# Cognitive Interactions: The Relationship between Working Memory and Reading Comprehension in Elementary School Children

Interacciones Cognitivas: La Relación entre la Memoria de Trabajo y la Comprensión Lectora en Niños de Primaria

Interações Cognitivas: A relação entre a memória de trabalho e a compreensão da leitura em crianças do ensino básico

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#### Abstract

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**Introduction:** Working memory and reading comprehension are essential cognitive processes for students' academic development. **Objective:** This research explores the relationship between these variables in elementary school children, analyzing key studies that demonstrate how working memory facilitates decoding and text processing and on the other hand, in reading comprehension, as a process of great importance in meaningful learning, interpretation and consolidation of a priori knowledge in children. **Methodology:** Theoretical models such as Baddeley and Hitch (1974) are discussed and their applicability in the educational context is evaluated. **Result:** The implications of these findings are highlighted to design pedagogical strategies that optimize more effective teaching strategies based on the needs and abilities of the students, which can help to improve their skills in the reading comprehension process. **Conclusion:** Finally, it was possible to identify gaps in the literature that may help future research proposals that can generate pedagogical interventions based on these skills to optimize academic performance.

Keywords: Learning; Neuropsychology; Reading comprehension; Working memory.

#### Resumen

**Introducción:** La memoria de trabajo y la comprensión lectora son procesos cognitivos esenciales para el desarrollo académico en los estudiantes. **Objetivo:** Esta investigación explora la relación entre estas variables en niños de primaria, analizando estudios clave que demuestran cómo la memoria de trabajo facilita la decodificación y el procesamiento del texto y por otro lado, en la comprensión lectora, como proceso de gran importancia en el aprendizaje significativo, la interpretación y la consolidación del conocimiento a priori en los niños. **Metodología:** Se discuten modelos teóricos como el de Baddeley y Hitch (1974) y se evalúa su aplicabilidad en el contexto educativo. **Resultado:** se destacan las implicaciones de estos hallazgos para diseñar estrategias pedagógicas que optimicen estrategias de enseñanza más efectivas, basadas en las necesidades y habilidades de los estudiantes, lo que puede ayudar a mejorar sus habilidades en el proceso de la comprensión lectora. **Conclusión:** Finalmente, se pudieron identificar vacíos en la literatura, los cuales puedan ayudar a propuestas futuras en investigaciones que puedan generar intervenciones pedagógicas basadas en estas habilidades para optimizar el desempeño académico.

Palabras clave: Aprendizaje; Comprensión lectora; Memoria de trabajo; Neuropsicología.

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#### Resumo

Introdução: A memória de trabalho e a compreensão da leitura são processos cognitivos essenciais para o desenvolvimento académico dos alunos. Objetivo: Esta investigação explora a relação entre estas variáveis em crianças do 1º ciclo do ensino básico, analisando os principais estudos que demonstram como a memória de trabalho facilita a descodificação e o processamento do texto e, por outro lado, a compreensão da leitura, enquanto processo de grande importância na aprendizagem significativa, interpretação e consolidação de conhecimentos a priori nas crianças. Metodologia: Discutem-se modelos teóricos como o de Baddeley e Hitch (1974) e avalia-se a sua aplicabilidade no contexto educativo. Resultado: Destacam-se as implicações destes resultados para a conceção de estratégias pedagógicas que optimizem estratégias de ensino mais eficazes, baseadas nas necessidades e capacidades dos alunos, que possam contribuir para melhorar as suas competências no processo de compreensão da leitura. Conclusão: Finalmente, foi possível identificar lacunas na literatura, o que pode ajudar futuras propostas de investigação que possam gerar intervenções pedagógicas baseadas nestas competências para otimizar o desempenho académico.

Palabras clave: Aprendizagem; Compreensão da leitura; Memória de trabalho; Neuropsicologia.



