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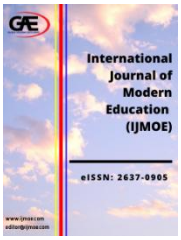

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THE APPLICATION OF METACOGNITIVE STRATEGIES IN READING COMPREHENSION: A SYSTEMATIC LITERATURE REVIEW

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Abstract:

This systematic review synthesizes findings from 33 empirical studies published between 2015 and 2025 and indexed in the Web of Science Core Collection to examine the role of metacognitive reading strategies across diverse linguistic, educational, and technological contexts. Specifically, it investigates how technology-enhanced environments, such as digital platforms and blended learning, influence the use and effectiveness of metacognitive strategies; how these strategies interact with cognitive-affective factors, including motivation, emotion, and critical thinking, to affect reading performance; and how learner characteristics, such as gender and cultural background, shape strategy use and outcomes. The findings indicate that metacognitive reading strategies generally improve reading comprehension, critical thinking, and learner autonomy across both school and higher education settings. However, their effectiveness varies according to learner profiles, academic disciplines, and instructional contexts. The review further shows that digital environments provide valuable opportunities to support metacognitive regulation, although their success depends on the quality of instructional design and pedagogical support. Effective implementation consistently requires explicit strategy instruction, appropriate scaffolding, and sustained professional development for educators. At the same time, challenges related to sustainability, equitable access, and the scalability of interventions remain significant.

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Overall, the review concludes that metacognitive reading strategies are valuable tools for improving reading-related outcomes, but their impact depends on context-sensitive and well-supported implementation. It also highlights the need for future research to further integrate emerging technologies, address learner diversity more systematically, and refine instructional practices to enhance the long-term effectiveness of metacognitive strategy instruction.

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Keyword:

Metacognitive Strategies; Reading Comprehension; Reading Strategies; Systematic Literature Review.

Introduction

Reading literacy is no longer viewed as the simple decoding or memorization of textual information. In major international frameworks, it is defined as the ability to understand, use, evaluate, reflect on, and engage with texts in ways that support personal development and social participation (Snow, 2002; Perfetti et al., 2005). It is therefore understood as a situated process of meaning-making that arises from the interaction among the reader, the text, and the reading context, while also contributing to knowledge acquisition and meaning construction (OECD, 2019a; International Association for the Evaluation of Educational Achievement [IEA], 2020). From this perspective, effective reading education requires not only comprehension but also transferable competence and sustained motivation (Britt et al., 2017; Van den Broek et al., 2011).

Metacognitive strategy is central to this process because successful reading depends not only on cognitive processing but also on learners' ability to regulate that processing. Skilled readers plan before reading, monitor comprehension during reading, and evaluate outcomes afterwards. Reading thus involves both cognitive and metacognitive activity, and the monitoring and regulation of strategy use are closely associated with academic achievement (Zhang & Lian, 2024). This view is supported by PISA findings that identify metacognitive strategies as important predictors of reading performance (OECD, 2019b), as well as by cross-national evidence linking strategy use to reading outcomes (Artelt & Schneider, 2015). Meta-analytic evidence further shows that reading comprehension is broadly associated with academic performance across domains (Akin, 2022).

A substantial body of empirical research has linked metacognitive strategies to improved reading performance across learner groups and educational stages (Urban et al., 2023; Babashamasi et al., 2022; Khellab et al., 2022; Muhid et al., 2020; Nordin et al., 2018; Channa et al., 2018). Their value has also been reported for learners with special educational needs (Albalhareth & Alasmari, 2023) and for second- and foreign-language readers facing linguistic barriers (Liao & Lee, 2024; Martelletti et al., 2023; Hasani & Pahamzah, 2022; Shih & Huang,

2018). In EFL higher education, explicit metacognitive strategy instruction has been found to improve reading comprehension and self-efficacy, particularly when combined with cognitive support and structured questioning (Msaddek, 2016; Tavakoli & Koosha, 2016; Salameh et al., 2019). Recent studies have further examined how technology, motivation, affect, and learner differences shape the use and effectiveness of these strategies (Jang et al., 2025; Acar-Erdol & Akin-Arikan, 2022; Ghaith & El-Sanyoura, 2019; Wei et al., 2025).

