SEÇÃO: TEMÁTICA LIVRE

# Comparing the effectiveness of study strategies on comprehension, retention, and learning from L2 English texts

*Comparando a eficiência de estratégias de estudo na compreensão, retenção e aprendizagem a partir de textos em Inglês (L2)*

*Comparando la eficiencia de las estrategias de estudio sobre la retención, comprensión y aprendizaje partir de textos en Inglés (L2)*

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**Abstract:** This study compared the use of the study strategies rereading, highlighting, and note-taking on the levels of comprehension, retention, and learning from L2 texts. Nineteen intermediate students of English (L2) participated in the study. In phase 1, they studied three expository texts in English, each with the support of a different strategy. After reading, they answered an immediate recall and true/false statements. Phase 2 took place a week after and comprised delayed recalls and a critical writing task. Prior to data collection, participants received instruction on study strategies to ensure they knew about the strategies to be worked with. Results of immediate recalls pointed to rereading as an effective strategy to comprehension; highlighting was related to higher true or false scores. Regarding retention, good performance in the delayed recalls was associated with the highlighting and note-taking conditions. Thus, the effects of rereading did not endure delayed tests, providing evidence for the ineffectiveness of this strategy for retention compared to highlighting and note-taking. Results from the critical writing task demonstrated that the task fostered elaborative inferencing, although the number of explicit text references was small. A link between highlighting and learning is hypothesized.

**Keywords:** Study strategies. Comprehension. Retention. Learning. L2 reading.

**Resumo:** Esse estudo comparou o uso das estratégias de estudo reler, realçar texto e fazer anotações nos níveis de compreensão, retenção e aprendizagem de textos em L2. Dezenove estudantes de inglês (L2) participaram do estudo. Na fase 1, eles estudaram três textos expositivos em inglês, cada um com o apoio de uma estratégia diferente. Após a leitura, responderam uma tarefa de recordação imediata (*free recall*) e questões de verdadeiro/falso. A fase 2 ocorreu uma semana depois e consistiu na tarefa de recordação tardia (*delayed recall*) e uma tarefa de escrita crítica. Antes da coleta de dados, os participantes receberam instrução em estratégias de estudo para assegurar que conheciam as estratégias a serem utilizadas. Os resultados das tarefas de recordação imediata apontaram para a releitura como uma estratégia eficiente para a compreensão; realçar texto esteve relacionado a escores altos nas questões de verdadeiro/falso. Com relação à retenção, bom desempenho na recordação tardia esteve associado às condições de realçar texto e fazer anotações. Sendo assim, os efeitos da releitura não se mantiveram nos testes tardios, evidenciando a ineficácia dessa estratégia para retenção comparada a realçar texto e fazer anotações. Os resultados da tarefa de escrita crítica demonstraram que essa tarefa promoveu a geração de inferências elaborativas, apesar do baixo número de referências explícitas aos textos. Hipotetiza-se uma ligação entre a estratégia de realçar texto e aprendizagem.

**Palavras-chave:** Estratégias de estudo. Compreensão. Retenção. Aprendizagem. Leitura em L2.

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**Resumen:** Este estudio comparó el uso de las estrategias de estudio releer, resaltar texto y tomar notas en los niveles de comprensión, retención y aprendizaje de textos en L2. Participaran del estudio diecinueve estudiantes de inglés (L2). En la fase 1, estudiaron tres textos expositivos en inglés, utilizando una estrategia diferente para cada texto. Después de leer, hicieron una tarea de recuerdo inmediato (free recall) y cuestiones de verdadero/falso. La fase 2 ocurrió una semana después y comprendió una tarea de recuerdo tardío (delayed recall) y una tarea de escritura crítica. Antes de la recopilación de datos, los participantes recibieron instrucción en estrategias de estudio para asegurarse que conocían las estrategias a ser empleadas. Los resultados de los recuerdos inmediatos indicaron a la relectura como una estrategia eficiente para la comprensión; resaltar texto se relacionó con puntuación más alta en las cuestiones de verdadero/falso. En cuanto a la retención, mejor desempeño en el recuerdo tardío se asoció a las condiciones de resaltar texto y tomar notas. Es decir, el efecto de la relectura no perduró por los testes tardíos, lo que demuestra la ineficacia de esta estrategia para retención en comparación a resaltar texto y tomar notas. Los resultados de la tarea de escritura crítica indicaron que esta tarea favoreció la generación de inferencias elaborativas, aunque el número de referencias explicitas a los textos fue bajo. Se plantea la hipótesis de una conexión entre la estrategia de resaltar texto y aprendizaje.

