reading processes less complex and less effortful than the critical-reading processes performed to revise a text? Is this effort difference caused by the fact that critical reading processes are controlled by a task schema?
2. Are critical-reading processes influenced by the to-be-revised text's characteristics: presence or absence of errors, and linguistic level of the errors?

In an attempt to answer these questions, we used a method that would enable us to assess cognitive effort (Olive & Kellogg, 2002; Piolat, Olive, Roussey, Thunin, & Ziegler, 1999). In this method, allocation of working memory resources is measured by reaction time (RT) to auditory probes, and then the RTs obtained are related to the processes implemented during the task under study (Olive et al., 2002; Piolat et al., 1999). Participants are instructed to focus their attention on the primary task and to respond as quickly as possible to auditory probes delivered at variable intervals. The technique of having two tasks is based on the assumption that the primary and secondary tasks compete for a limited pool of attentional or working memory resources (Just & Carpenter, 1992; Kahneman, 1973). Performance on the secondary task thus decreases as the demands of the primary task increase. The RT increase on auditory probes is the measure of the cognitive effort required by the primary task. This dual-task paradigm is commonly used in cognitive psychology. Based on the dual-task technique, Kellogg (1987) proposed a triple-task technique to study writing. More specifically, to couple RT data with specific writing processes, participants are asked to categorise their thoughts as they write. After each probe detection, they have to immediately retrospect about the thoughts they were having at the moment when the probe occurred. The answer is given by choosing among various response categories that describe writing processes.

By adapting this paradigm, it is possible to measure the effort expended by the participants throughout the experimental tasks proposed. The present experiment had two sessions. During the first session, the participants performed in a dual-task paradigm involving a text-reading task and an RT task. One week later, the participants performed in a triple-task paradigm involving a text-revising task, an RT task, and a retrospection task. This two-session procedure should allow us to determine attentional-resource allocation to comprehension reading (Session 1) and critical reading (Session 2). A number of studies have demonstrated the importance of memory capacity in text understanding (Daneman & Merikle, 1996; Engle, Cantor, & Carullo, 1992; Just & Carpenter, 1992; McCutchen, 1996; Torrance & Jeffery, 1999). In order to make sure that what determined the participants' activity was not only their memory capacity but also the nature of the processes implemented, their working memory span was also assessed.



## COMPARISON OF COGNITIVE EFFORT IN COMPREHENSION READING AND CRITICAL READING

Several authors have analysed the role of the detection process carried out during text revising (Berninger, Whitaker, Feng, Swanson, & Abbott, 1996; Daneman & Stainton, 1993; Hacker, Plumb, Butterfield, Quathamer, & Heineken, 1994; Lumbelli, Paoletti, & Frausin, 1999). In particular, Hayes (1996, 2004) emphasised the need for the reviser to activate a task schema (initially called a "task representation"; Hayes et al., 1987), which controls the critical-reading process and enables top-down processing. Participants given explicit instructions to revise a text should therefore intentionally activate a task schema to drive the critical-reading process (Wallace et al., 1996). On the other hand, when explicitly asked to read a text in order to understand it, and in the absence of instructions to revise, readers should not intentionally activate these top-down processes. Thus, the cognitive effort associated with comprehension reading should not be as great as for critical reading. The first objective of this study was to compare the cognitive effort demanded by comprehension reading (reading task) to that required for critical reading (revising task).

The process of reading a text for comprehension was expected to be less effortful than the critical-reading process carried out intentionally to revise the same text with errors (Hypothesis 1). Furthermore, reading a text for comprehension was expected to be less effortful than the critical-reading process carried out to revise the same error-free text, because of the intentional activation of the revising schema and the deliberate implementation of more complex processes (Hypothesis 2). Finally, the cognitive effort expended by low-span participants was expected to be greater than for high-span participants (Hypothesis 3).

## COGNITIVE EFFORT IN CRITICAL READING OF A TEXT WITH OR WITHOUT ERRORS

According to Hayes et al. (1987; Hayes, 1996, 2004), critical reading of a text involves processes that are more or less automated, and thus more or less effortful, depending on the text level being assessed. The second objective of this study was to examine the cognitive cost of critical reading during revising, in relation to the nature of the errors in the text. To test this idea, the participants were divided into three groups and asked to revise a text with no errors or a version of the same text containing spelling mistakes or syntax errors.

When participants start revising a text containing errors they immediately implement procedural knowledge to correct the errors encountered, using what Hayes et al. (1987) described as associations of problems and solutions (a means-ends table). In doing so, they instantiate the task schema for a given text-processing level. In the case of syntax errors, because several words must be processed at a time, error searching should generate a greater cognitive load than when the errors are misspelled words (Daneman & Stainton, 1993; McCutchen, Francis, & Kerr, 1997). Thus, the cognitive effort invested by revisers of a text containing syntax errors should be greater than for participants revising the same text containing spelling mistakes (Hypothesis 4).

In contrast, when they do not find any errors (which is necessarily the case when they are given an error-free text and nevertheless asked to correct it), revisers do not know what knowledge to activate in association with the task schema. The effort required to carry out the critical reading process should depend on how much knowledge they activate and what linguistic level they decide to process (Hypothesis 5).

Finally, for each text version, the cognitive effort of low-span revisers—who, for that reason, have fewer available resources—was expected to be greater than that of high-span revisers. This difference should be greater for the syntactically incorrect text version, since it was more difficult to revise than the misspelled version (Hypothesis 6).

## METHOD

### Participants

The two sessions of the experiment were run on 94 undergraduate psychology students at the University of Provence in Aix-en-Provence, France. Participation earned them credit for a methodology course. For the first session, the participants read an error-free text (see Materials). For the second session, they revised a version of the text that did or did not contain errors (see Table 1). Participants were randomly assigned to three conditions, each with a different text version to be revised: 31 revised the error-free text, 31 revised the version with spelling mistakes, and 32 revised the version with syntax errors.



### Working memory test

A French short version (Desmette, Hupet, Schelstraete, & van der Linden, 1995) of Daneman and Carpenter's (1980) Reading Span Test was used. It consisted of 60 unrelated sentences which were distributed into three series of 20 sentences; each series was made of five sets composed from two to six sentences. As an example, the first set of the first series actually consisted of the following two sentences: (a) Elle se leva très lentement et dit à son ami qu'il était un ivrogne [She stood up very slowly and said to her friend that he was a drunkard], and (b) Ils se dirigèrent vers le balcon de l'appartement pour admirer les toits de la ville [They went to the terrace of the apartment to admire the roofs of the city]. Having read aloud these two sentences, the participant tried to recall the final word of each sentence, in this case "ivrogne" and "ville". In more details, the sentences were displayed on

TABLE 1
Number of participants, by working memory span and text version revised

| | *Error-free text* | | | *Spelling-mistake text* | | | *Syntax-error text* | | |
|---|---|---|---|---|---|---|---|---|---|
| | *High span* | *Low span* | *Total* | *High span* | *Low span* | *Total* | *High span* | *Low span* | *Total* |
| No. of subjects | 14 | 17 | 31 | 16 | 15 | 31 | 16 | 16 | 32 |
| Mean span | 2.43 | 1.74 | | 2.38 | 1.63 | | 2.91 | 1.53 | |

The 94 participants had read the error-free text in Session 1.

white paper sheets, one at a time and centred, grouped in a booklet. Two sets were separated with a yellow sheet on which "Please recall words" was written. Two series were separated with a blue sheet.

