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# The Role of Monitoring, Prior Knowledge, and Working Memory in University Students' Expository Text Comprehension

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ABSTRACT

The aim of this study is to analyze the impact of a monitoring strategy on the comprehension of expository texts, taking into account the influence of prior knowledge and working memory capacity in university students. Two experiments were conducted. The first investigated whether the use of the monitoring strategy enhanced comprehension of expository texts that required different levels of prior knowledge. The second experiment enquired into the role of working memory in conjunction with the monitoring strategy and varying levels of prior knowledge. The results revealed that the use of the monitoring strategy improved comprehension regardless of prior knowledge level. Furthermore, high working memory capacity is found to be associated with better comprehension, particularly in texts with low prior knowledge content. These findings highlight the importance of considering both the monitoring strategy and working memory capacity in the comprehension of expository texts, with implications for university contexts.

## El rol del monitoreo, el conocimiento previo y la memoria operativa en la comprensión de textos expositivos en estudiantes universitarios

*Palabras clave:*
Monitoreo de la comprensión
Texto expositivo
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RESUMEN

Este trabajo tiene como propósito examinar el efecto de una estrategia de monitoreo en la comprensión de textos expositivos, teniendo en cuenta la influencia del conocimiento previo y la capacidad de la memoria operativa en alumnos universitarios. Se realizaron dos experimentos, el primero de los cuales investigó si el uso de la estrategia de monitoreo mejora la comprensión de textos expositivos con diferente nivel de conocimiento previo y el segundo exploró el papel de la memoria operativa. Los resultados revelan que el uso de la estrategia de monitoreo mejora la comprensión independientemente del nivel de conocimiento previo. Además, se encontró que una gran capacidad de memoria operativa se asociaba con una mejor comprensión, especialmente en textos de escaso conocimiento previo. Estos resultados subrayan la importancia de considerar tanto la estrategia de monitoreo como la capacidad de la memoria operativa en la comprensión de textos expositivos, con implicaciones para el ámbito universitario.

It is a key expectation of university education that students will acquire course content through reading texts, particularly expository texts. It is therefore evident that the capacity to comprehend these texts is of paramount importance for academic success (Savolainen et al., 2008; Tibken et al., 2022). Prior research with university students has indicated that a significant challenge they encounter is the ability to engage in critical reading of the material they are reading (Din, 2020).

Expository texts represent a vital instrument for both learning and critical thinking (Marzban & Barati, 2016; Mason et al., 2013). In general, their purpose is to inform the reader about new concepts, abstract realities, and provide technical information, often on unfamiliar content (Ray & Meyer, 2011; Singer & O'Connell, 2003). In specific disciplines, such as chemistry, physics, history, and/or linguistics, students are required to engage with a range of expository sequences within the pedagogical curriculum, including biographies, explanations of concepts, non-fiction narrative structures, persuasive texts, and procedural texts (Martin, 2019). The inherent complexity of expository texts presents a significant challenge to comprehension (Kraal et al., 2017; Singer & O'Connell, 2003).

To comprehend a text successfully, readers must actively construct a mental model of the situation described in the text or a coherent

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mental model of the text itself (Kintsch, 1998). The construction-integration model posits that text comprehension involves constructing a situation model (Cook & O'Brien, 2023; Kendeou et al., 2014; Kintsch, 1988). This process goes beyond representing individual words or sentences, requiring readers to integrate these meanings into a coherent whole, aided by prior knowledge (Van Dijk & Kintsch, 1983). It is important to acknowledge that this mental representation undergoes continuous refinement as readers progress through the text, integrating successive ideas and concepts into their existing mental model (Rapp & Kendeou, 2007).

While there are not many studies on reading comprehension difficulties in adults, data from the National Center for Education Statistics in 2017 (National Center for Education Statistics, 2019) indicate that one in five adults in the United States struggles with basic reading skills. For this reason, recent research suggests that it is important to better understand these difficulties in adults by analyzing the skills involved in comprehension (Talwar et al., 2021; Tighe et al., 2023). These comprehension difficulties may be linked to limitations in working memory capacity (Carretti et al., 2009; Prat et al., 2016) and a lack of effective metacognitive strategies, such as comprehension monitoring (Tibken, et al., 2022; Tighe et al., 2023).

According to Oakhill and Cain's comprehension model (Oakhill, Berenhaus, et al., 2015; Oakhill & Cain, 2007, 2013, 2019; Oakhill et al., 2015), three key skills are identified as essential for constructing a coherent mental model of a text: inference making, comprehension monitoring, and understanding text structure. Each of these processes plays a critical role in determining how effectively a reader can understand and integrate information from a given text (Oakhill & Cain, 2018). Inference-making involves going beyond the explicit content of the text to generate meaning by integrating information from different parts of the text or by drawing on prior knowledge. Inferences are crucial for establishing both local coherence—linking ideas between adjacent sentences—and global coherence, which integrates information across larger sections of the text (Oakhill, Cain, et al., 2015). Comprehension monitoring refers to a reader's ability to evaluate their understanding of the text and to detect inconsistencies or gaps in meaning (Oakhill & Cain, 2007). The ability to understand the structure of a text, particularly its narrative or organizational features, is another vital component of comprehension. Knowledge of text structure helps readers anticipate the purpose of different sections of a text, such as introductions and conclusions, and facilitates the construction of a coherent representation of the text's meaning (Oakhill & Cain, 2007; Oakhill et al., 2019).

