

# Exploring the effects of working memory on reading comprehension among Chinese EFL learners



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**Abstract** Reading comprehension is crucial for language acquisition and has garnered significant attention. In light of this, substantial research has examined the variables affecting reading comprehension from various perspectives. Studies in cognitive psychology have explored the connection between working memory (WM) and English reading comprehension. However, few reviews specifically address the influence of WM on reading comprehension in the context of Chinese English as a Foreign Language (EFL) learners. Therefore, this study aims to review the role of WM in reading comprehension among Chinese EFL learners, with a focus on how WM contributes to improved reading performance. Eight studies published between 2018 and 2023 were selected from the databases Google Scholar and Web of Science. Findings reveal a positive correlation between WM and reading comprehension among Chinese EFL learners. Moreover, WM capacity (WMC) was shown to be a significant predictor of reading performance. The results indicate that both educators and students can collaborate to strengthen WMC, thus improving reading comprehension outcomes. This review encourages further research on the impact of different WM subcomponents on EFL reading comprehension in China and on effective strategies that instructors and learners can employ to enhance WMC in the EFL learning process.

**Keywords:** cognitive memory, reading performance, Chinese learners of English, memory capacity, language acquisition

## 1. Introduction

Language is a fundamental aspect of human life and is essential for communication. Acquiring English to keep pace with global developments requires the integration of four language skills: listening, speaking, reading, and writing (Akram & Malik, 2010). Among these, reading comprehension is particularly crucial for language learners (Pardede, 2020), as it involves the ability to understand and interpret written language. According to Snow (2002) and Erya and Pustika (2021), reading comprehension entails both extracting and constructing meaning through engagement with text. This complexity suggests that effective reading comprehension requires not only the ability to accurately interpret words and phrases but also sufficient world knowledge to derive meaning from the content (Smith et al., 2021).

Language and literacy are the cornerstones of communication, with reading playing a central role in both education and language acquisition. Insufficient reading comprehension can adversely affect students' academic performance (Al-Jarrah & Ismail, 2018). Learners with strong reading skills are likely to become proficient and effective readers, capable of developing critical thinking, evaluating information, and solving problems independently (Rajasagaran & Ismail, 2022). Meanwhile, reading broadens perspectives and enriches the mind. Additionally, strong reading comprehension contributes significantly to language acquisition, professional development, international engagement, and improved concentration, all of which influence individuals' thought processes and behaviors (Rintaningrum, 2019). However, numerous studies have identified challenges that language learners face in developing reading comprehension, such as unfamiliarity with text genres (Casado-Ledesma & Tarch, 2024), text complexity (Proctor et al., 2020), inadequate background knowledge (Smith et al., 2021), and deficiencies in language skills, including limited vocabulary and knowledge of phonetics, grammar, and syntax (Hjetland et al., 2021; Quinn et al., 2020; Srisang & Everatt, 2021). Consequently, English as a Foreign Language (EFL) learners often struggle with language acquisition due to these prevalent issues when attempting to read and comprehend English texts (Al-Jarrah & Ismail, 2018).

Given that reading comprehension is a multifaceted process, it requires cognitive engagement, with working memory (WM) playing a significant role (Baddeley, 1992; Cowan, 2001). Baddeley's model (1992) characterizes WM as a multi-component system consisting of the central executive, phonological loop, visuospatial sketchpad, and episodic buffer. These components are closely linked to executive functions, which encompass higher-level cognitive processes, including planning, problem-solving, cognitive flexibility, inhibitory control, and WM itself (Schäfer et al., 2024; Cristofori et al., 2019). The central executive manages attention and task regulation, while the phonological loop supports language processing and the visuospatial sketchpad deals with visual and spatial information (Baddeley & Hitch, 1974). The episodic buffer integrates information across various modalities (Baddeley, 2000). Collectively, these components facilitate the execution of complex cognitive tasks. Conversely, Cowan (2001) emphasized the capacity limitations of WM. His model suggests that WM consists



of activated long-term memory and a central focus of attention. This focus can typically hold about four items at a time (Cowan, 2001). Various tasks measure WM, ranging from simple span tasks, like the Digit Span Task, which assess basic recall (Schroeder et al., 2012), to complex span tasks, such as the Reading Span Task (RST), which evaluate the integration of language processing and memory storage (Friedman & Miyake, 2004). Additional tasks, like the N-Back Task (Jaeggi et al., 2010) and the Corsi Block-Tapping Task (Berch et al., 1998), assess the updating and storage of spatial and visual information.