Participants had to read aloud this material without any interruption. When the participant uttered the last syllable of the last word of the sentence, the experimenter turned the page which made the next sentence appear with no time lag. At the end of each set, the instruction on the yellow sheet indicated to the participants that they had to recall the final words of the sentences they had just read. Each participant was presented with the first set of the first series, i.e., a set of two sentences; after the two final words of this set were recalled, the set of three sentences was presented, and so on until the series was completed. When this happened, the procedure restarted with the sets of the second series, and finally with the sets of the third series.

A participant's working memory span was defined as the length (e.g., set number) of the largest set completed in at least two series out of three. If the participant was correct on only one series at a particular level, he was given a credit of 0.5. For example, if a participant was correct on two out of the three four-sentence sets, he was assigned a span of 4; if he was correct on two out of the three three-sentences sets and only one of the three four-sentence sets, he was assigned a span of 3.5. In order to differentiate the participants at the median span, the total number of words correctly recalled was used. Therefore, participants were categorised as having a low or high working memory span on the basis of their median reading span score (median = 2) and the median of the total number of words correctly recalled by all participants (median = 19). Note that with this procedure, we could not set up strictly matched groups. Out of the 94 participants, 48 had a low reading span (mean span of these participants: $M = 1.64$) and 46 had a high reading span ($M = 2.58$). Out of the 31 participants who revised the error-free version, 17 had a low reading span ($M = 1.74$) and 14 had a high reading span ($M = 2.43$). Out of the 31 participants who revised the spelling-mistake version, 15 had a low reading span ($M = 1.36$) and 16 had a high reading span ($M = 2.38$). Finally, among the 32 participants who revised the syntax-error version, 16 had a low span ($M = 1.53$) and 16 had a high span ($M = 2.91$).

## Experimental design

Participants were tested individually in both sessions. In Session 1, the participant read a text in view of answering comprehension questions, and his/her working memory span for reading was assessed (see Table 1). In Session 2, the participant revised a text. The two sessions were held one or two weeks apart, depending on the participant's availability. The delay between the sessions was designed to promote forgetting of text details between the reading and revising phases, while still allowing subjects to remember the main topic.

## Verbal material

The text used in the experiment was taken from a French psychology journal. The topic was child psychoanalysis according to Anna Freud and Melanie Klein. The original text (362 words) was printed on paper and used as the "error-free" text. It can be summarised as follows: "Anna Freud and Melanie Klein are child psychoanalysts who advocate different theoretical approaches and practices for psychoanalysing children. For Anna Freud, the analyst acts as a teacher in psychoanalytic therapy. For Melanie Klein, child analyses are like those of adults. Child psychoanalysts must consider these two attitudes."

Two incorrect versions of the text were generated, one containing spelling mistakes and one containing syntax errors (see Appendix). The number of errors in each version differed, however, based on a pilot study where we observed faster revision with spelling errors than with syntactic ones. The pilot study also showed that misspelled words were easier to detect and to correct than syntax errors, and were corrected more often. Accordingly, we inserted 24 misspelled words in the spelling-mistake version of the text and 12 syntax errors in the syntax-error version.

In order to be able to compare the performance of participants on these two types of errors, it was important that they not have to write or rewrite words or sentences (whether ones already in the text or new ones), since the number of items to be manipulated was very different for spelling errors (one letter) and syntax errors (several words). The errors introduced in the text were chosen so that the participants could indicate the necessary changes in the words and sentences without writing any words, using an editing system based on graphic symbols only. In both error versions, half of the errors were produced by moving an element and the other half, by adding an element. To edit the text, the participants had to "move" problematic items by circling them and then indicating where they should go with an arrow, or "delete" them by crossing them out. Moving and deletion are two of the operations in Faigley and Witte's (1984) taxonomy of surface revisions that lead to a change in form (conventional editing revisions) or a paraphrase (meaning-preserving change).

The text with spelling errors was generated by adding a letter to 12 words and moving a letter in 12 other words. Errors of this kind, which are often made when writing on a word processor, have no grammatical or semantic consequences (Faigley & Witte, 1984). The errors were deliberately located on words from several different grammatical categories (adjectives, nouns, adverbs, and verbs). Some examples of misspelled words where a letter had to be deleted are: *réielle*, *persepective*, and *provocquer* instead of *réelle*, *perspective*, and *provoquer* (real, perspective, and provoke); some examples of misspelled words where a letter had to be moved are: *téorhique*, *implusion*, *enrte*, and *suppleér* instead of *théorique*, *impulsion*, *entre*, and *suppléer* (theoretical, impulsion, between, and supplant).

The text with syntactic errors was generated by adding a word to six sentences and moving a word in six other sentences. The words that had to be deleted or moved belonged to several grammatical categories (verbs, nouns, adverbs, verb phrases). Note that, despite these additions and moves, a pilot study showed that the sentences were judged as "not totally standard, but fully understandable". An example of an error that required deleting a word from a sentence is found in the second sentence of the first paragraph, where "*très*" (very) was added in front of "*considérablement*" (considerably); an example of an error that required moving words is found in the fifth sentence of the third paragraph, where the order of the phrases "*toute intervention pédagogique*" (any pedagogical intervention) and "*le psychanalyste refuse*" (the psychoanalyst refuses) was reversed. Both for texts with incorrect spelling and ones with incorrect syntax, the errors were spread randomly throughout the text.

The participants questioned in the pilot study said they had no trouble carrying out the operations needed to correct the misspelled words and syntax errors (crossing out a word or moving a word by circling it).

## Apparatus

The experiment was computer-assisted and was run on SCRIPTKELL software (Piolat et al., 1999). When using this software, the researcher can choose either a dual-task setup (with probes only) or a triple-task setup (probes and directed retrospection). One of the features of the program is to randomly deliver sound-probes within a time interval determined by the experimenter (see later). The random occurrence of the probes prevented participants from anticipating their RT responses. This software automatically records and analyses the different variables (number of reactions, frequency of category choices, mean RTs, mean difference scores; for more information on these tasks, see Procedure; Kellogg, 1987; Olive et al., 2002; Piolat, Kellogg, & Farioli, 2001; Piolat & Olive, 2000).