Of the proposed skills, one key skill is comprehension monitoring, a metacognitive ability (Ehrlich, 1996). Monitoring refers to a reader's ability to assess and regulate their understanding of the text (Ehrlich, 1996; Kim et al., 2018; Oakhill et al., 2005; Tibken et al., 2022; Tighe et al., 2023). In this sense, comprehension monitoring involves more than merely reading words and sentences; readers must continually evaluate their understanding, attending to the information provided by the text and drawing on their prior knowledge. Through monitoring, a reader can detect inconsistencies or contradictory information and adopt appropriate strategies to address comprehension problems that arise. To assess comprehension monitoring, researchers often use error detection tasks (Kim et al., 2018; Tibken et al., 2022). In these tasks, readers are asked to determine whether a story, paragraph, or sentence makes sense, requiring them to identify inconsistencies or incoherencies, such as nonexistent words, violations of prior knowledge, or internal contradictions. Previous studies indicate that participants who effectively monitor the text demonstrate successful comprehension (Kim et al., 2018; Oakhill et al., 2005; Tibken et al., 2022) and those trained in monitoring also show improved subsequent performance (Wassenburg et al., 2015). In most of these studies external measures have been used to evaluate monitoring without analyzing the comprehension of the same text being monitored.

Text comprehension depends on having appropriate prior knowledge related to the content being read (McNamara & Kintsch, 1996; Perfetti & Stafura, 2014; Smith et al., 2021). This is because comprehending the meaning of words and concepts in the text enables connections to be made between different parts of the text, facilitating the integration of the material with knowledge stored in memory (Gromley et al., 2010; Kendeou et al., 2009; Kendeou et al., 2014). By grasping the meaning of words and concepts, students can establish these connections and relate the text to their existing knowledge. Numerous studies have demonstrated the facilitating role of domain-specific prior knowledge in text recall, inference generation, and problem-solving (Kieffer & Stahl, 2016; O'Reilly & McNamara, 2007; Rapp & Kendeou, 2007; van den Broek et al., 2016). These studies argue that pre-reading information contributes to maintaining a more organized representation in memory for later retrieval (Kieffer & Stahl, 2016; van den Broek et al., 2016). Previous research in this field indicates that students perform worse when dealing with unfamiliar or texts for which they have low prior knowledge (Burin et al., 2015; Burin et al., 2018), a situation that mirrors the challenges faced by adults with reading difficulties or students beginning a new academic subject.

An important cognitive aspect in text comprehension relates to working memory (van den Broek et al., 2015). Working memory is a cognitive system responsible for the temporary maintenance and manipulation of information while performing complex tasks such as text comprehension. It involves not only holding information temporarily but also processing it simultaneously, integrating it with other knowledge (Baddeley, 2012; Baddeley et al., 2020). Differences in working memory capacity have been observed to directly impact comprehension in both adults and children (Budd et al., 1995; Cain et al., 2004; Daneman & Carpenter, 1980; Prat et al., 2016; Wu et al., 2020). Studies indicate that greater working memory capacity facilitates the retention and processing of more text information, allowing for the integration of information with prior knowledge and supporting the construction of a coherent representation (van den Broek et al., 2015). This capacity is crucial for effective text comprehension, as it enables the continuous processing and integration of relevant information. Working memory capacity is typically assessed through tasks that evaluate the ability to store and manipulate information simultaneously, such as complex span tasks, which involve recalling sequences of items while performing additional processing tasks (Baddeley et al., 2020; Daneman & Carpenter, 1980).

Given the importance of prior knowledge and working memory in text comprehension, this study aims to contribute to the understanding of cognitive processes involved in reading with implications for teaching and learning, particularly at the university level. Specifically, this study investigates the role of comprehension monitoring strategies in expository text comprehension, considering how these strategies interact with prior knowledge and working memory capacity. In this context, comprehension monitoring strategies may serve as a key metacognitive tool to enhance performance.

The specific questions this study aims to answer are: (1) Does the use of a monitoring strategy improve the comprehension of expository texts, both in high knowledge and low knowledge texts? (2) Are there interactions between the use of a monitoring strategy and the level of knowledge (high vs. low) on text comprehension? (3) How does working memory capacity influence the comprehension of high knowledge and low knowledge texts? (4) Are there interactions between working memory capacity and the use of a monitoring strategy in the comprehension of high and low knowledge texts? (5) Does the level of knowledge mitigate the effects of limited working memory capacity on text comprehension, and how do these factors interact with the use of monitoring strategies?