**Palabras clave:** Estrategias de estudio. Comprensión. Retención. Aprendizaje. Lectura en L2.

## Introduction

Strategies are the actions students consciously take in order to control and regulate their language learning process towards their reading goal (AFFLERBACH; PEARSON; PARIS, 2008; MANOLI; PAPADOPOLOU, 2012; GRABE, 2009). They can be learned and enhanced through practice, demanding active engagement on the part of the reader. Strategy use plays a crucial role in reading; it is part of the comprehension monitoring level of processing, being considered a high-level cognitive process (GAGNÉ; YEKOVICH; YEKOVICH, 1993). Successful readers often engage actively in comprehension, setting goals, considering the context and demonstrating willingness to overcome difficulties through the use of strategies (GRABE, 2009). These readers are aware of the strategies at their disposal and how to use them. They also have conditional knowledge, analyzing the context and evaluating which strategy is more appropriate to the task proposed and the task structure, monitoring their progress and making adjustments if necessary (PARIS; LIPSON; WIXSON, 1983).

Strategic reading has been researched both in L1 (PARIS *et al.*, 1983; PARIS; WASIK; TURNER, 1991, AFFLERBACH *et al.*, 2008) and L2 (WEINSTEIN; MAYER, 1986; ANDERSON, 1991; CHAMOT; EL-DINARY, 1999). Research on reading strategies has focused on strategy use at the comprehension level (PARIS *et al.*, 1983; SPRING, 1985; BAKER, 1989; MAGLIANO; TRABASSO; GRAESSER, 1999; JAFARI, 2002). Yet, few studies have explored the impact of study strategies on higher processing levels, i.e., comprehension and learning (DYER; RILEY; YEKOVICH, 1979). Noteworthy, these studies were carried out in the L1 context; therefore, there seems to be plenty of room to investigate the effect of study strategies on distinct levels in ESL reading. Study strategies encompass actions like underlining, annotating on the margins or taking notes separately on the main ideas, facts, and concepts that arise from the text (TOMITCH, 2012). They enhance retention but may pose a higher cognitive effort as the reader has to (re) organize the information from the text.

Rereading, highlighting and note-taking were the strategies dealt with in the present study. This selection was based on the assumption that there is a greater depth of processing involved in highlighting and note taking as compared to rereading. This greater depth "implies a greater degree of semantic or cognitive analysis" through *enrichment* or *elaboration* (CRAIK; LOCKHART, 1972, p. 675). Thus, comparing the effectiveness of these actions may provide data on the value of more "laborious" strategies, especially in study situations, where the text not only has to be comprehended but also retained and, ultimately, learned, so that it becomes available for further knowledge construction. Therefore, the present study had as its main objective to compare the use of the study strategies rereading, highlighting, and note-taking on the levels of comprehension, retention, and learning from L2 texts.

## 1 Comprehension, retention, and learning

Comprehension, retention and learning are

**Juliana do Amaral · Lêda Maria Braga Tomitch**
Comparing the effectiveness of study strategies on comprehension, retention, and learning from L2 English texts

**3/15**

interrelated processes of increasing complexity. Reading comprehension is the process of constructing a representation of the text in the mind, i.e., its most important idea units and the hierarchical relations among them. This textbase representation is integrated to the reader's prior knowledge and experiences into a situation model of the text (VAN DIJK; KINTSCH; 1983).

Retention refers to the cognitive processes of encoding information into long-term memory. To explain how retention takes place, this study will rely on Craik and Lockhart's (1972) levels of processing model, according to which incoming stimuli can be processed in different manners namely Type 1, shallow processing, and Type 2, deep processing. Type of processing determines the strength of the memory trace: in Type 1, primary stages deal with sensory features; retention in primary memory is related to the information in the focus of attention, not leading to the formation of a permanent memory trace. Type 2 occurs at later stages: input is matched with long-term memory items (recognition), with depth of processing involving more elaborated semantic reasoning. Such elaborative inferencing occurs when prior knowledge is added to meaning representation by making associations, providing examples, details and analogies (GAGNÉ *et al.*, 1993). As a result, deeper levels of processing are linked to stronger memory traces and increase the probability of transfer in learning tasks.

Learning from text requires the recruitment of both high and low cognitive processes. If the situation requires verbatim memorization, the reader will engage in *rote association,* which often consists of simply repeating the concepts (JUST;

CARPENTER, 1987), for instance, word-meaning relations. Nonetheless, most learning situations call for a higher level of cognitive involvement, in which the text is processed actively and with conscious attention. This is referred to as organizational learning, which involves "developing an organization, based on the structure and content of the text itself, that the reader can use to relate the new information to what she already knows" (JUST; CARPENTER, 1987, p. 404). Organizing improves recognition and delayed recall, and increases the chances that the content will be applied in novel contexts.

## 2 Reading strategies and study strategies – drawing the line

Reading comprehension strategies are characterized by being deliberate, goal-oriented and reader-initiated and controlled actions (KODA, 2004; MANOLI; PAPADOPOULOU, 2012; AFFLERBACH *et al.*, 2008). A strategic reader consciously implements strategies considering factors such as his/her objectives, the difficulty imposed by the text, the task and his/her own capacity. In particular, reading with the objective of learning involves employing a distinct set of strategies that require "to synthesize, interpret, evaluate, and selectively use information from texts." (GRABE, 2009, p. 5). This process is associated with reorganizing text information through the use of study strategies such as deciding to reread for clarification, highlighting what is considered important, taking notes, paraphrasing, summarizing the text to grasp its main ideas, constructing charts or tables (Table 1).