Participants were instructed to respond as rapidly and as accurately as possible to each probe by clicking on the mouse of the computer with the hand not used for writing. Response times (RT) were measured in milliseconds. When the reaction time task was performed in isolation, a total of 30 trials were presented and baseline measurements were thus collected. The first five trials were treated as warm-up signals and the mean baseline RT was calculated from the remaining 25 RTs. When the reaction time task was performed in dual-task setup, the recorded data were the interval between probes, the number of probes delivered during the task, the duration of each RT from which the mean baseline RT was subtracted to obtain a weighted RT, and, finally, the mean weighted RT (wRT). When the reaction time task was performed in triple-task setup, the software provided the same variables as before, but also the category chosen by the participant after each RT. The program also computed the mean wRT associated with each category (with their standard deviation). For each participant, all responses were then listed in chronological order along with their corresponding measures: the time since the beginning of the revising task, the RT since the last probe, the corresponding RT, the wRT, the subprocess identified with the directed retrospection and the designation time (time between the response to the probe and the identification of the retrospection category; note, the wRT does not included the designation time).

A pilot study aimed at designing the experimental device showed that participants took an average of 220 s to read the text, but an average of 452 s to correct it using the required editing system (regardless of the version). At the beginning of the pilot study, with the sound-probe delivery pace we usually use for writing tasks (intervals ranging from 15 to 45 s, with a mean of 30 s), participants performing the reading task had to react quickly only about seven or eight times on average, and for some, only five times. This number of RT measures per participant was too small to do statistical analyses. The fact that reading is not as resource-demanding as revising (Kellogg, 1994; Piolat et al., 2005) allowed us to use a faster probe delivery pace in the present study (intervals between 5 and 15 s, with a mean of 10 s) without hindering the reading activity (as confirmed by the participants who were asked this question). The purpose of the probes was to allow us to measure the resources available during execution of the primary task (for more information, see Piolat et al., 1999). Accordingly, for the reading task (Session 1 of the experiment), the probes were randomly presented at intervals between 5 and 15 s (mean 10 s). Given the pace of probes' presentation, and given the individual speed for reading the text, we obtained between 5 and 15 wRTs for each participant in order to compute mean wRT for comprehension. During the revision task (Session 2), the probes were randomly presented at intervals between 15 and 45 s (mean 30 s), and we obtained between 12 and 30 wRTs for each participant. Among those responses, 6–13 wRTs concerned critical reading and were used for computing the mean wRT for this subprocess.

## Procedure

The first session (aimed at evaluating the cognitive effort involved in comprehension reading) started with a training session to familiarise the participant with the probe task. The participant was informed that he/she would occasionally hear sound signals coming from the computer at variable intervals. He/she was instructed to react to every probe by pressing the computer mouse with his/her hand not used for writing, which was resting on an empty sheet of white paper between probes. The participant held a ballpoint pen in the other hand. The sole purpose of this setup was to create an RT measurement situation that would be as close as possible to the situation set up in the subsequent reading and revising tasks. This task was used to compute each participant's mean baseline RT.

After training, the participant read a version of the text as many times as needed to understand it. Before beginning to read, the participant's used hand for writing was holding a ballpoint pen, and both hands were resting on the back side of the sheet on which the text was printed. He/she was informed that, after reading the text, he/she would have to answer questions about its content. He/she was also told that while reading, he/she had to respond to the auditory probes by pressing on the computer mouse with his/her hand not used for writing and to hold the pen with his/her used hand for writing throughout the task. Then, the experimenter turned the sheet over so the participant could read the text. To make sure he/she remembered to react as quickly as possible to the probes, a panel saying "React as quickly as possible to the probes" was displayed in front of the participant. When the participant had finished reading, he/she had to press a designated key on the keyboard to stop the program.

Next, the participant judged whether three brief affirmative sentences about the content of the text were correct or incorrect. This was aimed at checking whether he/she had paid attention to the text as he/she read.

Then, the participant's working memory capacity was assessed using the Reading Span Test. A series of sentences, each printed on a white sheet of paper in a notebook, were presented. The participant had to read each sentence aloud at his/her own pace. To prevent the use of a rehearsal strategy (Turley-Ames & Whitfield, 2003), he/she was not allowed to pause between sentences (the experimenter turned the page as soon as a sentence was read). The participant had to memorise the last word of each sentence. When a blank sheet appeared (at the end of each block), the participant had to recall the memorised words, in any order and with no time limit. To avoid recency effects, the participant was told not to start with the last word read. When this instruction was not followed, the recall was scored as incorrect.

Finally, for each participant who had to revise the text during the second session of the experiment, an appointment was made for 1 or 2 weeks later.

In the second session, processing time and cognitive effort were evaluated for three subprocesses of revising: critical reading, solution searching, and text transforming (Hayes et al., 1987). In this paper, only data related to critical reading are presented (for further information on cognitive effort in the other processes, measured for participants who revised a text containing either spelling errors, syntax errors, or coherence errors, see Piolat et al., 2004).

The participant was first trained in how to perform the retrospection task. The experimenter showed him/her the labelled keys he/she would have to use to categorise his/her thoughts during the task. There were three labelled keys, one for each of the three revising subprocesses (critical reading, searching solution, and text transforming). A fourth key labelled "Other" could be used to indicate a thought that did not concern the revising task (this key was not in fact used by the participants). For training, the participant categorised 12 written "thoughts" of a fictitious writer claimed to have revised different text levels. When a participant made an error, the experimenter reminded him/her of the correct meaning of each of the three labels.

Next, the participant performed the probe task in the same conditions as in Session 1. This task was used to compute his/her mean baseline RT.

Then, the participant had to revise one of the three versions of the experimental text (error-free version, spelling-mistake version, or syntax-error version) in a triple-task situation. He/she was told how to edit the text with the pen by crossing out or circling–"moving" an incorrect element (see Verbal Material). Before the revising began, the experimenter first announced that the content of the text was the same as in the first session of the experiment, but that the text could contain errors that he/she was supposed to correct (note: the participant was not warned about the type of errors or the lack of errors). Then the experimenter read the summary aloud to remind the participant of the topic. This prevented the participant from reading the text for comprehension only (as he/she had done in Session 1) and engaged him/her in a critical reading process in view of revising. The participant was also told that he/she would occasionally hear sound signals during the revising task. He/she was given the same instructions for responding to probes as in the first session of the experiment by pressing the mouse button. In addition, the participant was also asked to indicate his/her thoughts, using a labelled key, after each response to a probe.