Two studies were conducted: the first study examined whether the use of monitoring strategy enhances comprehension of high knowledge text and low knowledge text, while the second study analyzed the role of working memory in the comprehension of high and low knowledge expository text, with or without employing the monitoring strategy. In both experiments, prior knowledge was defined as the level of familiarity with the content of the text, determined by whether the text covered familiar (high knowledge) or unfamiliar (low knowledge) topics (Burin et al., 2015). Meanwhile, text comprehension is defined by the performance on a multiple-choice questionnaire administered immediately after reading, which evaluates the ability to recall, infer, and understand the text's content. Experiment 1 was designed as a baseline study to establish whether the expected effects of the monitoring strategy on text comprehension were present. This was done to provide a foundational understanding before moving on to Experiment 2, where the role of working memory capacity in these effects was further analyzed.

## Experiment 1

The purpose of the following study was to analyze whether the use of a monitoring strategy improved text comprehension and whether readers demonstrated differences in the comprehension of high and low knowledge expository text due to the use of the monitoring strategy. We hypothesized that readers would show better performance in comprehension when effectively utilizing a monitoring strategy and would also demonstrate better comprehension of high knowledge text compared to low knowledge text.

### Method

#### *Participants*

The sample consisted of 48 volunteers from an original pool of 62 (mean age = 21.81, *SD* = 3.48, female percentage = 77.41%), all university students enrolled in the Psychology program at the University of Buenos Aires, with an average age of 22.23 years (*SD* = 3.76), ranging from 18 to 45 years old. Among them, 10 were male (20.8%) and 38 were female (79.2%). Fourteen participants were excluded based on methodological criteria, as explained in detail in the procedure section of Experiment 1. Participants had completed the introductory first year and were in their second or third year of the program. Students were recruited through advertisements within the faculty, and those who participated provided informed consent. To ensure ethical considerations, the researchers were not instructors of the participating students.

#### *Materials and Design*

Four expository texts were used (Burin et al., 2015; Burin et al., 2018), two with high prior knowledge in Cognitive Psychology (one text about memory processes and another about language comprehension), and two with low prior knowledge in natural sciences (one text about telescopes and another about particle physics). All four texts ranged from 712 to 719 words and followed the same expository structure: (1) General concept, (2) Subordinate concept A, (3) Details of concept A, (4) Subordinate concept B, (5) Details of concept B, (6) Problem or comparison relating A to B, and (7) Conclusion.

Based on these texts, four additional versions were created, each containing ten incongruent sentences. These incongruent sentences were defined as sentences that disrupted the logical flow or structure of the text, creating inconsistencies or contradictions within the expository argument. These sentences were designed to be easily identifiable if readers were effectively monitoring the coherence of the text. An example of an incongruent sentence used in the memory processes text was: "Long-term memory retains the information present for about fifteen seconds", included in a text that talks about long-term memory and provides information about the characteristics of short-term memory. The monitoring manipulation involved asking participants to mark these incongruencies during their second reading of the text in the directed monitoring condition. Both the original and modified texts (with and without incongruent sentences) were used across the different conditions, with participants in the control condition reading the texts without being prompted to monitor for inconsistencies.

To ensure comparability in terms of readability and difficulty, objective measures were calculated for all four texts. The readability index, μ (Muñoz & Muñoz, 2019), categorized all texts as difficult, with scores ranging from 39.42 to 49.67. The Inflesz Scale (Barrio-Cantalejo et al., 2008) classified the texts as somewhat difficult, with scores between 47.41 and 52.44. These findings confirm that the texts were comparable in terms of readability and difficulty across both high and low prior knowledge conditions.

The design of the study followed a 2 x 2 within-subjects model, with two factors: prior knowledge (high vs. low) and monitoring strategy (with vs. without directed monitoring). Each participant read four texts: one high prior knowledge text without monitoring strategy, one high prior knowledge text with monitoring strategy, one low prior knowledge text without monitoring strategy, and one low prior knowledge text with monitoring strategy.

Participants' performance was evaluated through comprehension questionnaires, each consisting of ten multiple-choice questions with four answer options, only one of which was correct. Reliability analyses demonstrated good internal consistency (Cronbach's alpha = .71, Guttman's lambda 6 = .83 for low prior knowledge texts; Cronbach's alpha = .66, Guttman's lambda 6 = .80 for high prior knowledge texts), with item-test correlation values ranging from .21 to .96. The materials, including the texts and comprehension questionnaires, are available at the following link: https://osf.io/xwy9g/?view_only=20c506036747473e8c9ea80d1cf45631

#### *Procedure*

Participants who had previously completed the first introductory year in a psychology program (who successfully passed content about cognitive processes) were tested in small groups of no more than eight participants, all in a single session. Each participant was presented with the four expository texts in random order. The presentation of texts was counterbalanced to control for order effects. Participants read texts that varied in both prior knowledge level and monitoring strategy. The high prior knowledge texts included topics on memory processes and language comprehension, while the low prior knowledge texts covered telescopes and particle physics. In the monitoring condition, participants were instructed to identify and mark ten incongruent sentences during their second reading of each text. In the non-monitoring condition, participants read the texts twice without being asked to mark any inconsistencies. The presentation order of texts was fully counterbalanced across participants to ensure that all participants experienced each condition across both levels of prior knowledge. Some participants began with a high prior knowledge text without a monitoring strategy, followed by a low prior knowledge text with a monitoring strategy, and vice versa. This setup ensured that the effects of text order were minimized.

