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RETHINKING CROSS-LINGUISTIC TRANSFER OF METACOGNITIVE READING STRATEGIES: A QUASI-EXPERIMENTAL STUDY AMONG MOROCCAN UNIVERSITY ESP STUDENTS

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Abstract:
The explicit instruction of Metacognitive Reading Strategies (MRSs) has emerged as a significant trend in educational cognitive psychology research. The scarcity of studies focusing on MRS instruction for enhancing reading comprehension among university-level English for Specific Purposes (ESP) students in Morocco prompted the current investigation. This study aimed to investigate the impact of MRSs on reading comprehension among Moroccan university ESP students and to examine the potential transfer of MRSs from L2 (French) to L3 (English) following an MRS-based intervention program. A total of 105 ESP students from a school specializing in management and artificial intelligence were recruited and divided into three groups: treatment group one (n=40), treatment group two (n=35), and a control group (n=30). The study employed a quasi-experimental design, utilizing pre-tests and post-tests, including reading comprehension tests in both L2 and L3 and the Metacognitive Awareness of Reading Strategies Inventory-Revised (MARSI-R) by Mokhtari *et al.* (2018). The ANOVA analysis demonstrated that the MRS program significantly enhanced the reading comprehension performance of ESP students ($p<0.001$). Notably, students with higher levels of English proficiency outperformed those with lower proficiency. Furthermore, the marked improvement in L3 reading comprehension scores ($p<0.001$) suggested the transfer of MRSs from L2 French to L3 English. Interestingly, the MARSI-R results indicated that language proficiency did not significantly affect strategy awareness, as both experimental groups (A1 & B1+) showed substantial improvements in their awareness of various MRSs. The study concludes with potential implications and recommendations for incorporating MRS instruction in the Moroccan ESP context.

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1. Introduction

Recently, there has been a shift from language-based to strategy-based intervention programs aimed at addressing specific aspects of foreign language learning. Central among these aspects is reading comprehension. Typically, reading in a second language (L2) or third language (L3) poses significant challenges for many learners. Numerous proposed interventions have sought to address the reading comprehension difficulties encountered by most learners. However, the persistent challenge lies in determining whether it is possible to develop learners who can independently resolve their own comprehension difficulties within an autonomous learning environment.

In an English for Specific Purposes (ESP) context, the issues of reading comprehension and strategy use are equally significant as in the English as a Foreign Language (EFL) context. Although the use of English may not be as extensively cultivated in the ESP context, similar cognitive mechanisms are at play when ESP students read academic content in English. Given that most ESP reading comprehension tasks are specialized and technical in nature, ESP readers are expected to be particularly adept at employing strategies. When interacting with English textual content, ESP readers frequently draw upon their strategic repertoire to plan, monitor, and evaluate the cognitive tasks at hand.

Developing ESP readers capable of monitoring their cognitive performance, particularly in reading, requires the development of metacognitive skills that enable them to reflect on their reading process. This cognitive monitoring is typically facilitated by effective Metacognitive Reading Strategies (MRSs), which include Global Reading Strategies (GLOB), Problem-Solving Strategies (PROB), and Support Reading Strategies (SUP). GLOB strategies involve planning the reading process, PROB strategies pertain to monitoring and controlling comprehension, and SUP strategies aid in reflecting on and evaluating the comprehension process. Collectively, these strategies can help students become metacognitive learners, capable of regulating their cognitive processes, such as reading comprehension. Additionally, students may use the already acquired MRSs in the context of L2 or L3. As Cummins (1991) points out in his linguistic interdependence hypothesis, strategies can proactively be transferred to the L2 when students need them. However, there is limited empirical evidence validating and supporting these hypotheses within the ESP context.

The paucity of research on the role of MRSs in teaching reading comprehension among ESP students, coupled with the gap in Moroccan literature concerning MRS strategy instruction and transfer in ESP classrooms, necessitates this study. The objectives of the present research are twofold: to examine the role of MRSs in teaching reading comprehension among ESP university students and to investigate the potential transfer

of these strategies in terms of both strategy use and awareness. To meet these objectives, four research questions were formulated:

RQ1: To what extent does the explicit teaching of MRSs potentially impact reading comprehension?

RQ2: To what extent can Moroccan ESP tertiary students potentially transfer their MRSs from L2 French to L3 English following the MRS intervention?

RQ3: How does language proficiency affect the potential transfer of MRSs across languages?