The experimenter was seated near the participant and had a copy of the text with the errors underlined. As the participant revised, the experimenter noted the order in which the participant made the corrections, circling and numbering the word the participant's pen was pointing to when each sound signal was heard. All participants spontaneously did this pointing in order to keep track of the place where they had to resume the revising task after each probe. This pointing behaviour made it possible for us to count the number of times the participant went through the text from top to bottom (number of scans). Once the participant had finished revising the text, he/she had to press a designated key to stop the program.

## Variables

The allocation of resources to comprehension reading (reading task) and critical reading (revising task) was assessed in terms of *cognitive effort*, which was measured by a mean weighted RT (wRT). The wRTs of each participant were calculated by subtracting his/her mean baseline RT (obtained on the probe task of each session) from the RTs collected in either the dual- or triple-task situation. In the triple-task setup, mean wRT was computed for each labelled key pressed by the participant (i.e., each revising subprocess). In the present study, only the wRTs of the critical-reading process were analysed (see Procedure).

Three other variables were used to analyse the participants' execution of the reading and revising tasks, and two variables were used to measure their performance on these two tasks:

1. *Task-execution time* (reading and revising) in seconds.
2. *Number of text-correction scans* (revising task), which was determined by looking at the location of the changes made and their order of occurrence. When participants corrected the errorless text, they spontaneously used the pen to point to the location where they were reading when the sound signal was heard. The pointing allowed us to count the number of text-correction scans. This variable told us how many times participants went through the text to find errors. When the text was scanned more than once, it was taken to mean that the participants were rereading the text to search for new problems or to find a solution to an error they had not corrected the first time.
3. *Mean time per revising scan* (revising task), which was calculated for each participant by dividing his/her revising-task execution time by the number of passes through the text to correct it. This mean provided a more accurate assessment of task difficulty than revising-task execution time alone, which could depend solely on the number of revisions to be made in each text version.
4. *Comprehension score* (reading task), which was equal to the number of correct answers (0 to 3).
5. *Corrected-error percentage* (revising task), which was computed for each participant by dividing the number of correct revisions by the total number of possible revisions. A revision was scored as correct when (a) the entire target was deleted, or (b) the target was moved to the correct location or the nonproblematic zone was moved next to the target.

## RESULTS

First, we will compare critical reading and comprehension reading, and then we will analyse critical reading with respect to the text's characteristics.

### Comparison of comprehension reading and critical reading

To compare cognitive effort in comprehension reading and critical reading, wRTs were calculated from the reaction times of the 94 participants who read the text during Session 1 of the experiment and revised a text during Session 2 (see Table 2). The effects of two factors (memory span and type of reading task) were analysed in three ANOVAs (one for each version of the text) with one between-group factor, span (low, high), and repeated measures for each session.

In order to make sure that all participants did in fact perform the reading task in Session 1, an ANOVA with one between-group factor, span (low, high), was computed on the Session 1 reading-time and comprehension scores.

### Cognitive effort

In line with Hypothesis 1, the results indicated that, irrespective of the participants' working memory span, critical reading in view of revising was more effortful than comprehension reading (Table 2).

More specifically, for the errorless text, the results indicated a main effect of type of reading, $F(1, 29) = 61.47$, $MSE = 4906$, $p < .001$, which is in line with Hypothesis 2. There was no main span effect, $F(1, 29) < 1$, but a marginally significant interaction between reading type and span, $F(1, 29) = 3.10$, $MSE = 4906$, $p < .09$. This interaction indicated that the effort

TABLE 2
Mean cognitive effort associated with reading for revision and reading for comprehension, by revised text version and working-memory span (standard error in italics)

| | *Error-free text* | | | *Spelling-mistake text* | | | *Syntax-error text* | | |
|---|---|---|---|---|---|---|---|---|---|
| | *High span* | *Low span* | *Mean* | *High span* | *Low span* | *Mean* | *High span* | *Low span* | *Mean* |
| Reading for revision | 329 | 380 | 355 | 374 | 398 | 386 | 384 | 500 | 442 |
| | *31.3* | *31.2* | *22.3* | *30.2* | *27.2* | *20.2* | *34.4* | *35.3* | *26.3* |
| Reading for comprehension | 221 | 209 | 215 | 148 | 189 | 169 | 158 | 193 | 176 |
| | *29.4* | *23.7* | *18.2* | *14.9* | *15.4* | *11.1* | *15.5* | *14.1* | *11.8* |

Each participant had read the error-free text in Session 1.

difference between comprehension reading and critical reading tended to be greater in low-span revisers, for whom critical reading was the more effortful process.

For participants who revised the spelling-mistake text on the second session, the results indicated a main type-of-reading effect (Hypothesis 1), $F(1, 29) = 169.85$, $MSE = 4307$, $p < .001$. There was no main span effect, $F(1, 29) = 1.34$, $MSE = 12131$, $p > .25$, or interaction between reading type and span, $F(1, 29) < 1$.

For the participants who revised the syntax-error text, the results indicated a main type-of-reading effect (Hypothesis 1), $F(1, 30) = 112.05$, $MSE = 10130$, $p < .001$, and a main span effect (Hypothesis 3), $F(1, 30) = 6.65$, $MSE = 13558$, $p < .02$. There was no interaction between type of reading and span, $F(1, 30) = 2.55$, $MSE = 10130$, $p = .12$. However, the high-span participants averaged a lower effort level (384) than the low-span participants (500) only for critical reading, $F(1, 30) = 5.47$, $MSE = 19429.8$, $p < .03$. This was not true for comprehension reading (158 vs. 193 for high-span and low-span readers, respectively), $F(1, 30) = 2.29$, $MSE = 4258$, $p > .14$.

## Reading time and comprehension score

Concerning reading time, the results indicated no main span effect, $F(1, 92) = 2.60$, $MSE = 6941$, $p > .11$ (high span = 226 s, low span = 253 s).

The same was found for comprehension reading. There was no main span effect, $F(1, 92) < 1$, $MSE = 0.33$ (high span = 2.65, low span = 2.58). The high overall mean comprehension score (2.62) indicated that the participants understood the text well, and thus, that they read the text effectively.

## Comparison of critical reading of a text with or without errors

An ANOVA with two between-group factors, span (low, high) and text type (error free, spelling errors, syntactic errors) was conducted on the 94 participants, for the four dependent variables (wRT, revising time, number of correction scans, and mean time per revising scan) (see Table 3).