Despite this expanding evidence base, the literature remains fragmented. Existing reviews have largely focused on specific contexts, such as EFL/ESL settings, blended learning, or primary education (Kan et al., 2024; Yulita & Napitupulu, 2023; Ali & Razali, 2019; Monika & Devi, 2022; Navarro, 2021). As a result, they do not yet provide an integrated account of how metacognitive strategies operate across instructional environments, interact with motivational and affective variables, or vary across learner groups. Broader issues, including cross-linguistic transfer, multilingual reading, and the generalizability of strategy effects across tasks and languages, also remain insufficiently synthesized (Razkane & Diouny, 2024). A more integrative review is therefore needed to clarify cross-context patterns and inform future research and practice.

Accordingly, this study conducts a systematic review of empirical research on metacognitive strategies in reading. It synthesizes recent evidence on how these strategies function across learning environments, learner conditions, and reading-related outcomes. To achieve this aim, the review addresses three research questions:

RQ1: How do technology-enhanced learning environments, such as digital platforms and blended learning, shape the use and effectiveness of metacognitive strategies in reading?
RQ2: In what ways do metacognitive strategies interact with other constructs, such as motivation, emotion, and critical thinking, to influence reading performance?
RQ3: What differences exist across learner groups, including gender and cultural background, in the frequency, preference, and effectiveness of metacognitive strategies, and what are the pedagogical implications of these differences?

Literature Review

Metacognition has long been regarded as integral to successful reading. Flavell (1976, 1979) defines it as knowledge of and regulation over one's own thinking. Baker and Brown (1984) distinguish between metacognitive knowledge and metacognitive control. Metacognitive knowledge is commonly divided into declarative, procedural, and conditional knowledge, referring to knowledge about the learner and task, knowledge of how to use strategies, and knowledge of when and why particular strategies are appropriate (McCormick, 2003; Schmitt, 2005). Metacognitive control refers to the regulation of cognition through planning, monitoring, and evaluation (Baker & Brown, 1984; Pressley & Afflerbach, 1995; Israel, 2007; Albalhareth et al., 2022). In reading research, these dimensions have consistently been linked to comprehension and academic success (Papleontiou-Louca, 2003; Carrell et al., 1989; Jacobs & Paris, 1987; Sheorey & Mokhtari, 2001).

In applied work, the planning-monitoring-evaluation sequence remains the most widely used framework for describing metacognitive reading strategies (O'Malley & Chamot, 1990; Wenden, 1998; Purpura, 1997, 1999; Brown, 1980; Chamot, 2005). These processes are reflected in practices such as goal setting, activating prior knowledge, prediction, rereading,

note-taking, and identifying main ideas (Sheorey & Mokhtari, 2001; Mukhlif & Amir, 2017; Xia et al., 2022). Test-based research has similarly shown that learners' strategic behavior during reading is shaped by task format and assessment conditions, particularly in second-language contexts (Lin et al., 2019; Liao & Lee, 2024). Mokhtari and Reichard (2004) further classify reading strategies into global, problem-solving, and support strategies, a framework widely adopted in both research and instruction. Across contexts, studies generally report positive associations between metacognitive strategy use and reading comprehension or academic performance (Chen, 2020; Mohseni et al., 2020; Muhid et al., 2020; Sutiyatno & Sukarno, 2019).

The literature also shows that the effects of metacognitive strategies vary across educational stages and learner populations. Direct strategy instruction can support early reading development and benefit learners with language-related difficulties (Schiff et al., 2017; Alenizi & Alanazi, 2016). In foreign-language settings, metacognitive strategies help learners regulate comprehension and manage linguistic difficulty (Leonet et al., 2025; Martelletti et al., 2023). At secondary and tertiary levels, they are associated with reading comprehension, vocabulary growth, reading speed, academic literacy, and learner autonomy (Riyadi et al., 2019; Hasani & Pahamzah, 2022; Asgari & Rafiee, 2018; Mijušković & Simović, 2016; Nordin et al., 2018; Channa et al., 2018; Babashamasi et al., 2022; Khellab et al., 2022; Huo & Cho, 2020). Additional evidence from school contexts outside English-dominant settings also supports the value of meta comprehension-oriented strategy instruction for strengthening reading comprehension (Rodríguez Riberosup et al., 2016). Comparable benefits have also been reported for learners with disabilities and for deaf and hard-of-hearing students, especially when digital tools are incorporated (Nicolielo-Carrilho & Hage, 2017; Benedict et al., 2015; Alsalem, 2018).