From the original sample of 62 participants, 14 were excluded for failing to correctly identify at least six of the ten inconsistencies presented in the texts under the monitoring condition. This exclusion criterion was based on the methodological goal of ensuring that participants were effectively engaging in the directed monitoring task. Identifying fewer than 60% of the incongruent sentences indicated insufficient engagement with the monitoring manipulation.

**Table 1.** Descriptive Statistics of Experiment 1 and Normality Test

| Monitoring Strategy | Prior Knowledge | | | 95% CI | | KS | *p* |
|---|---|---|---|---|---|---|---|
| | | *Mdn* | *SD* | Below | Upper | | |
| With strategy | High | 6.88 | 1.86 | 6.29 | 7.46 | 0.94 | .35 |
| | Low | 5.85 | 1.86 | 5.27 | 6.44 | 1.03 | .24 |
| No strategy | High | 5.46 | 2.30 | 4.87 | 6.04 | 1.05 | .22 |
| | Low | 4.65 | 2.15 | 4.06 | 5.23 | 1.08 | .19 |

*Note. M* = mean; *SD* = standard deviation; CI = confidence interval; KS = Kolmogorov-Smirnov.

### *Data Analysis*

Before performing the corresponding statistical analysis, the assumptions for the analysis were checked. The results obtained from the comprehension tests were analyzed in a two-way ANOVA analysis with repeated measures, based on a 2x2 fixed-effects model, with the factors of prior knowledge and use of the monitoring strategy considered. Effect size was analyzed using the partial eta squared statistic ($\eta^2_p$). Additionally, a sensitivity analysis was conducted to ensure the robustness of the results against random guessing. For this, a corrected version of the dependent variable was computed by penalizing errors. Specifically, this correction involved subtracting one point for each incorrect response to account for chance guessing. The statistical analysis was then replicated using this corrected variable.

## Results

The results obtained from the comprehension test questionnaires for expository texts were analyzed, and first the descriptive statistics obtained are shown, together with the estimation of the normality of the distribution of the scores (Kolmogorv-Smirnov test). Table 1 shows the results obtained.

After checking the assumption of normality of the distributions, the analysis of variance was performed and detected a main effect of the monitoring strategy, $F(1, 47) = 18.22$, $p < .001$, $\eta^2_p = .28$, and a main effect of prior knowledge, $F(1, 47) = 24.10$, $p < .001$, $\eta^2_p = .34$. No interaction effect was found, $F(1, 47) = 0.36$, $p = .55$, $\eta^2_p = .01$.

The results show that students who read expository texts with a directed monitoring strategy ($M = 6.36$, $SE = 0.23$, 95% CI [5.90, 6.83]) performed significantly better than those who read texts without a directed monitoring strategy ($M = 5.05$, $SE = 0.30$, 95% CI [4.45, 5.65]). Additionally, students performed significantly better when reading high-knowledge texts ($M = 6.17$, $SE = 0.24$, 95% CI [5.69, 6.65]) compared to low-knowledge texts ($M = 5.25$, $SE = 0.24$, 95% CI [4.77, 5.73]).

The sensitivity analysis conducted to assess the robustness of the results against random guessing indicated a main effect of the monitoring strategy, $F(1, 47) = 16.86$, $p = .002$, $\eta^2_p = .26$, and a main effect of prior knowledge, $F(1, 47) = 22.91$, $p < .001$, $\eta^2_p = .33$. No interaction effect was detected, $F(1, 47) = 0.44$, $p = .51$, $\eta^2_p = .01$.

## Discussion

Experiment 1 aimed to investigate the role of monitoring strategy and prior knowledge in the comprehension of expository texts. The results indicate that both the use of monitoring strategy and the level of prior knowledge of expository texts play an important role in comprehension. Specifically, the use of monitoring strategy in text comprehension, regardless of prior knowledge level, shows a positive effect on comprehension, highlighting the significance of this metacognitive skill as a process that aids in constructing meaning (Cain & Oakhill, 2014; Oakhill & Cain, 2007, 2013; Oakhill et al., 2019). The findings of this experiment suggest that readers who can evaluate and regulate their comprehension in real time demonstrate better performance in comprehending expository texts. Moreover, the sensitivity analysis conducted to assess the robustness of the results against random guessing confirmed the consistency of the observed effects. Even after penalizing errors due to potential guessing, the significant effects of both the monitoring strategy and prior knowledge on comprehension remained, supporting the robustness of these findings.