## Cognitive effort

As a whole (see Table 3), the results indicated a main text-version effect, $F(2, 88) = 3.87$, $MSE = 15889.5$, $p < .03$, and a main span effect, $F(1, 88) =$

TABLE 3
Mean revising time, mean number of text-correction scans, mean time per revising scan, mean corrected-error percentage, and mean cognitive effort in critical reading of texts with and without errors, by type of errors and working-memory span (standard error in italics)

| | *Error-free text* | | | *Spelling-mistake text* | | | *Syntax-error text* | | |
|---|---|---|---|---|---|---|---|---|---|
| | *High Span* | *Low Span* | *Mean* | *High Span* | *Low Span* | *Mean* | *High Span* | *Low Span* | *Mean* |
| Revising | 392 | 454 | 423 | 333 | 394 | 364 | 439 | 547 | 493 |
| time (s) | *27* | *29* | *20* | *17* | *25* | *15* | *16* | *36* | *20* |
| Text-correction | 2.00 | 2.00 | 2.00 | 1.25 | 1.20 | 1.23 | 1.25 | 1.63 | 1.44 |
| scans | *0.10* | *0.12* | *0.08* | *0.11* | *0.11* | *0.07* | *0.11* | *0.22* | *0.13* |
| Time per scan | 196 | 231 | 215 | 286 | 330 | 307 | 374 | 368 | 371 |
| | *19.3* | *22.5* | *15.2* | *28.7* | *18.4* | *17.5* | *28.4* | *37.1* | *23.0* |
| Corrected-error | — | — | — | 88.3 | 71.7 | 80.0 | 57.3 | 49.0 | 53.1 |
| percentage | | | | *3.2* | *3.1* | *2.7* | *5.0* | *4.7* | *3.5* |
| Cognitive effort | 329 | 380 | 355 | 374 | 398 | 386 | 384 | 500 | 442 |
| (ms) | *31.3* | *31.2* | *22.3* | *30.2* | *27.2* | *20.2* | *34.4* | *35.3* | *26.3* |

Note that the participants who revised the error-free text made very few corrections.

5.93, $MSE = 15889.5$, $p < .02$, but no interaction between text version and span, $F(2, 88) = 1.09$, $MSE = 15889.5$, $p > .34$.

However, our predication that cognitive effort would depend on whether or not there were errors in the to-be-revised text (Hypothesis 4), and if so what type of errors they were (Hypothesis 5), was partially validated. Hypothesis 6 pertaining to the effect of memory span was also partially validated. Only for low-span revisers was critical reading significantly more effortful for texts containing syntax errors than for errorless texts, $F(1, 88) = 7.39$, $MSE = 15889.5$, $p < .008$, or misspelled texts, $F(1, 88) = 5.05$, $MSE = 15889.5$, $p < .03$, the last two of which were equally effortful, $F(1, 88) < 1$. In contrast, among these high-span readers, the cognitive effort associated with critical reading did not vary significantly with error type: for syntax errors vs. errorless texts, $F(1, 88) = 1.42$, $p > .23$, $MSE = 15889.5$; for syntax errors vs. misspelled texts, $F(1, 88) < 1$; for misspelled vs. errorless texts, $F(1, 88) < 1$ (see Figure 1).

## Revising time

The revising time variable must be interpreted with caution here, because the three experimental conditions were not exactly the same: one text version contained no errors, while the other two contained a different number of

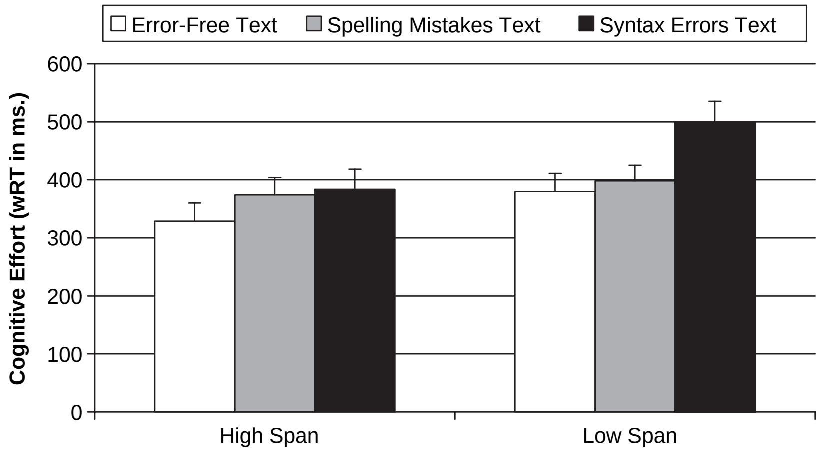


**Figure 1.** Cognitive effort (mean wRT) associated with critical reading, by text version and revisers' working memory span.



errors (24 spelling mistakes, 12 syntax errors). However, a comparison of the mean revising times of texts with and without errors can provide information about how difficult the revising process was in each case.

The results showed a main text-version effect, $F(2, 88) = 4.51$, $MSE = 29439.3$, $p < .02$. On average, it took less time to revise the spelling-mistake text than the syntax-error text (364 vs. 493), $F(1, 88) = 8.99$, $MSE = 29439.3$ $p < .004$. Errorless-text revising took an intermediate amount of time (423 s) but did not differ significantly from either of the other two versions: for spelling vs. errorless, $F(1, 88) = 1.82$, $MSE = 29439.3$, $p > .18$; for syntax vs. errorless, $F(1, 88) = 2.65$, $MSE = 29439.3$, $p > .10$ (see Figure 2).

The results also indicated a main span effect, $F(1, 88) = 4.70$, $MSE = 29439.3$, $p < .04$, but no interaction between text version and span, $F(2, 88) < 1$. However, the span effect was significant for syntax-error revising only (547 vs. 439, for low-span and high-span revisers, respectively), $F(1, 88) = 3.18$, $MSE = 29439.3$, $p < .08$. There was no effect when an errorless text (454 vs. 392), $F(1, 88) < 1$, or a spelling-mistake text (333 vs. 394), $F(1, 88) < 1$, was being revised.

## Number of text-correction scans

The data collected from all 94 participants were analysed. Indeed, even when given an error-free text, participants instructed to correct errors may have gone over the text more than once to make sure there were no problems.