A growing strand of research further suggests that metacognitive strategy use is shaped by motivational, affective, and contextual variables. Confidence and self-efficacy are positively associated with regulation and reading performance (Bozgun & Akin-Kosterioglu, 2023; Baki, 2025), while motivation and emotional conditions influence learners' willingness and capacity to sustain strategic reading (Jang et al., 2025; Acar-Erdol & Akin-Arikan, 2022; Ghaith & El-Sanyoura, 2019; Wei et al., 2025). At the same time, technology-enhanced learning environments have introduced new forms of reading that place greater demands on self-regulation, especially in online and hypertext contexts (Ruipérez, 2022; Ortega-Ruipérez et al., 2024; Reshadi-Gajan et al., 2020; Shang, 2016, 2017). Cross-cultural and learner-difference research has also shown variation in strategy frequency and preference across gender, language background, and educational context (Rianto, 2021; Ghaith & El-Sanyoura, 2019; Afsharrad & Sadeghi Benis, 2015; Razkane & Diouny, 2024).

Although this body of work is substantial, existing reviews remain limited in scope. Many focus on a single educational level, a specific linguistic context, or a particular instructional mode, and they often privilege achievement outcomes over broader conditions of effectiveness (Kan et al., 2024; Yulita & Napitupulu, 2023; Ali & Razali, 2019; Monika & Devi, 2022; Navarro, 2021; Galeano et al., 2020). What remains insufficiently clarified is how metacognitive strategies operate across varied reading contexts, under what conditions they are most effective, and how their effects are shaped by technology, motivation, affect, and learner differences. These unresolved issues provide the rationale for the present review.

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Methodology

This study adopts a systematic literature review (SLR) design to examine the application and effectiveness of metacognitive strategies in reading. An SLR is appropriate for synthesizing empirical evidence in a transparent and replicable manner and for identifying major trends, contextual variation, and research gaps (Paul et al., 2024). The review followed the PRISMA 2020 guidelines (Page et al., 2021).

Literature Search and Selection

A systematic search was conducted in the Web of Science Core Collection on 1 November 2025. The search strategy was designed to capture studies addressing metacognitive strategies and related regulatory constructs in reading:

TS = (((metacognit* AND (strateg* OR regulation OR monitor* OR awareness OR knowledge)) OR "metacognitive strategy" OR "metacognitive strategies" OR "metacognitive regulation" OR "metacognitive monitoring") AND ("reading comprehension" OR (read* AND (comprehens* OR performance OR achievement OR proficiency))))
The initial search yielded 1,495 records. These were refined to studies published from 2015 onwards, English-language journal articles, and education-related research, leaving 473 records for screening. After title and abstract screening and full-text eligibility assessment, 33 studies met the inclusion criteria and were retained for analysis. The selection process is presented in Figure 1.