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### INTRODUCTION

Reading comprehension constitutes a fundamental cognitive ability that enables individuals to interpret and process written information, significantly impacting students' academic success. In regions like Colombia, where international assessments such as PISA indicate comparatively low reading comprehension levels, it becomes crucial to identify the factors that can enhance this skill. One such factor is working memory (WM), which serves as a vital cognitive mechanism for the temporary storage and manipulation of information, thereby enabling students to integrate and utilize pertinent data during reading activities. Various studies have extensively explored the interplay between WM and reading comprehension. Research has demonstrated that WM capacity predicts performance in reading tasks, as it supports essential processes including decoding, retention of contextual information, and the formulation of inferences. Nonetheless, significant gaps remain in the existing literature, particularly regarding the dynamics of these variables within school populations and the potential for leveraging this understanding to develop effective pedagogical strategies.

There is a global surge in emphasis on the preparation and instruction of reading comprehension within educational settings. This initiative equips students with the capacity to acquire new knowledge, fostering a mode of communication that endures over time. Engaging in reading comprehension allows children to enhance their imagination and creativity while also improving their focus and concentration. Furthermore, it cultivates essential skills such as critical thinking and understanding, in addition to enriching and broadening their vocabulary.

The processes and advancements in reading comprehension vary across different subjects, necessitating that students cultivate their reading abilities in diverse contexts (Abusamra et al., 2008; Adolf et al., 2006; Bolkan et al., 2017; Goldman et al., 2016; Klein & Boscolo, 2016). To achieve proficiency in reading within any given field, students must develop a comprehensive set of language skills. Familiarity with formal languages is essential for comprehending the abstract language often found in academic texts (Alloway & Gathercole, 2004; Alonso & Del Mar Mateos, 1985; Atkinson & Shiffrin, 1968; Rose & Martin, 2012; Schleppegrell, 2004). Fitzgerald and Shanahan (2000) assert that reading is intertwined with other cognitive functions, as empirical research supports the relationship between reading and writing (Graham & Hebert, 2010; Graham et al., 2018; Palladino et al., 2001; Orylska et al., 2019).

Bill No. 130 of, 2013, introduced in the Senate of the Republic of Colombia, expresses the intention to foster a reading culture within educational programs for preschool, elementary, and middle school levels. It proposes the allocation of one hour each day specifically for activities related to books, reading, and writing, alongside additional provisions.

Since, 2011, under the National Reading Plan titled "Reading is my story," initiated by the Ministry of Education and Culture (MEC), efforts have been made to enhance reading comprehension among children, youth, and adolescents of both genders. In this framework, the state education secretariat aims to devise and implement strategies that promote the development of communicative skills within primary, preschool, and secondary educational institutions, thereby reinforcing the reading habits and literacy acquisition among students and their families.

Continuing the objectives of the National Reading Plan, there is also an exploration of creating collections for the educational community, which would facilitate the production of materials and bolster pedagogical support for reading instruction. In alignment with this vision, pedagogical support initiatives are being established, resulting in the creation of book collections in collaboration with experts and educational stakeholders, thereby enhancing the overall pedagogical process.

The Ministry of Education (MEN, 2011), through its National Plan for Reading, Writing, and Orality (PNLEO) project "Reading is my Story," aims to promote the development of communication skills that not only enhance learning but also improve the teaching methodologies associated with reading comprehension.

The enhancement of reading comprehension processes necessitates that educational systems in Colombia undergo immediate transformations. An analysis conducted by the Organization for Economic Co-operation and Development (OECD) in, 2019 revealed that Colombian students scored below the OECD average in reading, which stands at 412 points. This performance is comparable to that of students from Qatar, Mexico, and certain Southeastern European nations, including Albania and the Republic of North Macedonia. Despite a decline in reading scores since 2015, it is noteworthy that progress has been made across all subjects during the longest interval since the inception of the Program for International Student Assessment (PISA) in 2006. These findings underscore the critical need to emphasize the ongoing development of reading comprehension skills among primary school students in Colombia as a vital linguistic competency.

It is essential to examine the interplay between reading comprehension and working memory (WM), a cognitive function that is critical for individuals as it facilitates access to the necessary memory and knowledge for effective task execution (Barreyro et al., 2016; Hsu et al., 2023; Prabhakaran et al., 2000; Horne et al., 2022; Vernucci et al., 2021; Pretorius et al., 2022; Kocaarslan., 2022; Mekheimer., 2024).