The results indicated a main text-version effect, $F(2, 88) = 16.65$, $MSE = 0.30$, $p < .001$ (see Table 3). There was no main span effect, $F(1, 88) < 1$, nor

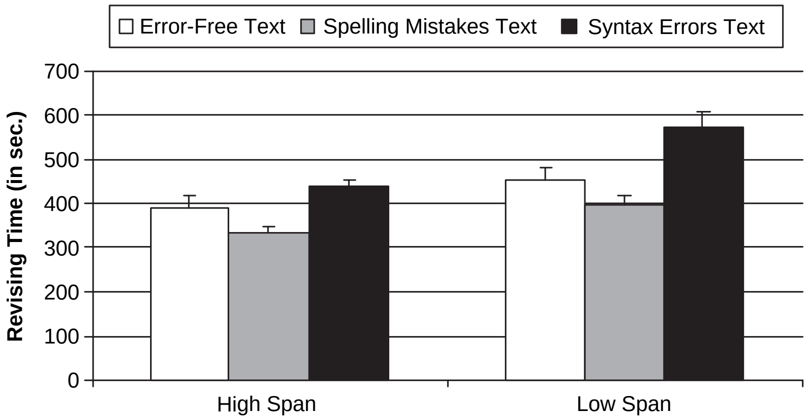


**Figure 2.** Mean revising time (in seconds), by text version and revisers' working memory span.

an interaction between text version and span, $F(2, 88) = 1.43$, $MSE = 0.30$, $p > .24$. However, the revisers scanned the text more times when it contained no errors. Participants averaged two complete scans to make sure the text was correct, whereas the average was 1.23 and 1.44 scans for texts containing spelling or syntax errors, $F(1, 88) = 31.06$, $MSE = 0.30$, $p < .001$ (see Figure 3).

Moreover, the low-span revisers went through the text more times when it contained syntactic problems (1.63) than when it contained misspelled words (1.20), $F(1, 88) = 4.71$, $MSE = 0.30$, $p < .04$.

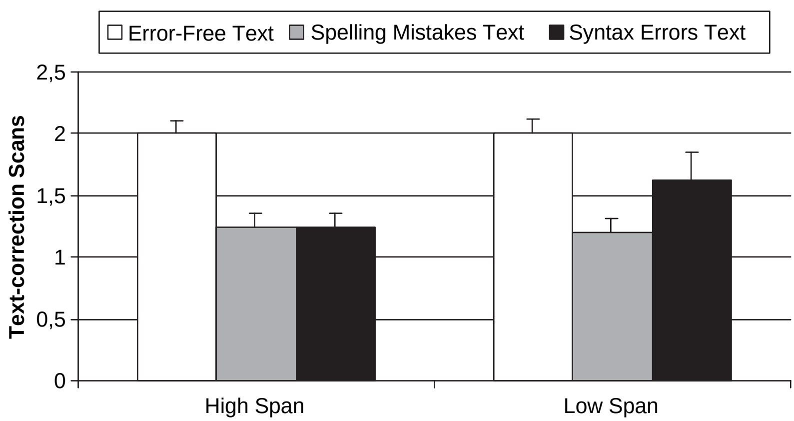


**Figure 3.** Mean number of text-correction scans, by text version and revisers' working memory span.

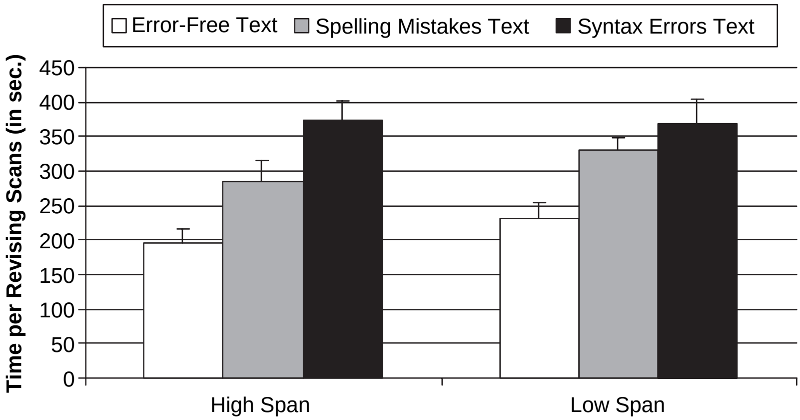


**Figure 4.** Mean time per revising scan, by text version and revisers' working memory span.



## Mean time per revising scan

The results for the mean time per revising scan, which gave us a more accurate indication of how difficult the revising task was by relating the number of correction scans to the time taken to achieve them, indicated a main text-version effect, $F(2, 88) = 17.36$, $MSE = 11341.3$, $p < .001$ (see Figure 4), but no main span effect, $F(1, 88) = 1.20$, $MSE = 11341.3$, $p > .27$, nor an interaction between text version and span, $F(2, 88) < 1$.

More specifically, when they revised the error-free text, the participants took significantly less time for each correction scan than when they revised the spelling-mistake text (215 vs. 307), $F(1, 88) = 12.14$, $MSE = 11341.3$, $p < .001$, or the syntax-error text (215 vs. 371), $F(1, 88) = 34.37$, $MSE = 11341.3$, $p < .001$. The text with syntax errors necessitated more revising time per scan than did the spelling-mistake text, $F(1, 88) = 5.54$, $MSE = 11341.3$, $p < .03$.

## Corrected-error percentage

The revising performance of the participants was assessed by looking at the number of errors successfully corrected. Given that the spelling- and syntax-error texts contained a different number of errors, this variable was expressed as a percentage. The data collected from the participants who revised an error-free text were not included here, since they had no errors to correct and therefore made few if any (unnecessary) changes to the text (one or two).

So an ANOVA with two between-group factors, span (low, high) and text type (spelling mistakes, syntactic errors) was computed on the errors

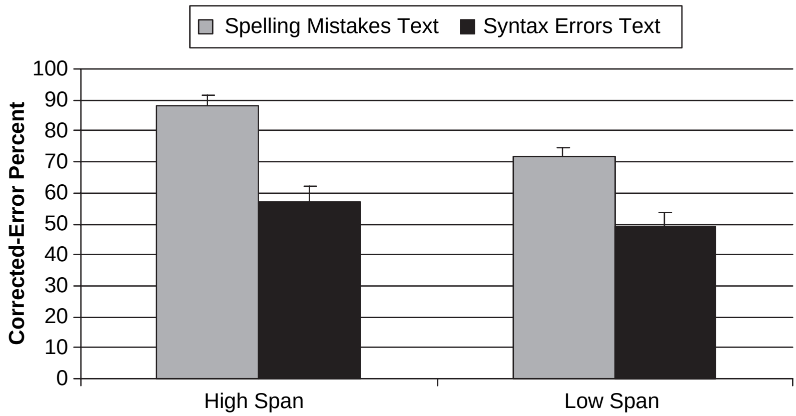


**Figure 5.** Mean corrected-error percentages, by text version and revisers' working memory span.

corrected by the 63 participants who revised a text version containing errors (Table 3).

The results indicated a main type-of-error effect (80% of the spelling mistakes and 53% of the syntax errors were corrected), $F(1, 59) = 42.23$, $MSE = 268.61$, $p < .001$, and a main span effect (high-span revisers corrected 73% of the mistakes and low-span revisers 60%), $F(1, 59) = 9.12$, $MSE = 268.61$, $p < .004$. The results showed no interaction effect between text version and span, $F(1, 59) = 1$, $MSE = 268.61$, $p > .32$.