Substantial studies have examined the role of WM in reading comprehension, revealing a significant moderate correlation (Shin, 2020; Hijikata & Koizumi, 2022; Peng et al., 2018). Moreover, learners with higher working memory capacity (WMC) typically exhibit better reading proficiency than those with lower WMC across various grade levels (Brunfaut et al., 2021). Joh (2018) further observed that when confronted with challenging reading tasks in English, learners with low WMC benefit from employing active strategies, a trend not observed among students with higher WMC or when dealing with easier texts. This indicates that learners with greater WMC comprehend reading materials more effectively and outperform their peers in second language (L2) reading comprehension. However, research on the relationship between WMC and L2 reading has yielded inconsistent results, possibly due to variations in the operationalization of WMC, differences in methodologies for controlling and scoring RSTs, and the measurement of L2 reading. Additionally, the influence of WMC may vary across different language proficiency levels (Shahnazari, 2023). This variability also applies to Chinese EFL learners, as the interaction between WM and EFL learning can affect reading comprehension, with WM's contribution varying based on the comprehension metrics used in correlation analyses (Li & Brantmeier, 2021). There is a pressing need to explore the connections between WM and various aspects of L2 learning in China, particularly reading comprehension, informed by a review of two decades of research on WM and L2 learning in the Chinese context (Shen & Park, 2020). Thus, uncertainty persists regarding the association between WM and reading comprehension among Chinese EFL learners.

Recent interest has also emerged around enhancing reading comprehension through WM training. López-Resca et al. (2023) found that WM training significantly improved reading comprehension and text processing abilities in children with dyslexia and dyscalculia, underscoring the importance of explicit WM training for enhancing complex cognitive tasks like reading. Similarly, Pauls and Archibald (2021) evaluated the effects of the Cogmed RM training program on children, demonstrating that participants who underwent WM training exhibited notable improvements in both WM and reading comprehension tasks compared to a control group, indicating the potential benefits of integrating WM training into educational settings. Therefore, investigating how WM training can enhance reading comprehension among Chinese EFL learners is a valuable endeavor.

While abundant studies have focused on the effects of WM on reading comprehension (Peng et al., 2018; Diningrat et al., 2023; Shahnazari, 2023), the relationship between these two constructs remains inconsistent due to various moderating factors. Additionally, it is of great interest to determine whether this phenomenon holds true for learners in the Chinese EFL context. Most prior research on Chinese reading of English has involved overseas Chinese speakers as subjects (Guo, 2001), which may not accurately reflect the psycholinguistic and cognitive models employed by EFL students in mainland China, given the differences in economic and social contexts (Wu, 2016). Therefore, this review aims to explore the relationship between WM and reading comprehension among Chinese EFL learners, identifying factors that may influence the role of WM in EFL reading comprehension. To this end, the following research questions will be addressed to shed light on the contribution of WM to reading comprehension among Chinese EFL learners and to inform instructors on improving EFL learners' WM for better reading outcomes:

Q1: What is the relationship between WM and reading comprehension among Chinese EFL learners?

Q2: How can Chinese EFL learners' reading comprehension be enhanced through WM training in foreign language teaching and learning?

In the methodology section, this review will collect data from the Scopus and Web of Science databases, applying specific inclusion and exclusion criteria to finalize the relevant articles. An overview of current research trends will be provided. Subsequently, the findings from the literature review will be synthesized into several themes, discussed, and summarized in relation to the proposed research questions. The review will conclude with an outline of the main findings, limitations, and recommendations for future research.