**TABLE 1 –** Reading comprehension and study strategies

| Reading comprehension strategies | Study strategies |
|---|---|
| Skimming / previewing | Highlighting / underlining |
| Scanning | Constructing semantic maps/diagrams |
| Identifying the function of words | Annotating in the margins |
| Looking up the meaning of a word in a dictionary | Note-taking |

| | |
|---|---|
| Guessing the meaning of unknown words by context | Reader-generated questions |
| Reading for meaning (focus on comprehension) | Retrieval practice |
| Rereading | Summary writing |

Tomitch (2012) defines study strategies as actions that go beyond text comprehension – although understanding a text is crucial for learning – and provide the student with a content framework that facilitates retrieval. Just and Carpenter (1987) observe three characteristics of study strategies: first, they are more consciously applied; second, they require more time spent on the text (compared to reading for comprehension); finally, they involve creating representations of the content such as written outlines and graphs.

Rereading is one of the strategies most reported by students (DUNLOSKY; RAWSON; MARSH *et al.*, 2013). It is referred to as a passive study strategy as opposed to active strategies such as reader-generated questions, explanatory-based answers, reciprocal teaching, and organization of the ideas in concept maps (NIST; SIMPSON, 2000). When contrasting massed (reading many times at once) versus distributed (reading at different times) rereading, massed rereading was associated with better performance on an immediate test, whereas distributed rereading had improved performance on a delayed test (RAWSON; KINTSCH, 2005). The main question underlying studies on rereading was whether this strategy supports a richer representation of the text, resulting in a more consistent situation model – and the answer is no: rereading does not demand higher-level processing, since the reader processes the text in a similar manner to the first reading (see Callender and McDaniel, 2009 for a review). Thus, it has a limited potential effect on learning.

Highlighting is commonly employed by students; its use is associated with higher scores in delayed fill-in-the-blanks questions (YUE; STORM; KORNELL; BJORK, 2015). Evidence from eye movements showed the effect of highlighted text on online processing and offline comprehension: reading time was longer for central than for peripherical highlighted information, but comprehension was not affected by the highlights (YEARI; OUDEGA; VAN DEN BROEK, 2017). In another study, instructed highlighting (marking of text parts to answer given questions) has been reported to correlate significantly with reading competence: the more unrelated words participants highlighted, the lower their competence (HEYNE; ARTELT; GNAMBS; GEHRER; SCHOOR, 2020). In this line, Dunlosky and colleagues (2013) emphasize the importance of the quality of highlighting to learning, since large quantities of highlighted text are often a constraint to comprehension and indicate poor selection ability in terms of what is relevant in a text. Thus, although students are familiar with this technique, they might fail in using it effectively.

The positive effect of highlighting on processing is explained by the *isolation effect* (DUNLOSKY *et al.*, 2013). The term is usually employed to describe enhanced retention of a semantically or phonologically different item in a list of related words, but also explains what happens to highlighted words because of their visual prominence in the text. Another explanation regards the effect of highlighted content on attention and processing time, signaling important information (LEMARIÉ *et al.*, 2008).

Note-taking is a complex strategy that involves paraphrasing, summarizing and reorganizing text information. It is also associated with enhanced comprehension of multiple texts (HAGEN; BRAASCH; BRATEN, 2014) and performance on an inter-textual relations task (KOBAYASHI, 2009a). Furthermore, purpose affected the level of strategic processing: reading multiple texts to build an argument increased intertextual elaboration compared to reading to summarize (HAGEN *et al.*, 2014). The effects of note-taking combined with summarizing and rereading on immediate comprehension and delayed retention were investigated by Dyer, Riley and Yekovich (1979).

College students read a text with or without taking notes. Next, half of the ones who took notes also wrote summaries, while the other half completed a spatial relations task. Finally, the ones who summarized either reread the passage or engaged in placebo work. All subjects performed both immediate and delayed tests with factual and integrative inferential questions. Results indicated a relationship between note-taking and rereading and improved recall. Summarizing was positively related to high posttest scores but was not considered as effective, since participants could not read as they summarized.

Previous studies have shown that the comparison among different study strategies had no effect on immediate nor delayed tests (JUST; CARPENTER, 1987). In addition, when compared to rereading, more active strategies did not result in enhanced performance. Nonetheless, these authors underscore that the effectiveness of a strategy will depend on how it is employed. Yet, previous studies have not approached rereading, highlighting and note-taking under a comparative paradigm in the L2 context.

## 3 The study

This article brings a partial report of a master's study carried out in 2018. Its objective was to analyze the use of the study strategies highlighting, note-taking and rereading, as a tool for promoting L2 reading comprehension, retention and learning among a group of students of English as a Second Language at the extracurricular course at UFSC. The study was divided into 2 phases: phase one aimed at collecting data on immediate comprehension and phase 2 comprised retention and learning tests. In order to achieve this objective, the following research questions were posed:

RQ1 Which study strategies, among highlighting, note-taking and rereading, promote better comprehension, as measured by an immediate recall and true or false statements?