Furthermore, these results underscore the role of prior knowledge in text comprehension. (Cain & Oakhill, 2014; Kieffer & Stahl, 2016; Oakhill, Cain, et al., 2015; Ouellette, 2006; Sterpin et al., 2021). When readers engage with texts that align with their prior knowledge, such as familiar topics, they are able to build a more coherent and integrated mental representation of the information provided in the text. This facilitates better comprehension and enables them to perform better in tasks that require answering questions about the text. High-knowledge texts allow readers to establish clearer connections between different parts of the text and integrate the information into their existing memory structures, leading to more effective retrieval of that information. This process has been well-documented in the literature, which highlights that the organization of prior knowledge in memory significantly influences how readers comprehend, organize, and retrieve information from texts (Cain & Oakhill, 2014; Kieffer & Stahl, 2016; Ouellette, 2006).

Additionally, the results emphasize the benefit of employing a monitoring strategy during reading. By using such strategies, readers are forced to pay closer attention to the text, actively detecting inconsistencies, which aids in building a clearer representation of the text's content (Kim et al., 2018; Oakhill et al., 2005; Tibken et al., 2022). In doing so, they must differentiate between information congruent with the text's global meaning and any incongruencies encountered. This process helps to solidify their understanding of the material, leading to a more robust mental representation of the text. As a result, readers demonstrate improved performance in comprehension tasks, regardless of their familiarity with the topic. The monitoring strategy, therefore ensuring a deeper and more integrated understanding of the material.

## Experiment 2

Experiment 2 aimed to examine the effect of working memory in the comprehension of high and low knowledge expository text, with the use of monitoring strategy, following the hypothesis that readers with high working memory capacity will demonstrate significantly better performance than readers with low capacity, as observed in previous studies (Oakhill et al., 2005; Prat et al., 2016).

In this study, an extreme-groups design was adopted, focusing on participants with either low or high WMC. Specifically, only participants who scored at or below the 25th percentile and those who scored at or above the 75th percentile on a standardized WMC test were included in the analysis. This decision is consistent with the extreme-groups methodology frequently applied in psychology research (Conway et al., 2005; Preacher, 2015). According to Conway et al. (2005), the use of extreme groups provides several methodological advantages. First, it increases the efficiency in detecting relationships between WMC and experimental tasks, as comparing participants at the extremes of the distribution enhances the likelihood of observing significant effects. Second, this approach reduces the risk of classification errors, as classifying participants in the upper and lower quartiles minimizes the variability found in those with moderate WMC scores, where misclassification is more likely. Lastly, the use of extreme groups is considered cost-effective, as it allows researchers to obtain meaningful results without requiring data from the entire sample, thus optimizing both time and resources.

## Method

### Participants

From an initial sample of 120 participants (mean age = 22.60 years, *SD* = 3.57, 80% female), all university students enrolled in the Psychology program, we selected for the experiment participants with low working memory capacity (percentile equal or lower than 25 on a working memory task) and high working memory capacity (percentile equal or higher than 75), with a minimum of 60% accuracy in detecting inconsistencies during the monitoring task. The final sample consisted of 68 participants, with 34 high working memory capacity individuals (23 females and 11 males, mean age = 22.39 years, *SD* = 3.51) and 34 low working memory capacity individuals (27 females and 7 males, mean age = 22.77 years, *SD* = 3.52). All participants had successfully completed their first year of studies and were currently enrolled in the second or third year of the Psychology program. Participants voluntarily agreed to take part in the study after providing informed consent. Importantly, to maintain ethical standards, none of the researchers had any instructional role or direct academic relationship with the students involved in the experiment.

### Materials and Design

The materials used in Experiment 2 were the same as those used in Experiment 1, consisting of four expository texts (two high-knowledge and two low-knowledge texts), along with comprehension questionnaires. Additionally, a verbal working memory task was administered: the Letter-Digit Span task from the BIMET-V (Verbal Working Memory Battery; Barreyro et al., 2019). This task assesses verbal working memory capacity by testing the ability to store and process information simultaneously. In the task, participants were shown sequences of numbers and letters on a computer screen. After viewing the items, they were instructed to recall and re-arrange the items, first placing the letters in alphabetical order and then the numbers in ascending order. The number of items presented increased from two to seven across trials, and the task was discontinued when participants failed to correctly recall and re-arrange the stimuli in two consecutive trials at the same level. The test shows satisfactory reliability coefficients, with a Cronbach's alpha of .84 reported in the original study (Barreyro et al., 2019).

The experimental design followed a 2 x 2 x 2 mixed design, with repeated measures for the factors of prior knowledge (high vs. low) and monitoring strategy (with vs. without monitoring), and independent measures for the factor of working memory capacity (high vs. low). The key distinction in this experiment was the inclusion of the working memory capacity assessment, which was used to divide participants into two groups: low working memory capacity (scoring at or below the 25th percentile) and high working memory capacity (scoring at or above the 75th percentile), according to extreme groups design (Conway et al., 2005; Preacher, 2015).

### Procedure

Participants took part in two testing sessions. In the first, individual session, participants completed the working memory task to assess their verbal working memory capacity. Based on their scores, only participants who scored at or below the 25th percentile (low WMC, score $\leq 8$) or at or above the 75th percentile (high WMC, score $\geq 13$) were selected to proceed to the second session.