## 2. Methodology

This literature review follows a straightforward, reproducible process that allows for updates as necessary (Winchester & Salji, 2016; Rajasagaran & Ismail, 2022). To gather relevant papers, two online databases were utilized: Google Scholar and Web of Science. Specific search terms were employed to identify a selection of research articles related to the research questions, with publication years limited to 2018-2023. The keywords used included 'WM and reading comprehension', 'the role of WM in EFL reading comprehension', and 'the relationship between WM and EFL reading comprehension in China'.

The terms 'WM', 'reading comprehension', and 'EFL learners' were used to search for related papers in Google Scholar. To ensure relevance, the filter 'Since 2018' was applied to restrict the search to recent publications. This approach ensured that all selected papers were published within the designated timeframe. Additionally, the advanced search feature on Google

Scholar was utilized by entering the phrase ‘WM in EFL reading comprehension’. This facilitated the identification of articles specifically addressing the interplay between WM and reading comprehension among EFL learners, effectively excluding unrelated research. A similar search was conducted in Web of Science using the term ‘WM in EFL reading comprehension’. The publication date was also specified as ‘Since 2018’ to maintain consistency with the Google Scholar search. For more refined results, additional keywords such as ‘EFL learners’ and ‘reading comprehension’ could be added sequentially. Initially, the searches yielded a total of 1,506 articles from Web of Science and 2,490 articles from Google Scholar. After applying the inclusion and exclusion criteria, 3,988 articles were excluded, resulting in a final selection of 8 relevant articles for this review. Table 1 provides a detailed overview of how these 8 articles were selected based on the established criteria, and Table 2 summarizes the findings of the included studies.

**Table 1** Inclusion and exclusion criteria.

Criterion	Inclusion Criterion	Exclusion Criterion
Focus of study	The effects of WM on reading comprehension	Does not relate to the effects of WM on reading comprehension
Features	Must involve the relationship between WM and Chinese EFL learners’ reading comprehension	Does not involve the relationship between WM and Chinese EFL learners’ reading comprehension
Field of research	Primary, Secondary, and Tertiary levels of the education field	Not implemented in the education field
Language skill	Reading comprehension	Listening comprehension, speaking, and writing output
Keywords	(a) Working memory (b) Chinese EFL learners (c) Reading comprehension	(a) Non-Chinese EFL learners (b) Listening comprehension (c) Writing output (d) Speaking output
Context of study	Chinese EFL learners	Non-Chinese EFL learners
Year of publication	Published 2018-2013	Not published 2018-2023

Source: Rajasagaran & Ismail (2022)

**Table 2** Selected articles for the review.

No	Authors	Summaries
1.	Ge (2021)	The study found a significant correlation between WMC and English reading performance among college EFL learners. The study implies that targeted training to improve WMC can enhance English reading performance among college EFL learners.
2.	Chung et al (2020)	The study highlighted that WM and inhibition significantly predict reading comprehension in both Chinese and English among Chinese adolescent readers with dyslexia. The research suggests that improvements in working memory and other executive functions could benefit reading skills in both L1 and L2 contexts.
3.	Chow et al (2021)	The research indicated that both reading anxiety and WM play crucial roles in English reading comprehension. The study implies that reducing reading anxiety and strengthening WM could enhance reading comprehension.
4.	Shen and Park (2018)	This study indicated that WMC, along with meta-cognitive strategies and syntactic awareness, affects L2 reading comprehension. The research indicates that training in meta-cognitive strategies and syntactic awareness, along with WM exercises, could enhance L2 reading comprehension.
5.	Li and Brantmeier (2021)	The research highlighted that WMC affects reading comprehension and strategy use among Chinese EFL university students. The study suggests that improving WMC through training could enhance reading comprehension and strategy use in Chinese EFL students.
6.	Chang et al (2019)	This study found that WM significantly predicts English reading comprehension among Chinese middle school students. The findings suggest that enhancing WM through targeted training could improve English reading comprehension for Chinese EFL learners.
7.	Huang et al (2022)	The study demonstrated that WM is closely linked to L2 reading comprehension, with eye-tracking providing additional insights. Findings suggest that WM training can enhance L2 reading comprehension, with eye-tracking data providing additional guidance for effective interventions.
8.	Huang and Jiang (2022)	Results revealed that WM plays a crucial role in processing unfamiliar words across different proficiency levels. The study implies that targeted WM training can aid in better processing unfamiliar words, thus improving reading comprehension.