RQ2 Which study strategies, among highlight-

ting, note-taking and rereading, promote better retention, as measured by a delayed recall a week after reading each of the texts?

RQ3 Which study strategies, among highlighting, note-taking and rereading, promote better learning, as measured by a critical writing task?

## 4 Method

### 4.1 Participants

Nineteen adult intermediate Brazilian students speakers of English as an L2 enrolled in the intermediate level of the English Language Course in the Department of Foreign Languages and Literature (Departamento de Língua e Literatura Estrangeiras – DLLE) at the Federal University of Santa Catarina – UFSC[2] comprised the sample of this study. A pilot study was done with a smaller sample of participants (n=3) to calibrate the time needed to perform the tests, task difficulty and accuracy of the instruments.

Data collection was done with two intermediate groups of English the first author taught at. Students were informed that this was a regular class activity: all of them would participate, and the ones who did not want their data to be used in the study were instructed not to sign the consent form. From the initial sample of participants of 31 participants, only twelve provided valid, complete data. At the first part of data collection there were absences in either Phase 1 or 2 or both. Participants who did not follow the instructions properly (e.g. did not highlight or take notes as requested), a student with dyslexia and three underage students were excluded from the sample. To increase the number of participants, students from another group within the same level were invited to take part in the study. This group also participated in the workshops, offered during their class time with the consent of the teacher. Data collection with the seven participants from this group happened in individual meetings scheduled with each participant out of class time. The total sample analyzed was constituted by 19 partici-

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[2]   Cursos Extracurriculares de idiomas (Inglês) – Departamento de Língua e Literaturas Estrangeiras – UFSC.

pants who were divided into three groups (Table 2) aimed at randomizing the order of the texts read

and the strategies they were required to apply.

**TABLE 2 –** Participants divided per group

| G1 | P11  P12  P13  P15  P18  P19 |
|----|------------------------------|
| G2 | P2  P4  P5  P8  P9  P16 |
| G3 | P1  P3  P6  P7  P10  P14  P17 |

### 4.2 Instruments for data collection

The materials used that comprise the scope of this paper were: 1) three expository texts; 2) three immediate comprehension tests, each comprising an immediate recall and a set of five true or false statements; 3) a retention test consisting of a delayed recall of each of the texts; and 4) a learning test consisting of a critical writing task. Except for the expository texts, which were in English, the instruments were administered in

Portuguese to minimize proficiency constraints.

### 4.2.1 Comprehension measures

Three texts were selected for this study: two texts about fake news and one text about fact-checking (Table 3). Suppressions and adaptations were made by this researcher in order to control for complexity and length. Additionally, a glossary was included in each text containing the less common words.

**TABLE 3 –** The texts

| | Title | Length | Retrieved from / date |
|---|-------|--------|------------------------|
| Text 1 | After 2017 Kenyan Election, US Officials Ready to Fight 'Fake' News | 558 words | https://learningenglish.voanews.com<br>March 21st 2018 |
| Text 2 | Google pledges $300m to support journalism and fight fake news | 375 words | http://www.bbc.com<br>March 21st 2018 |
| Text 3 | Fact-checking Facebok CEO Mark Zuckerberg's congressional testimony | 581 words | http://www.politifact.com<br>April 13th 2018 |

Recall protocols (KINTSCH; VAN DIJK, 1978) consist of asking participants to write down everything they would remember immediately after reading without looking back at the text. This test was followed by a true or false task comprising 5 statements involving implicit inference generation following the framework proposed by Pearson and Johnson (1974), according to which implicit information requires the reader's ability to connect different propositions and associate them with prior knowledge.

### 4.2.2 Retention measures

Participants were asked to perform a delayed recall one week after having read the texts. The procedures were similar to the immediate recalls:

they were asked to write down everything they remembered about each of the three texts, one at a time, on a worksheet. There was one difference: in the delayed recalls, the title of each text was provided; in addition, they were handed in to the participants in the same order as the texts read seven days before to facilitate retrieval.

### 4.2.3 Learning measures

Summaries, essays and open-ended questions have been used in reading research as an index of comprehension (KINTSCH; VAN DIJK, 1978) and deep processing (LEHMAN; SCHRAW, 2002). These tasks require that the reader uses the information learned in novel situations. The Critical writing task used in the present study required

**Juliana do Amaral · Lêda Maria Braga Tomitch**
Comparing the effectiveness of study strategies on comprehension, retention, and learning from L2 English texts

**7/15**

that students answered the following question, which raised a controversial aspect of the topic discussed in the three previously read texts: *Que medidas devem ser tomadas pelo governo e pelos usuários para identificar fake news e reduzir sua propagação?* (What actions must be taken by the government and the users to identify fake news and reduce its spreading?) Participants were instructed to answer the question in Portuguese. It is important to signal that, in order to perform the critical writing task and answer the question, participants would have to take a stance in relation to what was discussed in each text by comparing and contrasting the information to elaborate a solid argument.