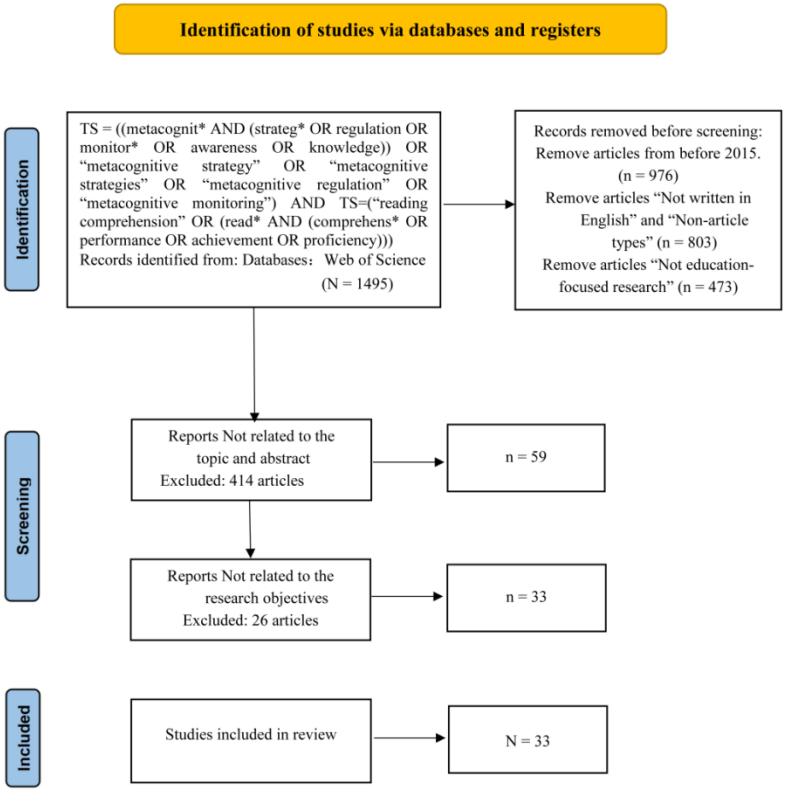

Figure 1: An Overview of the Search Protocol Based on the PRISMA Statement

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Inclusion and Exclusion Criteria

Included studies were peer-reviewed English-language journal articles published in or after 2015 and indexed in Web of Science as education-related. Each study had to address metacognitive strategies or closely related constructs, such as regulation, monitoring, awareness, or metacognitive knowledge, in relation to reading comprehension, achievement, performance, or proficiency. Only studies providing empirical evidence suitable for synthesis, whether quantitative, qualitative, or mixed methods, were retained.

Excluded were non-article publications, studies published before 2015, non-English works, studies outside the educational domain, studies without an explicit metacognitive focus or relevant reading outcomes, duplicate records, and studies with insufficient reporting or inaccessible full text.

Data Extraction and Synthesis

For each study, data were extracted on author and year, country, research design, educational level, participants, and intervention duration where reported. Study characteristics are summarized in Table 1. Because the included studies were heterogeneous in design, sample composition, and outcome measures, the review employed qualitative synthesis rather than statistical meta-analysis. The analysis was organized around the three research questions concerning technology-enhanced environments, the interaction of metacognition with motivational and affective constructs, and learner differences in strategy use and effectiveness.

Table 1: Characteristics of the Included Studies

Research Question	Author (Year)	Country	Research Design	Education Level	Participants number	Intervention Duration
RQ1	Ruipérez (2022)	Spain	Quant.	Master	EG: 56 students; CG: 56 students	15 weeks
RQ1	Reshadi-Gajan et al. (2020)	Iran	Mixed methods	University (EFL)	25 students	12 weeks
RQ1	Shang (2016)	Taiwan	Quant.	University (EFL)	37 students	18 weeks
RQ1	Alsalem (2018)	Saudi Arabia	Quant.	University (DHH)	EG: 18 students; CG: 18 students	16 weeks
RQ1	Urban et al. (2023)	Czech Republic/ Slovakia/ USA	Quant.	Elementary	EG: 195 students; CG: 212 students	32 weeks
RQ1	Shang (2017)	Taiwan	Mixed methods	University (EFL)	37 students	One session (100 min)