Research indicates that WM is integral to the learning process, as learning cannot occur without the involvement of WM in cognitive activities. In the educational context, the specific relationship between WM and reading comprehension emerges as a vital skill for elementary school students. The study of WM is deemed crucial for enhancing both academic performance and overall development in the realm of reading comprehension.

Shvartsman and Shaul (2023), in their study titled "The role of working memory in early literacy and numeracy skills in kindergarten and first grade," highlight that during the reading instruction process, young learners grasp the principles of the alphabet and develop the ability to utilize their knowledge of spelling and sound relationships (Baddeley, 2010). The decoding of new words relies on an understanding of these relationships. At this developmental stage, WM is pivotal, significantly influencing phonological encoding and the establishment of stable grapheme-phoneme connections.

Consequently, it is imperative to investigate the relationship between WM and reading comprehension, contributing valuable insights to the field. This study is centered on the inquiry: How does working memory correlate with reading comprehension among elementary school students? During this investigation, pertinent theories are examined, empirical evidence is scrutinized, and avenues for future research are proposed. Ultimately, the research highlights practical implications for educational practices and learning outcomes in children of school age.

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### 2. METHODOLOGY

A systematic review was conducted by searching academic databases, including Scopus, PubMed, and Google Scholar, utilizing key terms such as "working memory," "reading comprehension," "primary education," and "cognitive processes." The review encompassed studies published from 2000 to 2024 that explored the interrelationship among these variables in children aged 8 to 10 years. The inclusion criteria were:

- 1. Empirical and theoretical studies on WM and reading comprehension.
- 2. Research conducted in school contexts.
- 3. Availability in English or Spanish. Articles focused on populations with severe disabilities or without direct relation to the target population were excluded.

By conducting a bibliographic search of the respective literature, it was possible to select works by different authors that are closely related to the variables proposed in this research. These studies provided an important contribution to the development of this research.

Human beings have long exhibited a profound curiosity regarding the complexities of the brain and its functions. Cognitive processes such as learning, attention, language, thought, perception, and memory have consistently served as central themes even before the establishment of psychology as a prominent discipline within the humanities and social sciences.

Before exploring various theoretical frameworks related to reading comprehension and the examination of memory transfer processes and systems, it is essential to first define memory in a general sense and to understand its functions. Memory is particularly malleable during early childhood, possessing the ability to store emotions and feelings, which leads to the development of behavioral memory characterized by the practice and repetition of actions. This process enables children to learn from their experiences, facilitating their adaptation to their surroundings. They acquire the ability to input information, store it effectively, and retrieve it when needed. This concept is referred to as intellectual memory, which represents the culmination of memory skills development (Baddeley, 2012; Baker & Beall, 2009; Kvavilashvili & Ellis, 1996; Seigneuric et al., 2000).

### Working Memory: Concepts and Models

Working memory (WM) serves as an essential cognitive framework for the temporary storage and manipulation of information, enabling intricate processes such as problem-solving, reasoning, and language understanding. Baddeley and Hitch's (1974) multicomponent model posits that WM consists of three primary components: the central executive, the phonological loop, and the visuospatial agenda.

**The Central Executive:** This component acts as the primary regulator, orchestrating the activities of the subsystems and managing attentional resources. Its principal role is to allocate and oversee cognitive resources, which are vital for performing tasks that require the integration of information.

Phonological Loop: This component is responsible for the retention and manipulation of verbal and

auditory data. It is essential for activities like reading, as it facilitates the temporary storage of words and phrases, enabling their later decoding and understanding.

**Visuospatial Agenda:** This subsystem manages visual and spatial information, serving a supportive function in tasks such as reading, particularly in the interpretation of the visual arrangement of text.

In, 2000, Baddeley introduced the episodic store, a component that synthesizes information from various modalities, including visual, auditory, and semantic inputs, thereby facilitating connections to longterm memory. This framework underscores the dynamic and multifaceted characteristics of working memory (WM), particularly its significance in engaging with complex academic tasks. Neuropsychological research has pinpointed specific brain regions associated with working memory, notably the dorsolateral prefrontal cortex and the superior temporal gyrus, which correspond to the central executive and the phonological loop, respectively. These areas exhibit activation during activities that necessitate planning and the manipulation of information, which are essential for effective reading comprehension.