In the second session, which was conducted in small groups of no more than eight participants, the procedure was similar to that of Experiment 1. Participants read four expository texts, each with either a high or low prior knowledge level, and with or without a monitoring strategy. In the monitoring condition, participants were instructed to mark incongruent sentences during their second reading, as in Experiment 1. The presentation order of texts was counterbalanced across participants to control for order effects.

Unlike Experiment 1, where all participants were included in the final analysis, Experiment 2 only included participants from the extreme groups of WMC. Out of the original pool of 120 volunteers, 46 participants were excluded after the first session because their WMC scores fell between the 25th and 75th percentiles. Additionally, six participants were excluded after the second session because they identified less than 60% of the incongruities in the monitoring condition, suggesting insufficient engagement with the task.

### Data Analysis

The results from the comprehension task of high and low prior knowledge texts, with and without monitoring strategies, were analyzed using a three-factor 2 x 2 x 2 ANOVA model with fixed effects. This analysis incorporated repeated measures for the factors of prior knowledge and monitoring strategy, and independent measures for the working memory factor. To carry out this analysis, the assumptions were first checked. Effect size was calculated using the partial eta squared statistic.

**Table 2.** Descriptive Statistics of Experiment 2 and Normality Test

| Working Memory Capacity | Monitoring Strategy | Prior Knowledge | *M* | *SD* | 95% CI | | KS | *p* |
|---|---|---|---|---|---|---|---|---|
| | | | | | Below | Upper | | |
| High | With strategy | High | 7.26 | 1.80 | 6.64 | 7.89 | 1.27 | .08 |
| | | Low | 7.00 | 1.30 | 6.55 | 7.45 | 1.20 | .11 |
| | No strategy | High | 6.65 | 1.43 | 6.15 | 7.15 | 1.05 | .22 |
| | | Low | 5.68 | 1.36 | 5.20 | 6.15 | 1.29 | .07 |
| Low | With strategy | High | 6.50 | 2.00 | 5.80 | 7.20 | 0.75 | .63 |
| | | Low | 5.12 | 1.74 | 4.51 | 5.72 | 1.35 | .05 |
| | No strategy | High | 5.65 | 2.72 | 4.70 | 6.60 | 1.10 | .18 |
| | | Low | 4.06 | 2.51 | 3.18 | 4.93 | 0.93 | .35 |

*Note. M* = mean; *SD* = standard deviation; CI = confidence interval; KS = Kolmogorov-Smirnov.

## Results

First, descriptive and distribution statistics were obtained for measures of comprehension of high and low prior knowledge expository texts, read with and without monitoring strategy, for readers with high and low working memory capacity (see Table 2 and Figure 1).

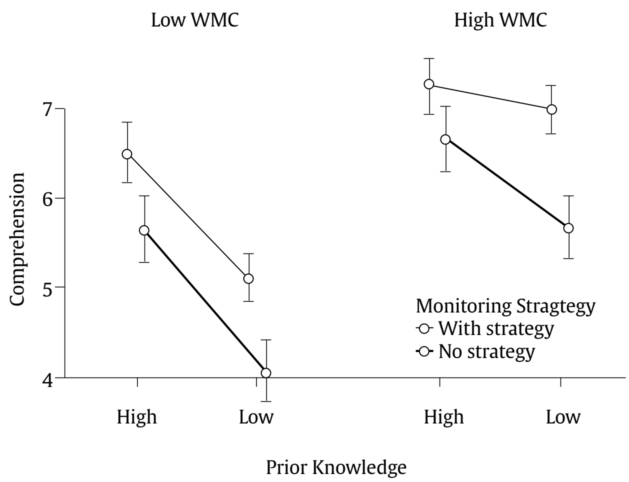


**Figure 1.** Mean and 95% Confidence Interval of Comprehension Scores by Working Memory Capacity, Monitoring Strategy, and Prior Knowledge.

The analysis of variance revealed a main effect of working memory capacity, $F(1, 66) = 14.40$, $p < .001$, $\eta^2_p = .18$, a main effect of monitoring strategy, $F(1, 66) = 18.79$, $p < .001$, $\eta^2_p = .22$, and a main effect of prior knowledge, $F(1, 66) = 47.36$, $p < .001$, $\eta^2_p = .42$. Regarding interaction effects, there was a significant interaction between prior knowledge and working memory capacity, $F(1, 66) = 8.06$, $p = .006$, $\eta^2_p = .11$, but no interactions were observed between monitoring strategy and working memory, $F(1, 66) = 0.00$, $p = .97$, $\eta^2_p = .00$, between monitoring strategy and prior knowledge, $F(1, 66) = 2.16$, $p = .15$, $\eta^2_p = .03$, or in the overall interaction, $F(1, 66) = 0.65$, $p = .42$, $\eta^2_p = .01$.