### 3. Current Research Status

In recent years, research on the relationship between WM and reading comprehension has attracted widespread interest, especially among Chinese English as a second language (ESL) and EFL populations. These studies have looked into how WM functions in English reading comprehension and how it might help students become better readers. To explore the potential connections between WM and reading comprehension, several studies have emphasized cognitive psychology (Johann et al., 2020). These investigations might involve tests and surveys designed to gauge and analyze the connection between students' WM and reading comprehension. On the other hand, other research may concentrate more on educational applications, examining how particular educational interventions or tactics might enhance students' WM and reading comprehension skills (Ibarra Santacruz et al., 2020). These studies could evaluate the efficiency of various instructional strategies to improve WMC. With the advancement of technology in recent years, some research may now focus on the digital link between WM and reading comprehension, such as learning via the use of apps or online educational platforms.

After the comprehensive retrieval in both Google Scholar and Web of Science databases, the participants of the six research, among eight studies mentioned in this review, were all English language learners in mainland China. Figure 1 shows us the number of studies published on this topic in the last five years in mainland China and non-mainland regions. It is evident to see that the attention to the EFL population in China is still dominated by mainland China and shows an upward trend after 2020. For instance, one research investigated the connection between vocabulary processing and WM in reading comprehension using eye-movement experiments (Huang & Jiang, 2022); another study advanced the interaction between cognitive psychology and linguistics (Li & Brantmeier, 2021). In contrast, research conducted in non-mainland regions, mostly in Hong Kong, have examined how WM interacts with other variables to influence language learning and acquisition among ESL learners (Chung et al., 2020). However, only individual studies specified the research location, for example, Chang et al.'s (2019) study was conducted in Shanghai, involving middle school students from Shanghai Jiaotong University, East China Normal University, and Shanghai Normal University, while most of the articles did not specify the address where the study was conducted, e.g. Chow et al. (2021), Huang and Jiang (2022), Ge (2021).