### **Reading Comprehension: Processes and Models**

Reading comprehension encompasses the capacity to interpret, synthesize, and critically evaluate the information presented within a text. This multifaceted process merges linguistic competencies, such as decoding and vocabulary acquisition, with advanced cognitive abilities, including the formulation of inferences and the integration of semantic content.

One of the leading theoretical frameworks in this domain is Kintsch (1998) construction-integration model, which posits that the process of reading comprehension unfolds in two distinct phases:

**Construction:** A preliminary depiction is created from the text that has been read, utilizing clear and specific information.

Integration: This depiction is refined and enhanced by engaging existing knowledge and making inferences.

Kintsch's theory emphasizes that reading comprehension is not a linear process, but an interactive one, where the reader actively constructs a mental model of the text. This approach is aligned with the interactive models of reading proposed by Tejada (2001), which combine top-down processes (guided by the reader's knowledge) and bottom-up processes (based on the text).

# Relationship between Working Memory and Reading Comprehension

Working memory (WM) is crucial for reading comprehension as it allows for the temporary storage of textual information while simultaneously processing new material. Specifically, the phonological loop aids in the decoding of words, whereas the central executive is responsible for synthesizing information to create a cohesive understanding of the text. Empirical research supports this relationship; for instance, Daneman and Carpenter (1980) were among the first to illustrate the connection between WM and reading comprehension, revealing that individuals with higher WM capacities performed better on tasks requiring the integration of multiple sentences. More recent studies by Swanson and Beebe-Frankenberger (2004) indicated that verbal WM serves as a significant predictor of reading performance in children, particularly in tasks that necessitate the retention of contextual information.

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Ramus and Szenkovits (2008) emphasize that the active manipulation and processing of information by WM is essential when engaging with written text, as it facilitates the understanding and assimilation of the conveyed message. Additionally, Nevo and Breznitz (2013) and Cain et al. (2004) argue that WM is intrinsically linked to reading ability, positing that WM functions as a foundational process that underpins reading comprehension.

Research involving populations with learning disorders, including ADHD, has underscored the significance of working memory (WM). Jacobson et al. (2011) found that impairments in WM are linked to challenges in reading fluency and comprehension of texts. This indicates that enhancing WM may provide advantages for both students facing cognitive difficulties and those who do not.

The exploration of the connection between working memory (WM) and reading comprehension carries significant educational implications. Instructional approaches can be tailored to enhance WM through targeted activities, including sequential memory tasks, digit span exercises, and training focused on attention skills (López-Resa & Moraleda-Sepúlveda., 2023; Gao & Li.,2024; Linares & Pelegrina., 2023; Giofrè et al., 2022; Teng.,2023).

Furthermore, it is essential to apply these strategies within authentic reading environments, thereby fostering the growth of both linguistic and cognitive abilities. In Colombia, initiatives like "Leer es mi Cuento" could benefit from the inclusion of modules aimed at bolstering WM, particularly for students facing challenges in reading. This integration would not only facilitate improvements in reading comprehension but also enhance other related academic competencies.

# 3. RESULTS

In this study, approximately 35 pertinent investigations examining the connection between working memory (WM) and reading comprehension among elementary school students were evaluated. The primary outcomes underscore the significant role of WM in both fundamental tasks and intricate processes related to reading. A summary of these findings is presented below:

### Relationship between MT and Reading Comprehension.

The relationship between working memory (WM) and decoding skills has been substantiated by the reviewed studies, which indicate that the phonological loop component of WM plays a crucial role in both the decoding of words and the temporary retention of sentences. This function is vital for the formation of coherent textual representations (Amador & Forns, 2019; Daneman & Carpenter, 1980; Swanson & Beebe-Frankenberger, 2004). Furthermore, the capacity of the central executive to oversee and integrate diverse information sources is positively correlated with readers' proficiency in generating inferences and linking both implicit and explicit content within texts (Cain et al., 2004).