However, for the text containing spelling mistakes, high-span revisers corrected a greater mean percentage of the errors (88.3%) than did low-span revisers (71.7%), $F(1, 59) = 7.95$, $MSE = 268.61$, $p < .007$. This difference no longer existed when the text contained syntax errors (high span = 57.3% vs. low span = 49%), $F(1, 59) = 2.06$, $MSE = 268.61$, $p > .15$ (see Figure 5).

## DISCUSSION

We had two main goals for this study: (1) Show that critical reading during a revising task is more effortful than comprehension reading aimed at understanding a text's content. (2) Show that the cognitive effort associated with critical reading depends on the type of revisions to be made (spelling or syntax). The results allow us to take a stand on these questions.

Regarding our first goal, the main results showed that critical reading was more effortful than comprehension reading. This effort difference compared to error-free text reading was observed for all three situations studied: revising an error-free text, revising a spelling-mistake text, and revising a syntax-error text. Moreover, the difference was observed regardless of the participants' working memory capacity, which had no effect on cognitive effort in comprehension reading of the error-free text. Nor did it have an impact on the two task execution and performance measures in reading for understanding: errorless-text reading time and comprehension.

Regarding our second goal, the main results were as follows. The cognitive effort associated with critical reading was found to depend on the type of errors in the to-be-revised text only for low-span participants. These participants allocated more attentional resources to critical reading when they revised the syntax-error text than when they revised the other two versions. Regarding processing times, the results were as follows. Regardless of their memory capacity, participants took more time correcting the syntax-error text than the spelling-mistake text. To correct the latter text, low-span participants needed more time than high-span participants did. All participants read the errorless text more times than they did the other two versions. Only the low-span readers scanned the syntax-error text more times than the spelling-mistake text. The mean time per revising scan (an index of task difficulty) was greater for all participants when they corrected the syntax-error text than when they corrected the spelling-mistake text. Scanning time was shorter for the error-free text. All participants corrected more errors in the spelling-mistake text than in the syntax-error text. Finally, for the spelling-mistake text, the high-span revisers corrected more errors than the low-span revisers did.

The first set of findings shows that all participants did well on the reading task, since they obtained a very high mean comprehension score. Moreover, this task was not particularly difficult even for the low-span participants, who did not devote more cognitive effort than the high-span participants.

On the other hand, the cognitive effort invested by the participants was greater when, to carry out the revising task, they evaluated the text as they read (critical reading) rather than simply trying to understand it (comprehension reading). This difference suggests that critical reading is more complex than comprehension reading, as Hayes (1996, 2004) assumed. This result clearly indicates that different processes are at play in the two kinds of reading.

Furthermore, even when the text contained no errors at all, the cognitive effort needed to read it critically was greater that the effort allocated to reading it for comprehension. This significant increase in effort—not imposed by the text since it was errorless—is of utmost importance here. It means that even when the text was exactly the same, the participants were not carrying out the same processes during the two phases of the experiment. During the second phase, as indicated in the instructions, the participants were indeed reading for revision, not reading for understanding.

The second set of results allows us to relate the effort expended during critical-reading processes to the linguistic level of the text the participants evaluated, and to the nature of the linguistic processing they performed. Correcting syntax errors was more difficult than correcting spelling mistakes, regardless of the participants' memory capacity. On the one hand, low-span participants devoted more cognitive effort to detecting syntax errors during critical reading than to detecting spelling mistakes. This finding can be explained by the fact that more information must be held in working memory to detect syntax errors (sentence fragments and relationships between elements) than to detect spelling mistakes (which are confined to only one word). This puts low-span participants at a disadvantage. Their difficulty also showed up in the revising-task execution measures: they had a greater number of text rereadings, a higher mean time per scan, and a lower average proportion of syntax errors corrected. On the other hand, the high-span participants, although they did not devote more cognitive effort to critical reading for the syntax-error text, nevertheless had more trouble with this version. Their mean time per scan was longer than when they were confronted with a spelling-mistake text, and they detected and corrected a smaller proportion of the syntax errors than of the spelling errors. All in all, difficulty handling syntax errors was apparent in both groups of revisers, who, regardless of their working memory span, corrected spelling mistakes more easily and/or better than they did syntax errors. A remaining question to be explored concerns the cause of this difficulty, which could either be an error-detection problem (critical reading) resulting from how much information is taken into account, or a problem of finding a solution or implementing the necessary editing procedures. Determining which of these levels is the responsible one requires isolating these processes in a future study.

Note also that our results did not indicate a systematic correspondence between the working memory span of the participants, the amount of cognitive effort they devoted to critical reading, and their performance on the revising task. Indeed, the high-span participants did not allocate more resources to critical reading when they were confronted with the syntax-error text than when they were processing the spelling-mistake text, where their editing performance was better. As for the low-span participants, they allocated more resources when working on the syntax-error text, which they nevertheless corrected less well than the spelling-mistake text. Finally, the high-span participants corrected the misspelled text better than the low-span participants did, which was not true for the syntax-error text. This absence of a relationship between working memory span, cognitive effort devoted to critical reading, and performance—particularly the fact that the high span participants corrected more spelling mistakes than the low span participants without allocating more resources to the critical reading process—raises the question of potential differences in the linguistic skill levels of the two groups of participants. Differences in skills or in the cost of implementing those skills, which might be related in this study to less automatised spell-checking procedures among low-span participants, call for new studies in which these variables are more carefully controlled.

The second set of results brought out another interesting finding: both the presence/absence of errors and the type of errors had a significant impact on the variables assessing execution of the revising task. Task-execution time was longer when the text contained syntax errors; it was shorter when the text contained spelling mistakes, and fell in between when the text was error-free. The number of scans was greater for the error-free text. And the mean time per scan (an indicator that condenses the first two measures) was the longest for the syntax-error text, followed by the spelling-mistake text and lastly the error-free text. These results are in line with the first set of findings: even when the text was errorless, revisers devoted some cognitive effort and spent a non-negligible amount of time on the revising task (compared to when they actually corrected mistakes). This time, during which they did not make any corrections but tried to revise, indicates that they performed the revising activity anyway, even though the text needed no corrections. They thus seem to have activated a revising-task schema because they were following the instructions given earlier, not because they came across problems in the text. Moreover, the fact that the revisers reread the text more times when it did not contain any errors than when it did further supports the idea that their activity was driven by the revising-task schema. According to Hayes et al.'s (1987) model, revisers try to define the task and set task goals. Here, they mentally scanned the text to see if there was anything they could do, in compliance with the revising-task schema. Thus, as Hayes (2004) proposed, the revising-task schema seems to activate top-down processing (implementation of a critical-reading process) rather than bottom-up processing (from elements in the text). The activation of the revising-task schema and the implementation of the critical reading process had a cognitive cost for all participants, no matter what their memory capacity was.

