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SELECTED POSTER PRESENTATIONS[1]

The impact of gaze-contingent highlighting on incidental learning of collocations from computer-mediated reading

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1. Literature review

1.1 Gaze-contingency paradigm

In recent years, the potential of eye-tracking technology as an attention-trigger rather than an attention-tracker has received increasing attention in educational research. Inspired by the gaze-contingency paradigm (Reder, 1973), researchers have begun to use learners' eye gazes as a way to activate visual events on computer screens to draw learners' attention to targeted features in an adaptive manner. Révész et al. (2023) were among the first to investigate whether gaze-contingent highlighting of glosses could promote the noticing of glosses during computer-mediated reading. The findings of the study indicated that gaze-contingent highlighting led to increased fixation counts and longer gazes at the glosses, ultimately facilitating the learning of the glossed word forms.

1.2 Textual enhancement and the gaze-contingency paradigm

Gaze-contingent highlighting can be thought of as a form of textual enhancement. In previous research, textual enhancement has usually taken the form of boldfacing (Choi, 2017; Toomer & Elgort, 2019), underlining (Puimège et al., 2021; Szudarski & Carter, 2016), and coloring (Jung et al., 2022). In some cases, compound enhancement techniques have been designed, such as boldfacing with underlining (Majuddin et al., 2021; Peters, 2012) or with coloring (Sonbul & Schmitt, 2013). Extant studies have, overall, demonstrated that textual enhancement can facilitate learners' noticing (Choi, 2017; Jung et al., 2022; Majuddin et al., 2021; Puimège et al., 2021) and learning of second language (L2) collocations, the target feature in the present study (Sonbul & Schmitt, 2013; Szudarski & Carter, 2016; Toomer & Elgort, 2019).

The present study set out to assess the effectiveness of gaze-contingent textual enhancement to draw learner attention to target collocations. Thus, rather than utilizing proactive textual enhancement as in past research, target collocations were highlighted interactively, triggered by the participants' eyes fixating on them during reading. This technique allowed for precise temporal synchronization between learners' visual attention and the timing of the textual enhancement (Révész et al., 2023). We hypothesized that the synchronization of textual enhancement with learners' eye-gaze behaviours may facilitate learner attention to and learning of L2 collocations.

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[1]A reproduction of the poster discussed is available in the supplementary material published alongside this article on Cambridge Core.

1.3 Research questions

Against this backdrop, the present study compared the effects of gaze-contingent highlighting and proactive highlighting on learners' attentional processes during computer-mediated reading tasks and subsequent learning of L2 collocations. Proactive highlighting referred to the pre-highlighting of target L2 collocations before reading. Gaze-contingent highlighting, on the other hand, involved highlighting target L2 collocations when participants' eye-fixations were detected on them during reading.

1. To what extent do proactive and gaze-contingent highlighting affect L2 learners' attention to target collocations embedded in reading texts?
2. To what extent do proactive and gaze-contingent highlighting affect L2 learners' development in the knowledge of the target collocation forms?
3. To what extent does L2 learners' development in the knowledge of the forms of target collocations correlate with their attention to the target collocations?

2. Method

2.1 Overall design

This study employed a treatment-immediate posttest-delayed posttest design. Participants were randomly assigned to one of three groups: proactive highlighting, gaze-contingent highlighting, or no highlighting. The dependent variables were participants' attention to the target collocations, as indicated by eye-movement measures, and change in their knowledge of the target collocations, as evaluated through collocation form recall and recognition tests.

2.2 Participants

The study was comprised of 75 university students from the UK. These participants were first language (L1) speakers of Chinese and had English as their L2. Their English proficiency level ranged between B1 and B2, based on the Common European Framework of Reference (CEFR). Additionally, the scores from the Oxford Placement Test indicated that there was no significant difference among the three groups in terms of their English proficiency.

2.3 Data collection and analysis

The reading task employed in this study was an editor task, where participants played the role of an editor for a lifestyle magazine. They were asked to evaluate three article drafts for potential inclusion in an upcoming issue. These drafts contained 12 target collocations, each appearing three times throughout the drafts. The target collocations were presented under one of three conditions: no highlighting, proactive highlighting (target collocations pre-highlighted), and gaze-contingent highlighting (target collocations highlighted when the participants' eye gaze fixated on them). Participants' attentional processes were recorded using an EyeLink 1000 Plus eye-tracker while they engaged in the tasks. After finishing the editor task, participants completed an unannounced collocation form recall and recognition test immediately after and two weeks later. Additionally, a subset of five participants from each group took part in a stimulated recall session, where they shared their thoughts while reading, prompted by recordings of their own eye movements.

3. Results and discussion

We found that both highlighting techniques resulted in longer and more frequent eye fixations on the target collocations. Participants' stimulated recall comments from both highlighting groups further revealed that participants tended to become aware of the highlighting, actively tried to infer the meanings of the target collocations, and recognized subsequent encounters with them. Additionally, from the gaze-contingent highlighting group, participants occasionally expressed surprise at unexpected blinking (associated with gaze-contingent highlighting) while reading. Importantly, both highlighting methods significantly improved posttest scores. The impact of gaze-contingent highlighting, in particular, was sustained in the delayed recall

test. However, there were no significant correlations between eye movement measurements and posttest scores, suggesting that the amount of visual attention may not necessarily indicate depth of processing.

4. Conclusion and limitations

This study, like any research, is not free from limitations. Firstly, participants may have had varying levels of prior knowledge of the target collocations. However, the target collocations were carefully selected based on a thorough pilot study involving learners with similar English learning profiles to minimize this potential variability. Additionally, the semantic transparency of the target collocations was not tightly controlled. To mitigate this concern, explicit and transparent meanings of each target collocation were provided within the surrounding context.

Despite these limitations, the study confirmed the pedagogical potential of utilizing the gaze-contingency paradigm (Reder, 1973) as a learner-adaptive focus-on-form device to trigger attention and thereby promote learning of target L2 features during computer-mediated reading tasks (Révész et al., 2023). From a methodological standpoint, this study highlighted the value of triangulating eye-movements with retrospective comments to gain a more comprehensive understanding of learners' attentional processes (Jung & Lee, 2022; Jung & Révész, 2018; Wang & Pellicer-Sánchez, 2023).

Supplementary material. To view supplementary material for this article, please visit https://dx.doi.org/10.1017/S0261444824000260.

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