RQ1	Berenji (2021)	Iran	Quant.	University (EFL)	EG: 40 students; CG: 40 students	6 weeks
RQ1	Shang (2018)	Taiwan	Mixed methods	University	EG: 37 students; CG: 32 students	18 weeks
RQ1	Khellab et al. (2022)	Libya	Quant.	University	EG: 30 students; CG: 30 students	8 weeks
RQ1	Ortega-Ruipérez et al. (2024)	Spain	Quant.	Master	EG: 105 students; CG: 147 students	15 weeks
RQ1	Jozwik & O'Quin (2025)	USA	Mixed methods	Elementary	3 students	6 weeks
RQ1	Taki (2016)	Canada/ Iran	Quant.	College / Master	90 students	NR
RQ2	Acar-Erdol & Akin-Arikan (2022)	Turkey	Quant.	Age 15	6,890 students	NR
RQ2	Jang et al. (2025)	USA	Quant.	Age 15	2,928 students	NR
RQ2	Muche et al. (2024)	Ethiopia	Quant.	High school	150 students	NR
RQ2	Jang et al. (2023)	USA	Quant.	Age 15	1,192 students	NR
RQ2	Kim (2016)	Korea	Quant.	University	153 students	NR
RQ2	Mohseni et al. (2020)	Iran	Quant.	Intermediate EFL learners	3 groups × 18 students	Two semesters
RQ2	Hasani & Pahamzah (2022)	Indonesia	Quant.	Senior high school	EG: 30 students; CG: 30 students	4 weeks
RQ2	Ghaith (2020)	Lebanon	Quant.	University	103 students	NR
RQ2	Wei et al. (2025)	China	Quant.	High school	343 students	NR

RQ2	Miyamoto et al. (2019)	Germany	Quant.	Secondary school	3,829 students	NR
RQ2	Aziz & Rawian (2022)	Pakistani	Mixed methods	University	200 students	NR
RQ3	Afsharrad & Sadeghi Benis (2015)	Iran	Quant.	Pre-university	86 students	NR
RQ3	Kamis et al. (2017)	Malaysia	Quant.	Upper secondary school	EG: 30 students; CG: 30 students	Four-phase MCS training
RQ3	Rianto (2021)	Indonesia	Quant.	University	602 students	NR
RQ3	Babasham asi et al. (2022)	Malaysia	Mixed methods	University	EG: 33 students; CG: 32 students	14 weeks
RQ3	Ghaith & El-Sanyoura (2019)	Lebanon	Quant.	Upper secondary school	119 students	NR
RQ3	Furnes & Norman (2015)	Norway	Quant.	Upper secondary school	EG: 22 students; CG: 22 students	NR
RQ3	Liao & Lee (2024)	USA	Quant.	College	108 students	NR
RQ3	Alshehri et al.(2025)	Saudi Arabia	Quant.	University	464 students	NR
RQ3	Razkane et al.(2023)	Morocco	Quant.	High school	42 students	NR
RQ3	Es-sarrad et al.(2025)	Morocco	Qual.	University	183 students	NR

Note. Quant. = Quantitative; Qual. = Qualitative; EG = Experimental Group; CG = Control Group; DHH = Deaf and Hard of Hearing; MCS = Metacognitive Strategy Training; NR = Not Reported.

Results

The 33 included studies reveal a literature base dominated by quantitative research, with fewer mixed-methods studies and very limited qualitative inquiry. This suggests that the field has focused more on measuring outcomes than on examining how metacognitive strategy instruction is enacted in practice. Reporting of intervention duration is also uneven. Although

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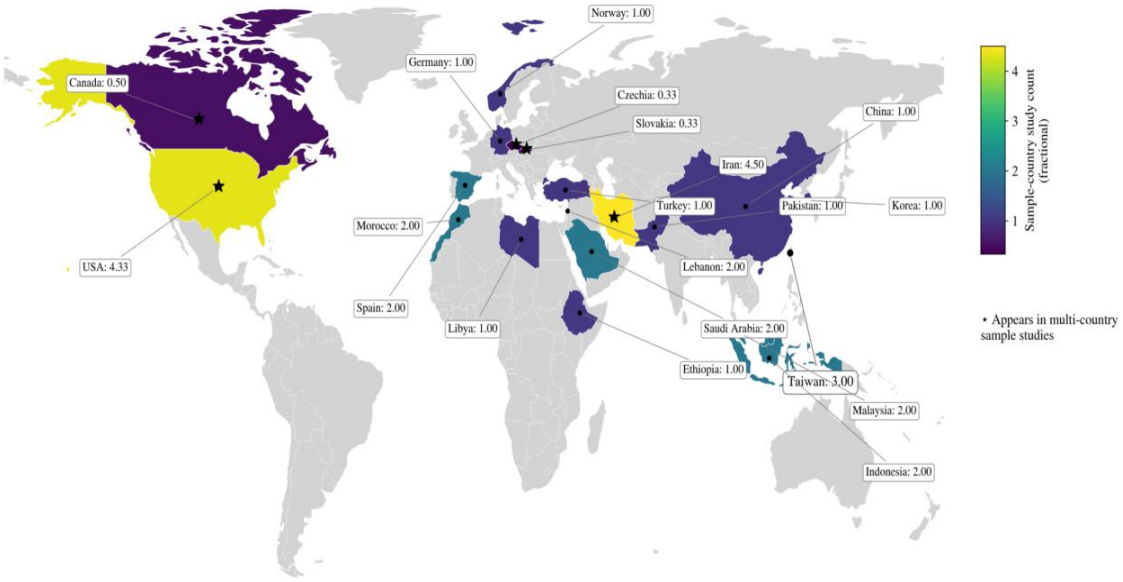
many instructional studies span approximately 6 to 18 weeks, a substantial number do not report duration, limiting comparison across studies.