However, the fact that cognitive effort varied with the type of errors in the to-be-revised text—at least among the low-span participants—raises the question of the reason for this high cost. Is it linked solely to the activation of the revising-task schema? Or does it also depend on how the critical reading processes driven by this schema function? Do the resource demands of the correction process differ according to how automated the various levels of writing expertise are in participants? These questions are worth exploring, since the high cost of critical reading observed in this study seems to be incompatible with Hayes's (1996) postulate that critical-reading processes are triggered unintentionally during comprehension reading or writing.

Finally, the observed performance differences (text revising time, number of text-correction scans, mean time per scan, number of corrected errors, and amount of cognitive effort) across participants with different working memory spans need further investigation. The differing memory capacities of the two groups of readers/revisers led to differences in attentional control. It would seem that the memory-span variable provides more than just a measure of the memory capacity of participants; it also indirectly assesses their expertise in managing critical-reading activities. We need further knowledge of the "nature" of this type of expertise, if, as Hayes (2004) proposed, we hope to enhance the judgemental skills needed to detect problems and carry out a critical-reading process. This knowledge is crucial because revision is a multidimensional activity. The correction of spelling or grammatical errors is but a limited part of this activity.

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# APPENDIX

## Text with spelling mistakes

(misspelled words in italics, correct spellings in parentheses)

Anna Freud et Mélanie Klein, des psychanalystes célèbres, ont été les précurseurs de la *curre* (cure) psychanalytique des enfants. Les deux approches *divregent* (divergent) considérablement au niveau conceptuel. Elles posent le problème des contraintes méthodologiques associées à l'analyse des enfants.

En effet, les *spychanalystes* (psychanalystes) qui se réclament de la conception proposée *part* (par) Anna Freud tentent d'appliquer la méthode analytique destinée aux névrosés adultes, tout en utilisant un cadre *téorhique* (théorique) qui dépasse largement la psychanalyse. *Prace que* (Parce que) l'enfant n'a pas conscience de son symptôme et n'a pas la volonté de guérir, il est nécessaire de le rendre analysable. *Eaussi* (Aussi), ces praticiens préconisent d'instaurer une session préparatoire à l'analyse où tous les moyens sont bons pour "attirer" l'enfant, afin de *provocquer* (provoquer) de sa part un transfert positif. L'ascendant pris par le psychanalyste sur le jeune patient, grâce à ce transfert *possitif* (positif), doit servir d'amorçage au processus analytique. En *boutre* (outre), l'analyste doit obtenir en permanence des renseignements sur la structure familiale et *suppleér* (suppléer) au manque des parents à être de bons pédagogues. Aussi, dans cette démarche, le psychanalyste est un "éducateur bienveillant".

Au contraire, sous l'*implusion* (impulsion) de Mélanie Klein, d'autres psychanalystes préconisent de pratiquer avec les enfants la psychanalyse, rien que la psychanalyse. Selon eux, l'analyse peut être utilisée avec tous les enfants, les enfants normaux *compirs* (compris). Ces praticiens *reucourent* (recourent) à l'angoisse et au sentiment de culpabilité de l'enfant comme signes *interpértables* (interprétables). Ainsi, la construction d'un transfert forcément positif dès le premier contact avec l'*anfent* (enfant) n'est pas nécessaire. De plus, le psychanalyste refuse toute intervention pédagogique et il n'a pas besoin de renseignements sur la situation *réielle* (réelle) du jeune patient. Par sa parole, l'enfant est l'unique promoteur de son changement et de son *évollution* (évolution). Seule sa parole compte. Ainsi, dans cette *persepective* (perspective), l'analyste est une tierce personne absolument *impartialle* (impartiale) en position d'écoute pure.

En tout état de cause, ces divergences méthodologiques ne doivent pas faire *oubiler* (oublier) un problème essentiel, *celiu* (celui) de la possibilité d'entreprendre une analyse avec un enfant. Chaque analyste, au-delà des oppositions *enrte* (entre) les écoles et les courants psychanalytiques, doit *réssoudre* (résoudre) ce problème qui se pose de façon renouvelée chaque fois qu'il reçoit un nouvel enfant.

## Text with syntax errors

(words to delete in italics, words to move in the same sentence in boldface)

Anna Freud et Mélanie Klein, des psychanalystes célèbres, ont été *lancés* les précurseurs de la cure psychanalytique des enfants. Les deux approches divergent *très* considérablement au niveau conceptuel. Elles posent le problème des contraintes méthodologiques associées à l'analyse des enfants.

En effet, les psychanalystes qui se réclament de la conception proposée par Anna Freud tentent d'appliquer la méthode analytique destinée aux névrosés adultes, tout en utilisant un cadre théorique qui dépasse largement la psychanalyse. Parce que l'enfant n'a pas conscience de son symptôme et n'a **de guérir** pas la volonté, il est nécessaire de le rendre analysable. Aussi, ces praticiens préconisent d'instaurer *dans l'installation* une session préparatoire à l'analyse où tous les moyens sont bons pour "attirer" l'enfant, afin de provoquer de sa part un transfert positif. L'ascendant pris par le psychanalyste sur le jeune patient, grâce à ce transfert positif, doit servir d'amorçage au processus analytique. L'analyste doit obtenir en permanence des **en outre** renseignements sur la structure familiale et suppléer au manque des parents à être de bons pédagogues. Aussi, dans cette démarche, le psychanalyste est un "éducateur bienveillant".

Au contraire, sous l'impulsion de Mélanie Klein, d'autres psychanalystes préconisent *en proposant* de pratiquer avec les enfants la psychanalyse, rien que la psychanalyse. Selon eux, l'analyse peut être utilisée avec tous les enfants, *à la clé* les enfants normaux compris. Ces praticiens recourent à l'angoisse et au sentiment de culpabilité de l'enfant comme signes interprétables. Ainsi, la construction d'un transfert positif **forcément** dès le premier contact avec l'enfant n'est pas nécessaire. De plus, **toute intervention pédagogique** le psychanalyste refuse et il n'a pas besoin de renseignements sur la situation réelle du jeune patient. Par sa parole, l'enfant est l'unique promoteur de son changement et de son évolution. Seule *seulement* sa parole compte. Ainsi, dans cette perspective, l'analyste est une tierce personne absolument impartiale en position d'écoute pure.

Ces divergences méthodologiques ne doivent pas faire oublier un problème essentiel, celui de la possibilité d'entreprendre une analyse avec un enfant **en tout état de cause**. Chaque analyste, au-delà des oppositions entre les écoles et les courants psychanalytiques, doit ce problème qui **résoudre** se pose de façon renouvelée chaque fois qu'il reçoit un nouvel enfant.