Prior to data collection, two 90-minutes workshops on study strategies were conducted by the first author during class time for each of the three groups of possible participants. These workshops were proposed to ensure participants have had contact with the strategies to be worked with in the study. The first workshop focused on highlighting and main idea identification, while the second focused on note-taking. They combined explicit instruction, individual and group practice.

**Phase 1**: In phase 1, participants were divided into three groups, aiming at mixing the order of the texts and the strategies to be applied with each text (Table 4).

## 4.3 Procedures

**TABLE 4 –** Design of the grouping per condition

| Group 1 | Group 2 | Group 3 |
|---------|---------|---------|
| Text 1 + Note taking | Text2 + Highlighting | Text3 + Rereading |
| Text2 + Rereading | Text3 + Note taking | Text 1+ Highlighting |
| Text3 + Highlighting | Text 1+ Rereading | Text2 + Note taking |

Participants were given the text and instructed to study its content (Table 5). Both written and oral instructions were provided; they varied depending on the condition.

**TABLE 5 –** Instructions per condition

| **Instructions for the rereading condition** |
|---|
| *Estude atentamente o texto abaixo. Você pode ler e reler quantas vezes quiser dentro do tempo estabelecido. Há um glossário ao final para ajudá-lo.* (Read carefully the text below. You can read and reread as many times as you want within the time set. There is a glossary at the end of the text to help you). |
| **Instructions for the highlighting conditon** |
| *Estude atentamente o texto abaixo. Você pode ler e realçar o texto usando marca-texto dentro do tempo estabelecido. Há um glossário ao final para ajudá-lo.* (Read carefully the text below. You can read and highlight the text using a highlighter within the time set. There is a glossary at the end of the text to help you). |
| **Instructions for the note-taking condition** |
| *Estude atentamente o texto abaixo. Você pode ler e tomar notas livremente na folha apropriada dentro do tempo estabelecido. Há um glossário ao final do texto para ajudá-lo.* (Read carefully the text below. You can take notes freely on a separate sheet of paper within the time set. There is a glossary at the end of the text to help you). |

When the time was over, they underwent the comprehension test (immediate written recall and true or false statements). This procedure was repeated in each of the three texts read.

**Phase 2:** Phase two happened one week after phase one. It aimed at measuring the students'

retention through a delayed recall: students were asked to write down as much as they could remember from each of the three texts they had read, one at a time. Delayed recalls were followed by the Critical writing task. They were instructed to write in Portuguese and to use all the information they could remember from the readings as well as their background knowledge in order to give support to their arguments, stating an informed opinion on the topic.

## 5 Data analysis

Three anonymous raters who were researchers in reading were asked to categorize all the statements from each text in main idea (M), supporting idea (S) and detail. The statements lacking inter-rater reliability were then analyzed by a fourth rater (Table 6).

**TABLE 6 –** Number of ideas of each text divided per category

|        | Main ideas | Supporting ideas | Details | TOTAL |
|--------|:----------:|:----------------:|:-------:|:-----:|
| TEXT 1 | 6          | 13               | 12      | 31    |
| TEXT 2 | 3          | 6                | 9       | 18    |
| TEXT 3 | 5          | 10               | 18      | 33    |

Additionally, the raters analyzed the true of false statements to check whether they carried explicit or implicit relations with the textual information, following the framework proposed by Pearson and Johnson (1974). Ratings were organized in a table which was used as a framework for analysis of the immediate and delayed recalls. As regards the critical writing task, analysis comprised checking whether the propositions encoded from the three previously read texts were explicitly mentioned in the students' writing. All levels of inference were taken into account as indexes of reconstructive use of the knowledge acquired.

## 6 Results and discussion

### 6.1 Effect of strategy use on comprehension

The average results of immediate recalls were first compared across conditions. Second, individual performance was analyzed. In general, a higher percentage of main ideas was reported in the immediate recalls compared to supporting ideas and details, in accordance with the literature (van DIJK; KINTSCH, 1983; TOMITCH, 2000, 2003).

More ideas were immediately recalled in the rereading condition (24,6% in relation to the total ideas of each text) compared to highlighting (22%

of the total ideas) and note taking (18,3% of the total ideas). The effect of rereading in immediate recall holds true for each of the levels of ideas: more main ideas (45,7%) were recalled after rereading compared to highlighting (44,6%) and note taking (30,3%), although we are aware that the difference between rereading and highlighting is minimum. Rereading was also associated with better recall of supporting ideas (33,3%) compared to highlighting (26,8%) and note taking (24,4%). As for the details of the texts read, 13,6% of the details were recalled in the rereading condition; 11,7% of the details were recalled in the highlighting condition, and 9,8% of the details were recalled after taking notes. From these results, it is possible to say that rereading has favored immediate recall of all levels of ideas compared to highlighting and note-taking, albeit highlighting almost paired with it in relation to the recall of main ideas.