Geographically, the evidence is international but unevenly distributed. Research is concentrated in a relatively small number of contexts, especially the United States, Iran, and Taiwan, with additional contributions from Saudi Arabia, China, Spain, Malaysia, Indonesia, Lebanon, Morocco, and several other countries. Large regions remain underrepresented, which means that current conclusions should not be treated as fully global. The geographic distribution of the included studies is shown in Figure 2.



Note. Country shading indicates sample-country coverage strength (count-based). Multi-country samples are fractionally counted (1/k per country, where "k" is the number of sample countries). An asterisk (★) denotes countries appearing in multi-country sample studies.

Figure 2: Geographic Distribution of Metacognitive Reading Strategy Studies (2015-2025)

RQ1. Technology-Enhanced Learning Environments

Studies addressing RQ1 show that technology-enhanced environments influence metacognitive reading mainly through the degree to which they support self-regulation. Digital or blended settings are more likely to improve reading when planning, monitoring, reflection, and feedback are explicitly embedded in instructional design. Evidence from higher education and teacher education indicates that digital tools can strengthen planning, motivation management, and comprehension assessment when they are used to scaffold self-regulated learning (Ruipérez, 2022; Ortega-Ruipérez et al., 2024). Where such scaffolding is limited, the benefits of digital delivery are correspondingly modest (Reshadi-Gajan et al., 2020).

The reviewed studies also indicate that digital reading changes the nature of the reading task. In hypertext and online environments, outcomes depend less on the amount of strategy use than on the fit between strategies and task demands. Shang (2016) reports that online metacognitive

strategies and hypermedia annotations do not directly improve hypertext comprehension but contribute indirectly through motivation. Shang (2017) finds that some strategies, such as content guessing, positively predict hypermedia comprehension, whereas others, such as slow reading, may hinder it. Shang (2018) similarly shows that hypertext gains are associated with infer-and-verify monitoring behaviors, while reduced contextual cues and fatigue increase regulatory demands. Overall, these studies suggest that digital environments do not themselves guarantee stronger reading performance; what matters is the alignment among task design, strategy use, and instructional support.

Technology-supported metacognitive instruction also appears beneficial for diverse learner groups. Digitally supported interventions improve text access and engagement among deaf and hard-of-hearing learners (Alsalem, 2018), while multimodal support helps learners with language developmental disorders improve comprehension accuracy and related skills (Jozwik & O'Quin, 2025). Distributed classroom interventions increase students' awareness of reading strategies and are reflected in standardized reading outcomes (Urban et al., 2023). In EFL and ESP contexts, explicit metacognitive instruction delivered through inquiry-based or structured instructional models also improves strategy awareness and reading achievement (Berenji, 2021; Khellab et al., 2022; Msaddek, 2016). At the same time, cross-linguistic evidence cautions against assuming that online reading operates identically across L1 and L2 readers (Taki, 2016; Razkane & Diouny, 2024).