Examining the effect of working memory capacity on text comprehension, readers with high capacity showed significantly higher performance (*M* = 6.65, *SE* = 0.25, 95% CI [6.16, 7.14]) compared to readers with low capacity (*M* = 5.33, *SE* = 0.25, 95% CI [4.84, 5.82]). Analyzing the impact of the monitoring strategy, readers who employed directed monitoring during text reading exhibited significantly higher performance (*M* = 6.47, *SE* = 0.18, 95% CI [6.10, 6.84]) compared to those who read without directed monitoring (*M* = 5.51, *SE* = 0.23, 95% CI [5.06, 5.96]).

Regarding prior knowledge, participants who answered questions about high prior knowledge texts showed significantly higher performance (*M* = 6.51, *SE* = 0.20, 95% CI [6.11, 6.92]) than participants who read low prior knowledge texts (*M* = 5.46, *SE* = 0.18, 95% CI [5.11, 5.81]). Analyzing the interaction between working memory capacity and prior knowledge, readers with high working memory capacity did not differ in performance between high-knowledge texts (*M* = 6.96, *SE* = 0.29, 95% CI [6.38, 7.53]) and low-knowledge texts (*M* = 6.34, *SE* = 0.25, 95% CI [5.84, 6.84]). In contrast, readers with low working memory capacity showed significant differences in performance between high-knowledge texts (*M* = 6.07, *SE* = 0.29, 95% CI [5.50, 6.64]) and low-knowledge texts (*M* = 4.59, *SE* = 0.25, 95% CI [4.11, 5.09]). Confidence intervals revealed no differences during high-knowledge text reading between high and low working memory readers, but significant differences were observed during low-knowledge text reading, with high working memory readers performing significantly better than low working memory readers.

## Discussion

The purpose of Experiment 2 was to analyze the role of directed monitoring strategy in reading high and low knowledge expository text with high and low prior knowledge. The results are consistent with those found in Experiment 1, highlighting the role of a directed monitoring strategy in comprehending expository texts regardless of working memory capacity. Similar to the findings of Experiment 1, Experiment 2 indicates that readers who employ a directed monitoring strategy while reading a text demonstrate higher comprehension performance, with this outcome not being associated to other variables such as prior knowledge or working memory.

Regarding the role of working memory capacity in comprehending expository texts, the findings revealed a nuanced picture. Several studies in the text comprehension fields, both in children and adults (Borella & de Ribaupierre, 2014; Oakhill et al., 2005; Prat et al., 2016; Schwering & MacDonald, 2020), observed that readers with high working memory capacity exhibit significantly higher performance than those with low capacity. Nonetheless, the analysis detected an interaction effect between prior knowledge and working memory, suggesting that when reading high knowledge text, readers with high and low working memory capacity do not show significant differences. However, when reading low knowledge text, readers with high working memory capacity demonstrate higher performance than those with low capacity. Additionally, readers with low working memory capacity show significantly higher comprehension when reading high knowledge text compared to reading low knowledge text. This result indicates that prior knowledge reduces comprehension This supports the idea that working memory plays a crucial role in the simultaneous processing and manipulation of information in expository texts. Readers with high working memory capacity are better equipped to handle the cognitive load involved in integrating new and previously introduced concepts, especially when encountering unfamiliar content. In contrast, when prior knowledge is available, it can act as a scaffold that helps reduce the cognitive demands, effectively compensating for lower working memory capacity. differences among readers with varying cognitive capacities, such as working memory.

## General Discussion

This study aimed to explore the role of monitoring strategy, prior knowledge, and working memory in the comprehension of expository texts, with the goal of contributing to the understanding of cognitive processes involved in comprehension, particularly in the context of university students. Specifically, the study sought to address five key questions: (1) Does the use of a monitoring strategy improve the comprehension of expository texts, both in high knowledge and low knowledge texts? (2) Are there interactions between the use of a monitoring strategy and the level of knowledge (high vs. low) on text comprehension? (3) How does working memory capacity influence the comprehension of high knowledge and low knowledge texts? (4) Are there interactions between working memory capacity and the use of a monitoring strategy in the comprehension of high and low knowledge texts? (5) Does the level of knowledge mitigate the effects of limited working memory capacity on text comprehension, and how do these factors interact with the use of monitoring strategies? To address these questions, two experiments were conducted: the first investigated the role of a directed monitoring strategy in comprehending texts with high and low prior knowledge, while the second experiment analyzed the role of working memory in conjunction with monitoring strategy and prior knowledge.

The first research question asked whether the use of a monitoring strategy improves the comprehension of expository texts, both in high-knowledge and low-knowledge texts. The results of Experiment

1 answered this question, indicating that both the use of a monitoring strategy and the level of prior knowledge significantly influence comprehension of expository texts. This supports the importance of metacognitive aspects and prior knowledge in constructing meaning during reading. Specifically, employing a monitoring strategy during reading demonstrated a positive effect on comprehension, regardless of the prior knowledge level. This finding aligns with the comprehension model proposed by Oakhill and Cain (Oakhill et al., 2005), which emphasizes monitoring as a crucial component of text comprehension. Monitoring refers to the ability to analyze the state of text comprehension in real-time, regulating comprehension as inconsistencies are detected. In this experiment, participants were instructed to intentionally use this strategy to identify inconsistencies within the texts, and the results indicated that those who employed monitoring intentionally showed improved comprehension compared to those who did not.