### Individual Differences.

Research conducted by Jacobson et al. (2011) indicates that children experiencing working memory (WM) challenges, including those diagnosed with ADHD, exhibit notable impairments in both reading

fluency and comprehension. The Role of Visual WM: Recent investigations emphasize the importance of visuospatial working memory in reading comprehension, especially in tasks that incorporate graphics or texts characterized by intricate structures (Nevo & Breznitz, 2013; Schurer et al., 2020).

#### Working Memory-Based Pedagogical Interventions

Interventions designed to enhance working memory, including digit repetition exercises and sequential memory activities, have been demonstrated to positively influence reading performance, particularly among students who initially exhibit low reading comprehension skills (Gathercole & Alloway, 2008).

#### Synthesis of Findings

The following table (1) summarizes the main findings, organized according to the dimensions of MT and their relationship to reading comprehension:

#### Table 1.

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WM dimension	Impact on Reading Comprehension	Key Studies
Phonological loop	Improves decoding and word retention	Daneman & Carpenter (1980); Cain et al. (2004)
Central Executive	Facilitates semantic integration and inference generation	Swanson & Beebe- Frankenberger (2004)
Visuospatial agenda	Contributes to the comprehension of texts with graphic or visual elements.	Nevo & Breznitz (2013)
Interventions based on WM	Improving reading comprehension performance in children with reading comprehension difficulties	Gathercole & Alloway (2008); Jacobson et al. (2011)

### 4. DISCUSSION

The connection between working memory (WM) and reading comprehension has become an increasingly significant focus within educational and neuropsychological research. The reviewed studies indicate that WM is crucial for reading, functioning not merely as a temporary information storage system but also as a mechanism for integrating new information with existing knowledge to enhance overall understanding.

This observation aligns with theoretical frameworks like Baddeley's (2000) model, which characterizes WM as a multifaceted system where the central executive orchestrates intricate tasks, including reading, that necessitate attention, concurrent processing of information, and the retrieval of previously stored data.

Variations in individual characteristics and contextual influences Individual characteristics, including inherent working memory (WM) capacity and neuropsychological disorders like ADHD, play a crucial role in determining reading performance. Research conducted by Miller et al. (2013) indicates that deficits in WM are linked to challenges in reading fluency and comprehension. Furthermore, con-

textual elements, such as the availability of a literate environment and the implementation of effective teaching strategies, may influence this relationship. In settings like Colombia, where performance on international assessments such as PISA is notably low, these factors become especially significant.

The findings have important practical implications. Incorporating strategies that strengthen WM in the classroom, such as activities that improve attention, information retention, and semantic integration, could optimize reading learning. Intervention programs targeting students with specific WM difficulties also have the potential to significantly improve their reading skills.

# 5. CONCLUSIONS

Working memory serves as a crucial determinant of reading comprehension outcomes. The capacity to temporarily retain and manipulate information enables learners to synthesize textual information with their existing knowledge, thereby facilitating the interpretation and understanding of written material. This underscores the importance of developing instructional approaches that strengthen this cognitive function.

The elements of mental translation (MT) serve specific functions within the reading process. The phonological loop aids in the initial stages of decoding, whereas the central executive manages more complex activities, including semantic integration and the formation of mental representations. These distinctions highlight the necessity of customizing educational strategies to align with the developmental stages of learners.

Cultural and educational environments significantly impact the connection between machine translation (MT) and reading comprehension. In nations such as Colombia, where reading comprehension rates fall short of global benchmarks, it is crucial to establish initiatives that tackle both cognitive abilities and the socio-educational elements that hinder learning. This underscores the necessity for additional research and the creation of novel educational approaches that enhance the interplay between working memory and reading comprehension

# **Conflicts of interest**

Methodological Constraints and Prospective Challenges The absence of targeted instruments that explicitly connect this capability with reading comprehension processes within educational contexts is notable. Furthermore, the majority of the studies examined utilize cross-sectional designs, which restricts the capacity to determine causal relationships. There is a pressing need for longitudinal research to investigate how this relationship evolves and intensifies over time.