Within-subject analyses showed that the percentage of total ideas immediately recalled was higher in the rereading condition (compared to highlighting and note-taking) for ten participants. Eight participants recalled more ideas in the highlighting condition. Only G1P19 had better immediate recall in the note-taking condition. In other words, more participants performed better in immediate recalls after rereading the

**Juliana do Amaral · Lêda Maria Braga Tomitch**
Comparing the effectiveness of study strategies on comprehension, retention, and learning from L2 English texts

**9/15**

texts. Eleven participants recalled more main ideas in the rereading condition, followed by six participants in the highlighting condition and two participants in the note-taking condition. As for supporting ideas, nine participants recalled more supporting ideas in the rereading condition. Five participants recalled more supporting ideas in the highlighting condition and five participants recalled more supporting ideas in the note-taking condition. Some participants could not remember any details regardless of condition, hindering analysis of this idea level. Thus, analysis of individual performance across levels of ideas shows participants' enhanced immediate recall after reading and rereading a text, compared to reading and highlighting and reading and taking notes.

The highlights and notes taken by participants were contrasted with immediate recalls. In general, 71% of the total ideas present in the immediate recalls of texts read under the highlighting condition had in fact been highlighted, while 66,7% of the total ideas immediately recalled from texts read in the note-taking condition had been annotated. This data shows a relationship between the use of active study strategies and comprehension.

Last, the average true or false test scores were grouped per text (Table 7) and compared across conditions. Scores in Text 1 were higher in the rereading condition compared to the highlighting and notetaking conditions. In the true or false of Text 2, answers were more accurate in the highlighting condition compared to rereading and note-taking. Last, performance in the true or false of Text 3 was also better after readers had highlighted the text than after rereading or taking notes. This data shows a relationship between the study of texts in the highlighting condition and high scores in the True or False Task (texts 2 and 3).

**TABLE 7 –** True/false test – average scores

| | |
|---|---|
| T1+ rereading | **4,75** |
| T1+ highlighting | 3,5 |
| T1 + note-taking | 4,4 |
| T2+ rereading | 2,8 |
| T2 + highlighting | **4** |
| T2 + note taking | 3,7 |
| T3 + rereading | 3,8 |
| T3 + highlighting | **4,2** |
| T3 + note taking | 3,75 |

### 6.1.1 Conclusions on the effects of study strategies on comprehension

In a nutshell, findings from the analyses of immediate recalls and true or false tasks indicate that rereading was linked with better immediate recall of main ideas, supporting ideas and details; highlighting was associated with higher scores in the true or false task. The relationship between massed rereading (i.e. rereading twice or more times in sequence) and enhanced immediate recall is coherent with previous studies (DUNLOSKY *et al*., 2013; KRUG; DAVIS; GLOVER, 1990; AMLUND; KARDASH; KULHAVY, 1986), especially regarding the immediate recall of main ideas after rereading.

Thus, in answer to RQ1, "Which study strategies, among highlighting, note-taking and rereading, promote better comprehension and immediate retention, as measured by a test containing true or false statements and an immediate recall?", Rereading was the strategy associated with better results in immediate recalls while highlighting was linked with higher scores in the true of false task for 2 out of the 3 texts. These results are coherent with literature in the area, which points to rereading and highlighting as beneficial strategies for comprehension (AMLUD *et al.*, 1986; KRUG *et*

al., 1990; DUNLOSKY et al., 2013; YUE; STORM; KORNELL; BJORK, 2015).

Notwithstanding, the efficiency of rereading has been questioned compared to other study methods. In the words of Callender and McDaniel (2009, p. 39) words, "rereading is not an especially effective use of a student's study time." (2009, p. 39). In addition, when rereading, processing remains at the text base and little effort is made to construct a situation model (CALLENDER; MCDANIEL, 2009). In other words, rereading does not stimulate further processing; the mental representation created remains at the text base each time a text is reread. In the present study, results from immediate recalls and students' reports pointed to rereading as a helpful tool to understand the text, but no evidence was found of elaboration.

### 6.2 Effects of strategy use on retention

The effect of study strategies on retention was investigated first by comparing the average results from the delayed recalls across conditions; second, individual performance was analyzed across conditions. In phase 2, results on strategy effectiveness were different for the delayed recalls compared to immediate recalls.

After a week delay, results indicated a connectedness between highlighting and enhanced delayed recall: in general, 15% of the total ideas were recalled after a delay when texts were read in this condition. Delayed recall of texts that were read and reread comprised 13,8% of the total ideas and 13% of the total ideas were recalled from texts that had been read in the note-taking condition. A higher percentage of main ideas was recalled after a delay across all texts when notes had been taken (32,4%), although highlighting (32,1%) has a similar result. In the rereading condition, only 17,6% of the main ideas were recalled. Highlighting also enhanced delayed recall of supporting ideas (23,9%), while rereading led to 17,6% of recall of supporting ideas; 14,3% of supporting ideas were recalled after taking notes. The percentage of details recalled after a one-week delay is not significant and will not be approached. Thus,

there was more retention of texts that had been read in the highlighting condition; main idea recall was similar in the note-taking and highlighting conditions.