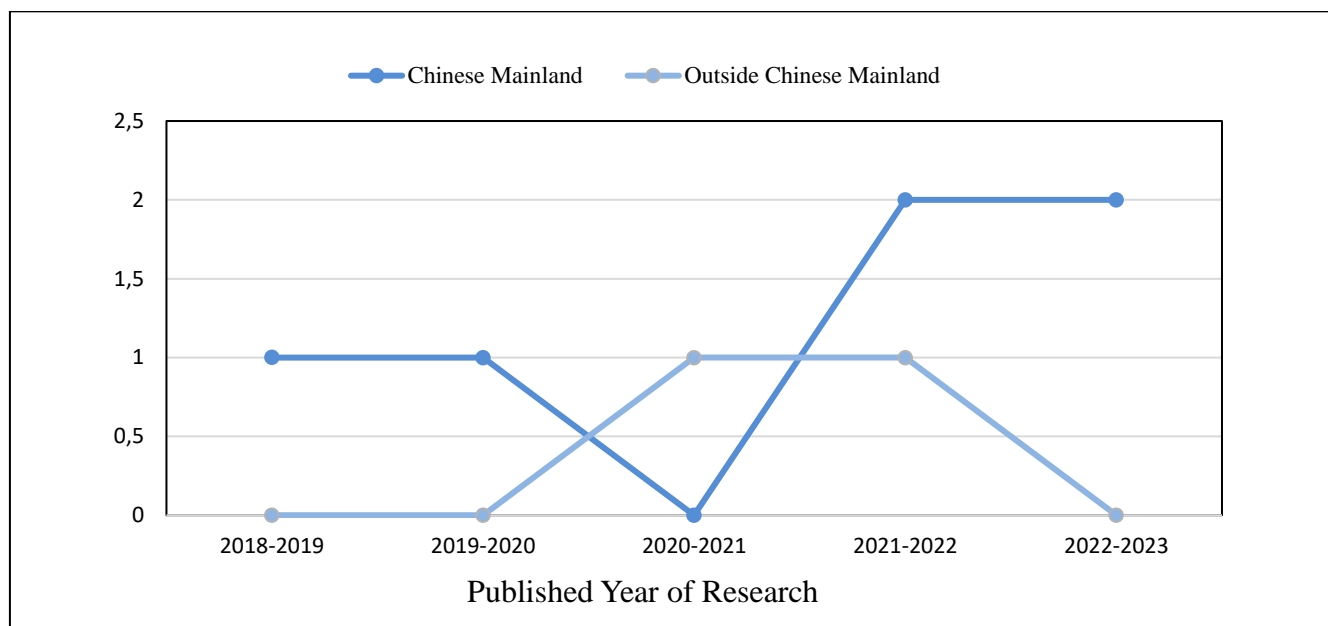


Figure 1 Current trend of research in mainland and non-mainland China.

### 4. Literature Review Findings and Discussion

#### 4.1. Research question 1: What is the relationship between WM and reading comprehension among Chinese EFL learners?

The relationship between WM and reading comprehension will be reviewed from three aspects in this part. One of the most explored cognitive variables for reading comprehension is WM, which is crucial for not just momentarily retaining information but also for regulating, selecting, and preserving information during reading (Hijikata & Koizumi, 2022). Due to a variety of factors, studies on the association between WM and L2 reading have suggested inconsistent results. However, the importance of WM in reading comprehension continues to attract researchers' interest for further exploration. The difference in WMC between learners can impact the speed and accuracy of information processing during cognitive activities significantly, indicating that the individual's comprehension of cognitive activities may be influenced by the restricted WMC (Shen & Park, 2020). Furthermore, learners with higher WMC are more adept at employing background information to enhance their reading comprehension compared to those with lower WMC. This underscores the importance of WM in L2 reading, particularly in



utilizing existing resources (Shin et al., 2019). Given the positive correlation between WM and reading comprehension and the predictive function of WM in reading comprehension performance, this review concentrates on elucidating the interplay between WM and reading comprehension among Chinese EFL learners. Overall, the significance of WM in the reading comprehension of Chinese EFL learners is evidenced by the observation that those with greater WMC achieve better reading comprehension outcomes. Additionally, WM consistently plays an important role in predicting reading comprehension in EFL contexts. These findings collectively demonstrate the impact of WM on the reading comprehension outcomes among Chinese EFL learners.

#### 4.1.1. Positive correlation with EFL reading comprehension

Reading is the most crucial skill for EFL students (Anderson, 2003). Enhanced reading comprehension abilities enable EFL learners to advance more rapidly and develop more comprehensively across all academic disciplines. The capacity to read complex academic articles significantly impacts their learning outcomes in professional fields (Ge, 2021). Individual differences in L2 reading comprehension performance can often be attributed to personal characteristics, particularly WMC, which accounts for a substantial amount of variance among learners (Juffs & Harrington, 2011). A myriad of studies have investigated the relationship between WM and L2 reading comprehension. However, findings have been discrepancy. This inconsistency may stem from several factors, including the participants' age and gender, levels of WMC, reading strategies employed, methods of measuring WM and reading comprehension, and educational backgrounds (Shahnazari, 2023).

Recent research focusing on Chinese EFL learners has demonstrated a significant positive correlation between WM and reading comprehension. One study indicated this relationship among Chinese EFL undergraduates by utilizing three different tasks, free written recall, sentence completion, and multiple-choice comprehension, to assess reading comprehension (Li & Brantmeier, 2021). The results revealed medium to high effect sizes for free written recall ( $r = .602$ ) and sentence completion ( $r = .695$ ) based on Pearson correlation analysis, suggesting that readers with higher WMC achieved significantly better scores on these tasks than those with lower WMC. In another study, Shen and Park (2018) conducted a Pearson correlation analysis to examine the interplay among metacognitive strategies, WMC, syntactic awareness, and reading comprehension. Their findings indicated close associations among these factors, with correlation coefficients of .676, .697, and .750, respectively. This suggests that WM, alongside other factors, significantly influences reading comprehension in EFL contexts. However, Chang et al. (2019) measured the relationship between WM and various components of language learning, contrasting with Shen and Park's focus on personal traits. Their results indicated that WM had moderate to strong positive associations with reading comprehension, grammar, writing, and overall English proficiency. Similarly, a Spearman correlation analysis conducted by Huang and Jiang (2022) examined the relationship between WM and L2 reading comprehension performance across both higher and lower proficiency groups. The findings showed significant correlations in the higher proficiency group, suggesting that the relationship between WM and L2 reading comprehension may be influenced by language proficiency.

