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Effects of seductive details evidenced by gaze duration ☆

Yongmin Chang [a,b], Sungmook Choi [c,*]

[a] Department of Molecular Medicine, Kyungpook National University College of Medicine, Daegu, South Korea
[b] Department of Radiology, Kyungpook National University Hospital, Daegu, South Korea
[c] Department of English Education, Kyungpook National University Teachers College, Daegu, South Korea

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ABSTRACT

According to a meta-analysis of empirical studies, seductive details such as emotionally interesting text segments and attention-grabbing pictures have significant negative effects on the reader's recall, reading comprehension, and learning of important textual information. This study investigates the negative effects of seductive details on recall of main ideas and reading comprehension by using an eye-tracking technique. In the experiment, a total of 56 undergraduate students read a block of expository text with seductive details, and the spatial and temporal distribution of attention was measured by gaze duration and recorded by an eye tracker. Then recall and reading comprehension tests were employed. Two multiple regression analyses were conducted to investigate the relationship between attention allocation and reading performance. The results indicate that increased attention to seductive sentences, not to seductive pictures, was a major determinant of poor performance in terms of both recall and reading comprehension, suggesting that increased attentional allocation to seductive sentences may hinder information retrieval and produce a less coherent mental representation of given text.

1. Introduction

A reader's interest plays a central role in learning from text, partly determining what he or she wants to read. It also determines the extent to which the reader deeply processes the text and thus how well he or she learns the given information (Hidi, 2001; Schiefele, 1991). In addition, this interest promotes "active engagement, focusing of one's attentional resources, and learning more than one would otherwise learn" (Schraw & Lehman, 2001, p. 23). Given the crucial role of the reader's interest, textbook authors and publishers have increasingly added interesting but irrelevant (i.e., not essential in comprehending important information in text) stories and visuals to otherwise uninteresting textbooks. These extraneous adjuncts have been described as *seductive details* (Garner, Brown, Sanders, & Menke, 1992; Garner, Gillingham, & White, 1989; Sanchez & Wiley, 2006; Wade, 1992).

Seductive details such as emotionally interesting text segments and attention-grabbing pictures are intended to energize the reader's interest in the text, capture his or her attention, and eventually foster his or her comprehension of structurally important ideas in the text (Gagné, Briggs, & Wager, 1988; Hidi, 1990; Schraw, 1998). However, several studies have shown that seductive details rarely contribute to the reader's interest (Lehman, Schraw, McCrudden, & Hartley, 2007). More importantly, a number of studies have shown that seductive details can seriously hinder the reader's reading comprehension and learning of important textual information (Choi, 2009; Harp & Mayer, 1997; Harp & Mayer, 1998; Lehman et al., 2007).

For instance, Garner et al. (1989) were among the first to investigate the effects of seductive details. They conducted two experiments using different participants. In the first experiment, 20 graduate students read either (a) the baseline text about different living styles of insects or (b) that containing seductive details such as "Monarch Butterflies taste bad" (p. 46). They found that students in the baseline condition were significantly more likely to recall main ideas ($M = 2.80$) than those provided with the baseline text plus seductive details ($M = 1.30$). In the second experiment, the participants were 37 seventh-graders. Consistent with the first experiment, those students reading the baseline text with explicitly signaled main ideas (i.e., italicized) ($M = 1.42$) were significantly more likely to outperform their counterparts who read the baseline text with seductive details and without explicitly signaled main ideas ($M = 0.42$).

Similarly, Harp and Mayer (1997) showed unfavorable effects of seductive details by considering a sample of 74 college students whose native language was English. The participants were

* Corresponding author. Address: Department of English Education at Kyungpook National University, 80 Daehakro, Bukgu, Daegu 702-701, South Korea. Fax: +82 53 950 6804.
E-mail address: sungmookchoi@knu.ac.kr (S. Choi).

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instructed to read one of four experimental passages about the process of lightning: (a) the baseline text, (b) the baseline text + seductive sentences, (c) the baseline text + seductive images, and (d) the baseline text + seductive sentences + seductive images. They were then instructed to recall everything that they remembered. According to the results, the baseline group ($M = 3.8$) was significantly more likely to recall idea units than the other three groups ($M = 2.3$, 2.2, and 0.9, respectively). In a follow-up study, Harp and Mayer (1998) conducted four experiments in which the first three replicated earlier studies (e.g., Garner et al., 1989; Harp & Mayer, 1997). For instance, 81 college students participated in the first experiment. They were asked to read an expository passage about lightning with or without seductive details. According to the results, those students who read the passage without seductive details were significantly more likely to recall important ideas ($M = 4.26$) than those who read the passage with seductive details ($M = 1.73$).

1.1. What induces the effect of seductive details?

Concerning the potential cause of the effect of seductive details, Rey (2012) summarized four theoretical explanations in his review paper, including the distraction hypothesis, the cognitive theory of multimedia learning, the inappropriate schema hypothesis, and the coherence disruption hypothesis.