RQ2. Interplay with Motivational, Affective, and Cognitive Constructs

The evidence related to RQ2 indicates a consistent mechanism: motivational resources support learners' engagement in metacognitive regulation, and such regulation, in turn, supports reading achievement by improving the quality and persistence of strategic processing. Longitudinal evidence shows that intrinsic motivation contributes to later comprehension partly through reading engagement and metacognitive knowledge, with particularly strong benefits for lower-performing readers (Jang et al., 2025; Jang et al., 2023; Miyamoto et al., 2019).

Population-level studies further clarify this relationship. Using Turkish PISA 2018 data, Acar-Erdol and Akin-Arikan (2022) show that gender differences in reading achievement are mediated by metacognitive strategy use and reading-related attitudes, including enjoyment and perceived difficulty. More advanced strategies, such as summarizing and credibility evaluation, are especially strongly associated with achievement. Similarly, self-efficacy and perceived control are consistently associated with both strategies use and reading performance, suggesting a reciprocal relationship between competence beliefs and effective regulation (Muche et al., 2024; Baki, 2025).

Affective conditions also shape the durability of metacognitive engagement. Confidence and perceived control appear to support sustained monitoring and evaluation more effectively than anxiety reduction alone, whereas reading discomfort and foreign language reading anxiety constrain both strategy use and comprehension (Kim, 2016; Ghaith, 2020). From a cognitive perspective, metacognitive regulation supports higher-order processing by enabling learners to plan, monitor, and evaluate complex reading tasks more effectively. Studies accordingly link metacognitive regulation not only to comprehension itself but also to vocabulary development, critical analysis, and inferential processing (Mohseni et al., 2020; Aziz & Rawian, 2022; Hasani & Pahamzah, 2022; Salameh et al., 2019). Taken together, these findings support a synergistic

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model in which motivation and affect energies strategic engagement, while metacognitive regulation channels that engagement into more effective cognitive processing.

RQ3. Learner Differences in Strategy Use and Effectiveness

The studies related to RQ3 suggest that differences in metacognitive strategy use are best understood in relation to language proficiency, task demands, prior instruction, and learner background. Across correlational and survey-based evidence, problem-solving strategies are used most frequently, followed by global strategies and then support strategies. Problem-solving strategies also show the most consistent association with both literal and higher-order comprehension (Ghaith & El-Sanyoura, 2019; Rianto, 2021).

At the same time, the evidence does not support simple demographic explanations. Large-sample studies indicate that metacognitive awareness is more closely linked to reading performance than gender alone, and differences by academic track or specialization are generally limited (Alshehri et al., 2025). Liao and Lee (2024) further show that metacognitive knowledge does not directly influence test performance; its effect is mediated mainly through second language reading proficiency. In their findings, problem-solving strategies show a relatively stable facilitative effect, whereas support strategies may be less effective or even negatively associated with performance in some testing contexts. This suggests that strategy effectiveness depends on task characteristics and linguistic demands rather than on strategy labels alone. Related evidence from test-based L2 reading contexts likewise suggests that strategic behavior varies by assessment format and reading demands (Lin et al., 2019).

Differences also emerge across language backgrounds and learner groups. Bilingual learners tend to outperform monolingual learners in both reading comprehension and metacognitive strategy use, while female learners often show stronger overall reading performance (Afsharrad & Sadeghi Benis, 2015). However, these differences are more visible in overall engagement than in sharply distinct patterns of specific strategies. Multilingual high school students may report relatively low levels of strategy use (Razkane et al., 2023), whereas university students often demonstrate moderate to high strategy awareness (Es-sarrad et al., 2025). Despite this variation, the transferability and facilitative role of metacognitive strategies remain evident across learner groups, including transfer across additional languages in multilingual settings (Razkane & Diouny, 2024). Planning strategies appear particularly important for multilingual learners' comprehension (Razkane et al., 2023), and systematic strategy training improves reading performance and learner autonomy in both online and face-to-face contexts (Kamis et al., 2017; Babashamasi et al., 2022; Tavakoli & Koosha, 2016). Even learners with reading difficulties do not necessarily show markedly weaker monitoring abilities than typical readers, suggesting that metacognitive capacity is not fully determined by general reading proficiency (Furnes & Norman, 2015).