In conclusion, the findings discussed above illustrate a positive correlation between WM and reading comprehension among Chinese EFL learners, highlighting the critical role of WM in reading comprehension within this context. This accentuates the need for further investigation into the specific mechanisms through which WM affects reading comprehension, thereby enhancing the understanding of the cognitive processes involved in language learning (Xu et al., 2023).

#### 4.1.2. Predicative contribution to EFL reading comprehension

WM is recognized as a significant determinant of L2 reading comprehension (Gathercole, 1999; Cowan, 2021; Pickering, 2001; Baddeley, 1992; Williams & Lovatt, 2003; Rouder, 2008; Chang et al., 2019), due to its predictive power in EFL reading comprehension (Chang et al., 2019). Seigneuric and Ehrlich (2005) discovered that WMC directly influences the development of reading comprehension. Their research indicated that early WM assessments reliably predict reading comprehension, highlighting its significance in determining reading comprehension as word recognition becomes automated in the early stages. Similarly, Geva and Ryan (1993) found that WM storage tests are reliable predictors of L2 reading comprehension, reinforcing the role of WM in explaining variance in L2 reading.

In relation to this review, WM is undoubtedly a predictor of reading comprehension among Chinese EFL learners. Chung et al. (2020) revealed that both WM and inhibition predict reading comprehension in Mandarin and English for both dyslexic and normal groups. Their regression analysis indicated that WM plays a more significant role in reading comprehension. Thus, WM can predict performance in L2 reading comprehension due to the positive correlation between WM and EFL reading comprehension, accounting for a substantial proportion of variance in this area. This relationship was further validated by Shen and Park's (2018) study, which investigated the predictive impacts of metacognitive strategies, WMC, and syntactic awareness on EFL reading comprehension. Their multiple regression analysis identified significant predictive effects on reading comprehension for syntactic awareness ( $t = 5.928$ ,  $B = 0.399$ ,  $\text{Sig.} = 0.000$ ), WMC ( $t = 3.867$ ,  $B = 0.242$ ,  $\text{Sig.} = 0.000$ ), and metacognitive strategies ( $t = 4.610$ ,  $B = 0.290$ ,  $\text{Sig.} = 0.000$ ). Consequently, WM, in conjunction with metacognitive strategies and syntactic awareness, is of importance in predicting EFL learners' reading comprehension. Moreover, Chang et al. (2019) found that WM could predict performance in English reading comprehension, grammar, and writing, emphasizing its

importance in the English acquisition of Chinese middle school students, particularly in reading comprehension. As WM increases, the benefits for students' English acquisition, especially in reading comprehension, also rise. Language instructors can leverage these insights to enhance students' WM in EFL lessons.

In summary, it can be inferred that WM significantly impacts the prediction of reading comprehension among EFL learners (Sok et al., 2021). Consequently, EFL instructors can utilize WM assessments at various language phases to forecast the development of students' reading comprehension, enabling them to identify stages requiring additional support and to tailor instructional strategies accordingly (Ge, 2021; Li & Brantmeier, 2021).

#### 4.1.3. Better performance in EFL reading comprehension

WMC has been established as a key factor in a person's ability to perform cognitive and linguistic tasks (Yeari, 2017). Research indicates that language learners with higher WMC tend to excel in reading comprehension, which ultimately benefits their overall language learning (Brunfaut et al., 2021; Joh, 2018). Specifically, L2 learners with greater WMC have an advantage when processing unfamiliar words (Huang et al., 2022). Indrarathne and Kormos (2018) noted that learners with high WMC and effective attention-regulating skills engage in more extensive attentional processing of input, such as unfamiliar word processing in EFL reading comprehension.