The effectiveness of each condition is not so evident when measured in number of participants. In general (main ideas, supporting ideas and details altogether), having highlighted the text favored delayed recall for eight participants; six participants benefited from prior rereading and three participants performed better in the delayed recall of the previously annotated texts. Two participants were not included in this analysis because their results were similar across conditions. Seen separately, each level of textual hierarchy was influenced by one condition: retention of main ideas was better in the rereading condition for seven participants; the highlighting condition favored delayed recall of main ideas for five participants and delayed recall of details was better in the note-taking condition for four participants.

### 6.2.1 Conclusions on the effects of study strategies on retention

After seven days, highlighting was associated with enhanced recall. In addition, more main ideas were recalled in the note-taking condition, although highlighting has had a similar effect. This result is in consonance with previous studies which pointed to the relationship between highlighting and enhanced delayed recall (YUE; STORM; KORNELL; BJORK, 2015). Indeed, study strategies such as highlighting and note-taking, which demand active engagement from the reader, have been extensively referred to in reading research as more effective for retention and learning (NIST; SIMPSON, 2000; RAWSON; KINTSCH, 2005). In answer to RQ2 "Which study strategies, among highlighting, note-taking and rereading, promote better delayed retention, as measured by a free recall a week after reading each of the texts?", After a one-week delay, more total ideas were recalled among the texts that had been highlighted, and more participants in this condition performed better in delayed recalls.

Comparing the results from comprehension

**Juliana do Amaral · Lêda Maria Braga Tomitch**
Comparing the effectiveness of study strategies on comprehension, retention, and learning from L2 English texts

**11/15**

and retention exams allows us to affirm that, although rereading had a major impact on immediate comprehension, after a one-week delay its effect did not last, or has visibly weakened. Furthermore, rereading did not enhance delayed recall of main ideas. These findings are in accordance with previous studies (AMLUND *et al.*, 1986; TOMITCH, 2003; RAWSON; KINTSCH, 2005; CALLENDER; MCDANIEL, 2009) which demonstrated that rereading improved performance in immediate tests, but it did not improve performance in delayed tests. To incorporate the use of these active study strategies in reading behavior, Nist and Simpson (2000) point to the need of extensive practice over time, with focus on specific contexts and content domains. In this sense, highlighting and note taking differ from rereading, which requires minimal or no training. As the authors emphasize, the reward of such training is positive, since "active study strategies may lead to more pronounced learning gains" (2000, p.79).

### 6.3 Effects of strategy use on learning

The Critical writing task (henceforth CWT) was used as a learning measure and to check whether the strategies used when reading the texts had an impact on learning. A great number of participants (eleven from a total of nineteen, to be precise) wrote a full-page answer to the CWT, demonstrating willingness to elaborate on the topic. Participants mentioned information from the texts in their answers, either directly or indirectly. Although some references were not explicit, they were included in the analysis since the previous readings might have influenced the construction of an informed opinion on the topic. In total, there were 35 references to any of the ideas of the texts read a week before (T=82): 4 explicit references and 31 implicit references.

A significant number of participants did not explicitly mention the ideas present in the text, making learning assessment problematic. This might be associated with difficulty in encoding new information due to the strength of their existing conceptions and the learner's commitment

to them (DOLE, 2000). Another explanation is task design, which may not have provided a clear account of students' learning. A third explanation is the participants' possible lack of expertise in stating an opinion by citing sources of information that give credibility to the text. Noteworthy, the mentions comprised main ideas, supporting ideas and details, demonstrating that what was mindfully attended by the reader was retained and used regardless of the level of hierarchy in the text.

A positive impact of the CWT was its likely role in fostering deep processing of the material through elaborative inferencing (CRAIK; LOCKHART, 1972). As stated before, elaborative inferences are associations made by the reader between textual information and his/her prior knowledge; albeit not necessary for comprehension, they enhance memory of the text (VAN DIJK; KINTSCH, 1983; GAGNÉ *et al.*, 1993). Therefore, this task has led to improved learning results by demanding from the reader integration between newly acquired knowledge and long-term memory traces. Yet, we hypothesize that because of the difference in time between the readings and the learning task, the information from the texts faded in memory.

With regard to the effect of the strategies on learning, the relationship between reading condition and use of learned information in the critical writing tasks was not a straightforward one. Among the 35 ideas cited by participants in the CWTs, 15 had been read and reread (42,8%), and 12 had been studied under the highlighting condition (34,2%), and 8 had been read when taking notes (22,8%).

### 6.3.1 Conclusions on the effects of study strategies on learning

The results obtained by the Critical Writing task pointed to the participants' high motivation to write on the topic to be learned, as noted by the length of the answers. The effect of strategy use on learning was not very clear, since participants did not make numerous explicit mentions to the texts. Thus, in answering RQ3 "Which study strategies, among highlighting, note-taking and

rereading, promote better learning, as measured by a critical writing task?", we can say that it is not possible to establish a direct connection between strategy use and learning outcomes. Yet, we hypothesize a relationship between highlighting and learning outcomes, since the effects of highlighting endured delayed recall, and 34,2% of the ideas mentioned either directly or indirectly in the Critical Writing task had been read in this condition.