#### REFERENCES

- Abusamra, V., Cartoceti, R., Raiter, A. & Ferreres, A. (2008). Una perspectiva cognitiva en el estudio de la comprensión de textos. *Psico, Porto Alegre, 39*(3), 352-361.
- Adolf, S. M., Catts, H. W. & Little, T. D. (2006). Should the simple view of reading include a fluency component? *Reading and Writin*, 19, 933–958. <u>https://doi.org/10.1007/s11145-006-9024-z.</u>
- Alloway, T. P. & Gathercole, S. E. (2004). Working memory and classroom learning. *The Psychologist*, *15*(5), 4–9.
- Alonso, J. & Del Mar Mateos, M. (1985). Comprensión lectora: modelos, entrenamiento y evaluación. *Infancia y aprendizaje*, 8(31-32), 5-19.
- Amador, J. A. & Forns, M. (2019). *Escala de inteligencia de Wechsler para niños, quinta edición: WISC-V.* Universidad de Barcelona.
- Atkinson, R. C. & Shiffrin, R. M. (1968). Human memory. A proposed system and its control processes. *Psychology of learning and motivation, 2,* 89-195.
- Baddeley, A. (2010). Working memory. *Current biology*, 20(4), R136-R140.
- Baddeley, A. (2012). Working memory: Theories, models, and controversies. Annual *Review of Psychology*, *63*, 1–29. <u>ht-</u> <u>tps://doi.org/10.1146/annurev-psych-120710-100422</u>.
- Baddeley, A. D. & Hitch, G. J. (1974). Working memory. *The* psychology of learning and motivation, 8, 47–89. <u>ht-</u> <u>tps://www.sciencedirect.com/science/article/abs/pii/</u> <u>S0079742108604521</u>
- Baddeley, A. D. (2000). The episodic buffer: A new component of working memory? *Trends in Cognitive Sciences*, 4(11), 417-423. <u>https://doi.org/10.1016/</u> S13646613(00)01538-2.
- Baker, L. & Beall, L. (2009). Metacognitive processes and reading comprehension. In S. E. Israel & G. G. Duffy (Eds.), *Handbook of research on reading comprehension*

(pp. 373-388). Routledge.

- Barreyro, J. P., Injoque-Ricle, I., Alvarez-Drexler, A. V. & Formoso, J. (2016). Cuestiones para tener en cuenta antes de leer: el rol de la memoria de trabajo y la atención en la comprensión de textos. En I. Introzzi y L. Canet Juric (Ed.), ¿Quién dirige la batuta? Funciones Ejecutivas herramientas para la regulación de la mente, la emoción y la acción. EUDEM
- Bolkan, S. S., Stujenske, J. M., Parnaudeau, S., Spellman, T. J., Rauffenbart, C., Abbas, A. I., Harris, A.Z., Gordon J. A. & Christoph Kellendonk (2017). Thalamic projections sustain prefrontal activity during working memory maintenance. *Nature Neuroscience*, 20, 987–996. https://doi.org/10.1038/nn.4568.
- Cain, K., Oakhill, J. & Bryant, P. (2004). Children's reading comprehension ability: Concurrent prediction by working memory, verbal ability, and component skills. *Journal of Educational Psychology*, 96(1), 31-42.
- Daneman, M. & Carpenter, P. A. (1980). Individual differences in working memory and reading. *Journal of Verbal Learning and Verbal Behavior*, *19*(4), 450–466. <u>ht-</u> <u>tps://www.sciencedirect.com/science/article/abs/pii/</u> <u>S0022537180903126</u>
- Fitzgerald, J. & Shanahan, T. (2000). Reading and writing relations and their development. *Educational Psychologist*, 35(1), 39–50. <u>https://doi.org/10.1207/</u> <u>S15326985EP3501\_5.</u>
- Gathercole, S. E. & Alloway, T. P. (2008). Working memory and learning: A practical guide for teachers. SAGE.
- Gao, X., & Li, L. (2024). Text difficulty, working memory capacity and mind wandering during Chinese EFL learners' reading. *Chinese Journal of Applied Linguistics*, 47(2), 123–140. <u>https://doi.org/10.1515/CJAL-2024-0304</u>
- Giofrè, D., Donolato, E., & Mammarella, I. C. (2022). The differential role of verbal and visuospatial working me-