In accordance with this, a study involving forty-four Chinese college L2 learners demonstrated that those with higher proficiency outperformed their lower-proficiency peers on WMC assessments. This finding suggests that higher proficiency L2 learners tend to excel in reading comprehension primarily due to their larger WMC compared to their lower proficiency counterparts (Huang & Jiang, 2022). Ge (2021) also explored the role of WMC in reading comprehension exams. An independent sample t-test revealed a significant difference in English reading ability between students with high and low WMC, indicating that the high WMC group scored substantially higher on reading comprehension tests. This implies that students with strong WMC significantly outperformed those with lower WMC in English reading tasks. Li and Brantmeier (2021) further explored the relationship between WMC and reading strategy use. A Pearson correlation study examined whether the frequency and diversity of strategy use were linked to WMC. The results indicated a "low-medium" effect size ( $r = 0.436$ ) between WMC and the variety of strategies employed, suggesting that readers with higher WMC were more likely to utilize top-down strategies in L2 reading comprehension, as well as a broader range of strategies. This diversity in strategy use contributes to improved efficiency and accuracy in reading comprehension.

To sum up, WM plays a significant role in reading comprehension among Chinese EFL learners, with greater WMC likely leading to better performance in reading tasks. Furthermore, learners with larger WMC are expected to be more proficient in EFL studies (Shen & Park, 2018) and will benefit significantly from adopting more top-down strategies and a diverse array of reading strategies in L2 reading comprehension. This highlights the significance of WM in language instruction, underlining the need for language teachers to focus on enhancing WMC in their EFL teaching practices.

#### 4.2. Research question 2: How can Chinese EFL learners' reading comprehension be enhanced through WM training in foreign language teaching and learning?

It is worth noting that the studies reviewed in this paper are correlational in nature. While they show a significant relationship between WM and reading comprehension, they do not establish a causal link. Therefore, this section of the study will review the literature on the advice and suggestions to teachers and students to enhance WM. Future experimental studies are needed to determine the causal effects of WM training on reading comprehension in Chinese EFL learners.

The implications for enhancing WM were explored through several studies published between 2018 and 2023, focusing on the perspectives of both educators and learners in the context of Chinese EFL teaching and learning. These studies addressed various aspects of pedagogical practices, from lexical collocation to curriculum design. Ibarra Santacruz et al. (2020) highlighted the use of games as WM triggers, demonstrating overall improvements in language performance during intervention sessions and classroom activities. Furthermore, Hayashi (2019) suggested that observable advancements in ESL or EFL proficiency could be attributed to WM training programs. Such training enhances WM and, in turn, may improve reading processing efficiency. Given that L2 reading involves greater cognitive demands and requires more effort than L1 reading, this type of training is particularly important for L2 learners (Chow et al., 2021).

##### 4.2.1. EFL educators

Educators are fundamental to EFL learning, serving as indispensable components of the educational process. They assist learners in acquiring the language, inspire and motivate them, broaden their cultural awareness, provide tailored instruction, and assess their progress. With regard to their role in enhancing learners' WM within EFL contexts, Ge (2021) argued that educators could strengthen students' WM by encouraging them to recall the content of each lesson. This practice can lead to long-term benefits in EFL reading comprehension as students continually engage with the material. Shen and Park (2020) suggested that teachers can help learners improve their WMC in L2 reading instruction by focusing on lexical and grammatical collocations. This approach allows students to draw upon pre-existing mental schemas to interpret and retain the content of

EFL reading materials through top-down processing. Additionally, Li and Brantmeier (2021) emphasized the importance of educators dedicating time and effort to both explicit WM training and the enhancement of L2 learners' linguistic expertise, which includes vocabulary and syntactic knowledge (Yapp et al., 2023; Grabe & Stoller, 2019).