The second research question explored whether there are interactions between the use of a monitoring strategy and the level of knowledge (high vs. low) on text comprehension. Although Experiment 1 demonstrated a robust main effect of monitoring strategy, no significant interactions were found between the strategy and prior knowledge. This suggests that monitoring strategies benefit comprehension regardless of the reader's familiarity with the topic, indicating that monitoring serves as a valuable tool for constructing coherent mental representations of the text, whether the reader has high or low prior knowledge. Additionally, the study found that texts addressing familiar topics were better understood than those on less familiar topics. Prior knowledge plays a critical role in text comprehension, as it facilitates the integration and organization of new information with existing memory structures, enhancing overall comprehension (Ouellette, 2006). The familiar content allowed participants to more easily establish connections between different parts of the text, reinforcing their ability to construct a coherent representation.

The third research question focused on how working memory capacity influences the comprehension of high-knowledge and low-knowledge texts. Experiment 2 addressed this question, confirming that working memory plays a significant role in the comprehension of expository texts. Readers with high working memory capacity performed better in comprehension tasks than those with low capacity, which is consistent with prior research emphasizing the importance of working memory in reading comprehension (McVay & Kane, 2012; Schwering & MacDonald, 2020). Working memory supports the retention and concurrent processing of information, enabling readers to manage complex expository texts by keeping relevant information active while integrating new content. This underscores the crucial role of working memory as a source of individual differences in cognitive performance (Prat et al., 2016).

The fourth research question examined whether there are interactions between working memory capacity and the use of a monitoring strategy in the comprehension of high-knowledge and low-knowledge texts. The results from Experiment 2 indicated that, similar to prior knowledge, working memory did not significantly interact with the monitoring strategy. This finding suggests that the monitoring strategy is equally effective across different levels of working memory capacity, allowing readers to engage with and integrate textual information independently of their cognitive resources. Thus, the monitoring strategy operates as a robust tool that can enhance comprehension across a wide range of cognitive abilities.

Finally, the fifth research question explored whether the level of knowledge mitigates the effects of limited working memory capacity on text comprehension, and how these factors interact with the use of monitoring strategies. The interaction between prior knowledge and working memory capacity, observed in Experiment 2, provides an answer. In high-knowledge texts, working memory capacity did not significantly affect comprehension, suggesting that prior knowledge compensates for lower cognitive resources by providing a scaffold for understanding the text. However, when reading low-knowledge texts, readers with high working memory capacity outperformed those with low capacity, highlighting the importance of cognitive resources when prior knowledge is insufficient. This interaction suggests that prior knowledge can mitigate comprehension differences among readers with varying working memory capacities (Currie & Cain, 2015).

A key implication of these findings is that the monitoring strategy appears to have a robust effect on text comprehension, regardless of other factors such as prior knowledge or working memory capacity. The absence of interactions between the monitoring strategy and the other variables suggests that this effect holds across different cognitive profiles. The monitoring strategy likely forces readers to focus their attention on integrating information, evaluating sentence by sentence how each new piece of information fits with what has been previously introduced (Tibken, et al., 2022). This process encourages the construction of a coherent and robust representation of the text, enabling better performance in comprehension tasks (Oakhill, et al., 2005; Tighe et al., 2023). Given that the strategy seems to operate independently of working memory and prior knowledge, it may provide a powerful tool for improving comprehension across a wide range of readers.

While the present study excluded participants with intermediate working memory capacities, it is reasonable to hypothesize that these participants would not differ significantly from those in the extreme groups. This is inferred from the observed robust effect of the monitoring strategy, which would likely benefit all readers by guiding their cognitive resources toward the detection and integration of inconsistencies. Regardless of their working memory capacity, readers using a monitoring strategy are prompted to analyze and integrate information more thoroughly, constructing a clear mental representation of the text. This effect, which appears to be independent of both working memory capacity and prior knowledge, reinforces the practical value of training monitoring strategies to improve comprehension across diverse educational contexts.

One limitation of this study is that the results cannot be generalized to all expository texts, as only a specific set of materials was used. It would be valuable to examine whether similar results are obtained with a broader range of texts, particularly those that reflect the diversity of instructional materials encountered by university students. Another limitation lies in the use of an extreme-groups design in Experiment 2. While this design enhances sensitivity to detect effects, it also involves trade-offs, such as the loss of information and potential overestimation of effect sizes. Including participants with working memory capacities in the middle range could provide a more nuanced understanding of how these variable impacts text comprehension. Additionally, this study's operationalization of comprehension monitoring was limited to detecting inconsistencies in the text. A broader approach that captures real-time processing strategies might yield further insights into how readers engage with texts and resolve inconsistencies. Incorporating a combination of behavioral measures could offer a more comprehensive understanding of the metacognitive processes involved in text comprehension.

## Conflict of Interest

The authors of this article declare no conflict of interest.

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