The distraction hypothesis (Harp & Mayer, 1998) posits that seductive details are detrimental to recall of main ideas and reading comprehension because such details distract readers from important text information. For example, readers may selectively process and remember seductive information about people killed by lightning at the expense of important information about factors influencing the formation of lightning (for more information on the passage about lightning formation, see Harp & Mayer, 1997). The distraction hypothesis suggests that readers are more susceptible to the effect of seductive details when they pay attention to those details instead of structurally important ideas.

Closely associated with the distraction hypothesis is the cognitive theory of multimedia learning (Mayer, 2005; Sweller, 2004). This theory proposes that readers have limited processing resources and that this limitation constrains the amount of information that can be processed simultaneously. It also suggests that high-interest information uses more of the learner's processing resources than low-interest information (Mayer, Griffith, Jurkowitz, & Rothman, 2008). Therefore, learners with a high working memory span are more likely to outperform low-span counterparts when processing text with seductive details. For instance, an expository passage with seductive details contains both important ideas and seductive details that compete for the reader's limited cognitive resources. In attending to and processing seductive details, high-span learners are less likely to be affected by the presence of seductive details than low-span ones.

The inappropriate schema hypothesis posits that seductive details activate an inappropriate schema, that is, a schema pertinent only to seductive details. In other words, when seductive details are placed before target information, learners are likely to activate a schema that is relevant to the seductive details, which in turn can lead to poor recall of important information (Lehman et al., 2007). Conversely, if seductive details are presented after important information, then this activates a schema related to the information and facilitates recall and learning for that information. As discussed later, this study reduces the likelihood of activating an inappropriate schema by placing important information in the beginning paragraph of the experimental text.

The coherence disruption hypothesis states that seductive details do their damage because they may interfere with text coherence, which in turn can prevent learners from constructing coherent mental representations and eventually lead to an overall decrease in reading comprehension (Harp & Mayer, 1998). Reading comprehension entails the detection of relationships between ideas. Relationships between important ideas are more likely to be detected if to-be-connected important idea are displayed spatially close to one another and if previously stated ideas are repeated (van den Broek, 2010). If this holds, then seductive details inevitably separate relevant ideas, resulting in reduced text coherence.

1.2. Present study

Rey (2012) provided a meta-analysis and showed that seductive details can have significant negative effects and that attention distraction can be an important variable in explaining the effect of seductive details. However, the distraction hypothesis has rarely been validated through experiments. To the authors' knowledge, only one study (Lehman et al., 2007) tested this hypothesis by employing a reading timer program (a software package that records the reading time for individual sentences) and showed that the presence of sentences with seductive details had a significant negative effect on the amount of time the participants spent reading baseline sentences. According to the recall analysis, those participants who read the baseline passage (i.e., no seductive sentences) were significantly more likely to recall important information than those who read the seductive passage (i.e., the baseline passage plus seductive sentences). Lehman et al. (2007) interpreted these results as supporting the distraction hypothesis.

The present study investigates the negative effects of seductive details on the recall of core content by using an eye tracker. The eye-tracking technology has several advantages over a reading timer program. For instance, unlike the reading timer, the eye tracker shows the experimental text at the discourse level (i.e., beyond the sentence level). Therefore, the frequency of key strokes is significantly reduced because multiple sentences are presented at the same time on the computer screen. In addition, the eye tracker allows for the recording of the participant's processing of visuals as well as text (i.e., multimedia text), whereas the reading timer program records the processing of only text-based information. Further, although the reading timer program provides only temporal information, the eye tracker provides not only temporal but also spatial information on the reader's moment-to-moment cognitive process and a millisecond-precise report on the intensity of his or her intentions (e.g., Henderson & Ferreira, 2004; Israel & Duffy, 2009; Just & Carpenter, 1980).

More specifically, the use of eye trackers in psychological research is based on the assumption of the "eye-mind link" (Reichle, Pollatsek, & Rayner, 2006, p. 4). According to this assumption, overt attention (i.e., eye fixation location) and covert attention (cognitive focal attention) operate in a highly intertwined manner (Castelhano & Rayner, 2008; Deubel & Schneider, 1996; Geisler & Cormack, 2011; Godfroid, 2012; Kowler, Anderson, Dosher, & Blaser, 1995; Rayner, 2009). Anderson (2000, p. 81) posited that "we are attending to that part of visual field which we are fixating." Similarly, Wang (2011, p. 185) stated that "time lengths of fixations indicate attention." Although attention and eye fixation locations (i.e., overt attention) can be dissociated in simple tasks (Posner, 1994), they are tightly linked in complex tasks such as reading (Deubel & Schneider, 1996; Kowler et al., 1995; Rayner, 2009).

Given that the fixation of the eye is triggered by attention shifts and that novel information is obtained only during the fixation (Rayner, 2009), many recent studies have used the eye fixations as a measure of the amount of attention paid (e.g., Godfroid, Boers, & Housen, 2013; Godfroid & Uggen, 2013; Rayner, 2009) and demonstrated a significant positive correlation between moment-to-moment attention and the eye fixation duration (Chaffin, Morris,