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mory in mathematics and reading. *Trends in Neuroscience and Education, 12,* 1–6. <u>https://doi.org/10.1016/j.tine.2018.07.001</u>

- Goldman, S. R., Britt, M. A., Brown, W., Cribb, G., George, M., Greenleaf, C., Lee, C. & Shanahan, C. (2016). Disciplinary literacies and learning to read for understanding: A conceptual framework for disciplinary literacy. *Educational Psychologist*, *51*(2), 219–246.
- Graham, S. & Hebert, M. (2010). Writing to read: Evidence for how writing can improve reading: A report from Carnegie Corporation of New York. Alliance for Excellent Education.
- Graham, S., Liu, X., Bartlett, B., Ng, C., Harris, K. R., Aitken, Barkel, A., Kavanaugh, C. & Talukdar, J (2018). Reading for writing: A meta-analysis of the impact of reading interventions on writing. *Review of Educational Research*, 88(2), 243–284. <u>https://doi. org/10.3102/0034654317746927</u>
- Horne, A., Zahn, R., Najera, O. I., & Martin, R. C. (2022). Semantic working memory predicts sentence comprehension performance: A case series approach. *Frontiers in Psychology*, *13*, 887586. https://doi.org/10.3389/ fpsyg.2022.887586
- Hsu, L. S.-J., Chan, K. & Ho, C. S. H. (2023). Reading fluency as the bridge between decoding and reading comprehension in Chinese children. *Frontiers in Psychology*, 14, 1221396. https://doi.org/10.3389/fpsyg.2023.1221396
- Jacobson, L. A., Ryan, M., Martin, R. B., Ewen, J., Mostofsky, S. H., & Denckla, M. B. & Mahone, E. M. (2011). Working memory influences processing speed and reading fluency in ADHD. *Child Neuropsychology*, 17(3), 209– 224.
- Kintsch, W. (1998). Comprehension: A paradigm for cognition. Cambridge University Press.
- Kocaarslan, M. (2022). The relationships between oral reading fluency, sustained attention, working memory, and text comprehension in third-grade students. *Psychology in the Schools*, 59(4), 744–764. https://doi.

org/10.1002/pits.22641

- Klein, P. D. & Boscolo, P. (2016). Trends in research on writing as a learning activity. *Journal of Writing Research*, 7(3), 311–350. <u>https://doi.org/10.17239/jowr2016.07.3.01</u>.
- Kvavilashvili, L. & Ellis, J. (1996). Varieties of intention: some distinction and classifications. In Brandimonte, M., Einsteinm G. and McDaniel, M. A., (Eds.) *Prospective memory: theory and applications, 6* (pp. 183-207). Erlbaum Associates.
- Linares, R., & Pelegrina, S. (2023). The relationship between working memory updating components and reading comprehension. *Cognitive Processing*, 24(2), 253–265. https://doi.org/10.1007/s10339-023-01127-3
- López-Resa, P., & Moraleda-Sepúlveda, E. (2023). Working memory capacity and text comprehension performance in children with dyslexia and dyscalculia: A pilot study. *Frontiers in Psychology, 14,* 1191304. https://doi. org/10.3389/fpsyg.2023.1191304
- Mekheimer, M. A. (2024). Working memory as a predictor of reading and listening comprehension in EFL college students: A reinvestigation. Australian Journal of Applied Linguistics, 7(3), Article 2076. https://doi. org/10.29140/ajal.v7n3.2076
- Miller, A. C., Keenan, J. M., Betjemann, R. S., Willcutt, E. G., Pennington, B. F. & Olson, R. K. (2013). Reading comprehension in children with ADHD: cognitive underpinnings of the centrality deficit. *Journal of Abnormal Child Psychology*, 41, 473–483. <u>https://doi.org/10.1007/</u> s10802-012-9686-8.
- Ministerio de Educación [MEN]. (2011). Plan Nacional de Lectura, escritura y oralidad "Leer es mi cuento".
- Miranda Morales, J. C., Maldonado Pastor, S., & González Mejía, X. (2023). Desfragmentación social y transmisión intergeneracional de desigualdades educativas en jóvenes colombianos. Pensamiento Americano, 16(31), 1-18. https://doi.org/10.21803/penamer.16.31.582