Discussion

The findings of this review indicate that metacognitive strategies support reading most effectively when they are embedded in instructional conditions that make strategy use explicit, purposeful, and adaptable. This shifts the emphasis away from treating metacognitive strategies as universally effective techniques in themselves. Their contribution depends instead on instructional design, learner readiness, and the fit between strategic behavior and reading task demands.

The findings for RQ1 show that technology does not automatically improve metacognitive reading. Digital and blended environments can strengthen planning, monitoring, and evaluation, but only when they provide suitable scaffolding. Technological affordances therefore function as conditional supports rather than independent causes of reading improvement. This helps explain why studies of digital reading sometimes report mixed outcomes: what matters is not the medium alone, but how the medium structures self-regulation. The evidence also suggests that technology-mediated strategy instruction is more effective when it is connected to explicit pedagogical routines rather than left to learners' spontaneous adjustment (Reshadi-Gajan et al., 2020; Ortega-Ruipérez et al., 2024; Msaddek, 2016).

The findings for RQ2 likewise show that metacognition cannot be separated from motivational and affective conditions. Learners are more likely to sustain strategic reading when they possess confidence, perceived control, and intrinsic motivation. Conversely, anxiety and discomfort can weaken monitoring and evaluation. The evidence therefore suggests that effective reading instruction should not isolate strategy training from learner engagement, but should integrate regulatory, motivational, and emotional dimensions of reading. This is particularly relevant in EFL settings, where self-efficacy and guided strategic support often appear to work together in sustaining comprehension effort (Tavakoli & Koosha, 2016; Muche et al., 2024).

With respect to RQ3, the review suggests that learner differences are meaningful, but not in a simplistic demographic sense. Although variation by gender and language background exists, more decisive factors appear to be proficiency, prior strategy instruction, and task demands. Problem-solving strategies emerge as relatively robust across contexts, yet even these are not uniformly effective under all conditions. This helps explain inconsistencies in the literature and suggests that pedagogy should focus less on prescribing fixed strategy sets and more on helping learners select and adapt strategies according to context. Cross-linguistic and multilingual evidence further supports the view that strategic reading is transferable, but that such transfer depends on instructional mediation and linguistic demands (Razkane & Diouny, 2024; Leonet et al., 2025).

The review also reveals several limitations in the evidence base itself. The literature remains geographically concentrated, methodologically dominated by quantitative studies, and often weak in reporting intervention parameters. These limitations restrict comparison across studies and make it difficult to trace how metacognitive strategies develop and stabilize over time. More longitudinal, cross-cultural, and process-oriented research is needed to clarify the conditions under which metacognitive reading support is most effective and transferable.

Conclusion

This systematic review shows that the contribution of metacognitive strategies to reading comprehension cannot be explained by strategy use alone. Their effectiveness depends on whether instructional conditions enable learners to apply planning, monitoring, and evaluation in ways that are responsive to task demands, learner characteristics, and learning context. Technology-enhanced environments can strengthen metacognitive reading, but only when digital tools are supported by explicit regulatory scaffolding. Motivation, confidence, and affective conditions further shape the extent to which learners initiate and sustain strategic reading. Differences in reading outcomes are therefore better understood in relation to language

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proficiency, instructional support, and contextual alignment than to demographic characteristics alone.

The review contributes an integrative perspective by bringing together technological, motivational, affective, and learner-difference dimensions within a single synthesis of metacognitive reading research. Rather than treating these strands separately, the findings show that they are interdependent and should be considered jointly in both research and pedagogy. The evidence also indicates that metacognitive strategy instruction is most convincing when it is explicit, sustained, and responsive to learner diversity, including multilingual and technology-mediated settings.

In practical terms, the findings suggest that reading instruction should move beyond strategy labels and place greater emphasis on explicit, systematic, and context-sensitive metacognitive training. Such an approach may be particularly valuable in multilingual, digital, and cognitively demanding learning environments.

Future research should pay greater attention to longitudinal development, cross-cultural comparison, and process-oriented analysis. More co nsistent reporting of intervention design and duration would also strengthen the field. Advancing research in these directions will help clarify how metacognitive strategies develop, transfer, and stabilize across languages and contexts, and how instructional design can better support sustained self-regulated reading.

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