Moreover, Chang et al. (2019) highlighted that WM training is pivotal in L2 education. They clearly stated that training in verbal WM and the updating function of the central executive system are beneficial techniques, particularly for Chinese middle school students' L2 reading comprehension. Furthermore, educators aiming to enhance students' reading competence should consider integrating executive functioning techniques into their literacy and school-based curricula (Chung et al., 2020). Therefore, educators may create lessons, assignments, and methods for the presentation that are accommodated to students' WMC. For instance, the activities designed should not place excessive demands on their WM. As learners' WMC improves through WM training, the complexity of the curriculum can be gradually increased (Chang et al., 2019). In conclusion, the reviewed studies clearly indicate that educators significantly impact EFL learners' WMC development. By implementing training in lexical and grammatical collocation, along with appropriately designed curricula, educators can augment EFL learners' success in reading comprehension.

#### 4.2.2. EFL learners

Learners are also essential in EFL learning. EFL learners need to actively participate in the learning process, be motivated to learn and practice regularly, be open to feedback, and be culturally aware to maximize their language acquisition and succeed in EFL learning. Hence, to improve their WM, students can benefit from understanding their individual WM and cognitive styles, which can encourage efforts to strengthen their memory abilities. For instance, mastering the information and techniques of memorization lexis would effectively improve their WM (Ge, 2021). Miller (1956) proposed that humans can consolidate closely related knowledge into small groups, or chunks, to support WM. Therefore, learners can group separate elements of information to form more meaningful, larger chunks based on prior knowledge, which can boost their WM (Jiang & Farquharson, 2018; Peng et al., 2018; Shen & Park, 2018). Furthermore, L2 learners should learn to allocate their cognitive resources flexibly during reading comprehension to aid in integrating words with context. This approach encourages learners to read attentively for contextual clues, which can improve their WM and foster success in EFL reading comprehension (Huang et al., 2022).

In summary, language learners may also make an effort to increase their WM in EFL reading comprehension, in addition to the contribution of educators. According to these studies, EFL learners can advance their WM in memorizing vocabulary, grouping meaningful chunks in reading texts, and inferring the meaning of words by integrating words with context.

### 5. Final Considerations

This review highlights the significant correlation between WM and reading comprehension among Chinese EFL learners. Following this, the research questions devised to guide the path of this review were revealed and supported by the findings that underscore the importance of enhancing WM to boost reading comprehension, thereby advancing educational success in EFL settings.

Regarding Research Question 1 (What is the relationship between WM and reading comprehension among Chinese EFL learners?), a review of past studies revealed that WM positively correlates with EFL reading comprehension. Higher WMC is associated with better performance in EFL reading comprehension, demonstrating the predictive contributions of WM to reading comprehension.

Concerning Research Question 2 (How can Chinese EFL learners' reading comprehension be enhanced through WM training in foreign language teaching and learning?), prior research indicates that both language learners and educators should work to improve WM training. This includes practicing lexical collocations and comprehensive curriculum planning. Both EFL educators and learners should recognize the importance of WM in reading comprehension and collaborate actively to enhance it.

Despite providing detailed answers to the research questions, this review faced two main limitations. Firstly, most of the included research focused on tertiary-level EFL learners, indicating a need for more studies on primary and secondary Chinese EFL learners. Secondly, the number of publications analyzed was limited due to the scarcity of studies focusing on the Chinese EFL environment. There is a clear need for more research in this area to better support Chinese EFL learners. Additionally, due to the correlational nature of the reviewed studies, future investigations should focus on conducting experimental studies that can establish causal relationships. Such studies could explore specific WM training programs and their direct impact on reading comprehension, providing more concrete evidence for educational interventions.

In conclusion, it is evident that WM is vital in reading comprehension among Chinese EFL learners. The insights gained from this review highlight the need for a comprehensive approach to enhancing WM through targeted training programs. This not only benefits individual learners but also contributes to the broader educational landscape by providing a deeper understanding of cognitive processes in language learning. Future research should continue to explore innovative methods and technologies that can further enhance WM, and consequently, reading comprehension. By addressing the gaps identified in

this review, educators and researchers can work together to develop more effective strategies for improving literacy outcomes among Chinese EFL learners. Moreover, as digital learning tools evolve, integrating these advancements into WM training could provide more personalized and engaging learning experiences, ultimately leading to better educational outcomes.

### Ethical Considerations

Not applicable.

### Conflict of Interest

The authors declare no conflicts of interest.

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