- Nevo, E. & Breznitz, Z. (2013). The development of working memory from kindergarten to first grade in children with different decoding skills. *Journal of Experimental Child Psychology, 114*(2), 217-228.
- Peláez, O. A., Echeverri, L. F., & Castrillón, E. F. (2024). La percepción instrumentalizada del inglés para la competitividad: un caso de estudio. Pensamiento Americano, 15(29), 45-57. https://doi.org/10.21803/penamer.15.29.416
- OECD. (2019). PISA 2018 Results (Volume I): What students know and can do. *OECD Publishing*. https://doi.org/10.1787/5f07c754-en
- Orylska, A., Hadwin, J. A., Kroemeke, A. & Sonuga-Barke, E. (2019). a growth mixture modeling study of learning trajectories in an extended computerized working memory training program developed for young children diagnosed with Attention-Deficit/Hyperactivity Disorder. *Frontiers in Education*, 4. <u>https://doi.org/https:// doi.org/10.3389/feduc.2019.00012.</u>
- Palladino, P., Cornoldi, C., De Beni, R. & Pazzaglia, F. (2001). Working memory and updating processes in reading comprehension. *Memory & cognition*, 29(2), 344-354.
- Prabhakaran, V., Narayanan, K., Zhao, Z. & Gabrieli, J. D. E. (2000). Integration of diverse information in working memory within the frontal lobe. *Nature neuroscience*, 3(1), 85-90. https://doi.org/10.1038/71156.
- Pretorius, M. J., le Roux, M., & Geertsema, S. (2022). Verbal working memory in second language reading comprehension: A correlational study. *Journal of Learning Disabilities*, 55(3), 195–206. https://doi. org/10.1177/1525740121991475
- Ramus, F. & Szenkovits, G. (2008). What phonological deficit? *Quarterly Journal of Experimental Psychology*, 61(1), 129-141.
- Rose, D. & Martin, J. (2012). Learning to write, reading to learn: Genre, knowledge and pedagogy of the sydney school. Equinox Publishing.

- Schleppegrell, M. J. (2004). *The language of schooling: A functional linguistics perspective.* Routledge.
- Teng, M. F. (2023). Effectiveness of captioned videos for incidental vocabulary learning and retention: The role of working memory. *Computer Assisted Language Learning*, 1–29. <u>https://doi.org/10.1080/09588221.2023.21</u> <u>73613</u>
- Schurer, T., Opitz, B. & Schubert, T. (2020) Working Memory Capacity but Not Prior Knowledge Impact on Readers' Attention and Text Comprehension. *Frontiers in Education, 5,* 26. https://doi.org/10.3389/feduc.2020 00026.
- Seigneuric, A., Ehrlich, M. F., Oakhill, J. V. & Yuill, N. M. (2000). Working memory resources and children's reading comprehension. *Reading and Writing*, 13, 81–103. https://doi.org/10.1023/A:1008088230941.
- Shvartsman, M. & Shaul, S. (2023). The Role of Working Memory in Early Literacy and Numeracy Skills in Kindergarten and First Grade. *Children*, 10(8), 1285. https:// doi.org/10.3390/children10081285.
- Swanson, H. L. & Beebe-Frankenberger, M. (2004). The relationship between working memory mathematical problem solving in children at risk and not at risk for serious math difficulties. *Journal of Educational Psychology*, 96(3), 471-491.
- Tejada, H. (2001). Metáforas y modelos de comprensión de lectura: aspectos teóricos e implicaciones prácticas. *Revista Lenguaje*, (28), 108-131.
- Vernucci, S., Aydmune, Y., Andrés, M. L., Burin, D. I., & Canet-Juric, L. (2021). Working memory and fluid intelligence predict reading comprehension in schoolage children: A one-year longitudinal study. *Applied Cognitive Psychology*, 35(4), 1115–1124. https://doi. org/10.1002/acp.3841