Contrary to our expectations that taking notes would involve a deep level of processing (CRAIK; LOCKHART, 1975) compared to highlighting, no effect of note-taking was found on learning. On the one hand, we assumed that participants would actively engage with the text through handwriting and possible elaboration (by restating the ideas) when taking notes. However, since we did not analyze the quality of the notes taken, participants may have just copied information from the text, engaging in shallow levels of processing. On the other hand, highlighting might have promoted strengthening of the code in memory (PAIVIO, 1986). This finding can also be explained in terms of task design: the effects of note-taking increase if the reader has the chance of studying his/her notes (MUELLER; OPPENHEIMER, 2014). Another possible explanation concerns participants' study habits: although note-taking was described as helpful in the retrospective questionnaire, it was rated as frequency 2 on a 4-point Likert scale (DO AMARAL, 2019, unpublished master's thesis). Goetz (1991) found a similar discrepancy between perceived strategy effectiveness and use; this mismatch is probably due to unwillingness to engage in deeper processing through the use of a more complex and time-consuming learning strategy.

## Final remarks

This study compared the use of the study strategies rereading, highlighting and note-taking on the levels of comprehension, retention and learning from texts in English as L2. At the comprehension level, rereading was associated with increased immediate recall, while highlighting was related to higher scores in the true or false task. Delayed recalls showed a relationship between highlighting and retention, and greater recall of main ideas that had been read in the note-taking condition, but differences were not significant. Last, the relationship between strategy use and learning was unclear, although there is a possible relation between highlighting and learning outcomes.

This study has some limitations. The first one concerns the sample size: nineteen students participated in the present study – which did not enable quantitative analysis. A second limitation is control of L2 proficiency: participants were all enrolled at the same intermediate level, but they were not formally assessed for their proficiency in English. This procedure would have made the sample more linguistically homogeneous, enhancing the reliability of the results. A third limitation regards prior knowledge: the topic (fake news and fact checking) was chosen based on the assumption that popular issues and news do not involve any specific area of expertise. Yet, adding a pretest writing could have ensured that the participants held the same amount of knowledge on the issue.

Another limitation concerns the effects of instruction. The two workshops on highlighting and note-taking offered to the participants prior to data collection were not a requirement for participation; their only goal was to ensure participants' knowledge of the study strategies to be worked with. Thus, it was unclear whether participants' metacognitive behavior was influenced by strategy instruction.

The last limitation of this study refers to its learning instruments and data analysis. The critical writing task was conceived to trigger the transfer of the ideas recalled after a delay. Nonetheless, participants made few explicit mentions to the ideas from the texts, hindering learning assessment. The difficulty relies on creating an instrument that enables the identification of accurate correlations between the use of study strategies and their impact on learning. In addition to task, a finer-grained analysis of the notes could have

unveiled the effect of verbatim copying x elaboration on the levels analyzed, following more recent studies on note-taking (MUELLER; OPPENHEIMER, 2014; HAGEN *et al.*, 2014). In addition, since the analysis focused on the comparison between immediate x delayed recall and the transfer of these ideas to the critical writing task, the issue of integration across multiple documents has not been explored.

As previously stated, conditional knowledge refers to the reader's ability to the act of evaluating and monitoring the appropriateness of a strategy considering the task and the text structure (PARIS *et al*, 1983). In this study, participants were randomly assigned to the text + strategy conditions and could not choose the strategies they would use in each text. Future studies could further investigate this aspect of comprehension monitoring and the effect of strategy selection on comprehension. Another facet of comprehension monitoring that calls for investigation is the combined use of strategies in L2 reading, following earlier works in L2 (DYER; RILEY; YEKOVICH, 1979).

Last, this study has some pedagogical implications. The first is the importance of fostering students' metacognitive awareness when reading in L2 and, in specific, awareness on study strategies (BAKER; BROWN, 1984; BAKER, 1989; PARIS; WASIK; TURNER, 1991; NIST; SIMPSON, 2000, SPRING, 1985). Especially in study situations, when readers have the goal of learning from text, simply reading does not suffice: learners need to be aware of the tools at their disposal as well as to reflect on how they should use study strategies, selecting the ones that are suitable to their goals, evaluating and monitoring the efficiency of these strategies, and making changes when necessary in order to optimize their learning. In this scenario, formal instruction on reading and study strategies is of paramount importance, and researchers point out the need for more studies on strategy instruction in classroom settings (NIST; SIMPSON, 2000; CHAMOT, 2005). In our study, the workshops had the objective of simply getting participants acquainted with the strategies; nevertheless, they fostered metacognitive thinking and gave participants ideas on how to use strategies more effectively, as well as practice. It is expected that the results here reported have somehow contributed to the discussions on metacognition and study strategies by providing evidence on the need for an active – albeit effortful – role of the student when reading a text with the objective of learning its content.

## Acknowledgments

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**Juliana do Amaral · Lêda Maria Braga Tomitch**
Comparing the effectiveness of study strategies on comprehension, retention, and learning from L2 English texts

**15/15**

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