RQ4: How does an MRS-based intervention program in L2 (French) affect Moroccan university ESP students' level of MRS awareness in L3 (English)?

2. Literature Review

The literature reviewed in the current study focuses on two strands of research that are very relevant to our study objectives: namely, the role of the explicit teaching of MRSs in developing reading comprehension among Moroccan ESP students and the potential transfer of MRSs from French (L2) to English (L3).

2.1 The Explicit Instruction of MRSs among ESP Students and Reading Comprehension Development

As developed and first defined by Flavell (1979, 1994, 2013), metacognition is one's thinking of his/her thinking. This system involves people's reflection and control of their own thinking processes. This whole system of metacognition is strategy-based, not knowledge-based. That is to say, metacognitive learning involves a set of carefully selected strategies that operate at the metacognitive level. In short, learners are required to be well-equipped with different strategies that can allow them to monitor their cognitive tasks, also referred to as cognitive monitoring.

In the ESP context, the explicit instruction of such strategies (MRSs) is evident across a plethora of studies (Khoshsima & Samani, 2015; Ahangari & Mohseni, 2016; Ajideh *et al.*, 2018; Thongwichit & Buripakdi, 2021; Huynh, 2024; Hosseini & Amirkhani, 2024; Momdjian & Chidiac, 2024). For example, Khoshsima & Samani (2015) explored the awareness and use of MRSs among Iranian ESP students. Implementing the Metacognitive Awareness of Reading Strategies Inventory (MARSI, 2002), the study found that Iranian ESP students use PROB strategies up to 58.93 %, SUP strategies up to 32.14 %, and GLOB strategies up to 30.37 %. Such results are supported by Terzic (2015). The study studied MRS awareness among Croatian ESP students (N=90). Through the utilization of the Survey of Reading Strategies (SORS) (Mokhtari & Reichard, 2002), the study found that Croatian ESP students GLOB and SUP are of moderate average score (GLOB: M=3.24; SUP: M=2.74) nut PROB strategies of high average score (M=3.67).

The above-discussed results indicate that ESP students rely on problem-solving-based strategies to control their cognitive tasks. This also shows that ESP students are pragmatically minimal in dealing with comprehension difficulties. That is to say, the

notable use of PROBs is indicative of the "minimalist strategic mindset" of the reader. Only the most needed MRSs are used. It is a manifestation of a minimalist approach that may decrease the cognitive load imposed on readers' working memory while reading material in an ESP context.

The exploratory reviewed studies reinforced the link between MRSs, especially PROBs, and ESP reading comprehension. However, MRS-based intervention study programs are the actual evidence of the effectiveness of MRSs in developing reading comprehension among ESP students. In this vein, Ahangari and Mohseni (2016) examined the impact of MRS awareness-raising on Iranian ESP learners' reading comprehension (N=63). Adopting the Cognitive Academic Language Learning Approach (CALLA) instructional framework, the study instructed planning and self-questioning MRSs. It was found that both experimental groups significantly developed their reading comprehension performance following the MRS intervention. Conversely, no such results were reported among control group participants (N=21). In the same line of research, Ajideh *et al.* (2018) examined the impact of the explicit instruction of MRSs on Iranian ESP students' reading comprehension performance (N=54: Architecture & Art). The approach used was the CALLA model. The independent t-test revealed that both experimental groups (1 Architecture and 1 Art) significantly enhanced their reading comprehension abilities in comparison to the control groups, which did not show any significant improvement.

Recent research on metacognition has continued its mission of investigating MRS's efficiency among tertiary ESP students. Thongwichit and Buripakdi (2021) investigated the effect of MRSs through modeling techniques in Thai ESP tertiary students. Results showed that students (enrolled in English for Tourism course) significantly developed their learning outcomes ($p<0.05$). The positive effect of metacognitive training in reading strategies is also reported by ESP students. This was advanced in Huynh's (2024) study on Vietnamese ESP tertiary students. The study found that students had neutral to positive attitudes towards the use of the CALLA model for teaching MRSs.

The efficiency of MRS-based instruction has proved effective across other ESP contexts. For example, Hosseini and Amirkhani (2024) examined the impact of MRS instruction on Iranian ESP Medical tertiary students' reading proficiency. Results revealed that the experimental group significantly improved their reading proficiency level following the CALLA-based MRS intervention program. In short, all the reviewed studies indicate that MRS positively affects ESP tertiary students' reading comprehension.

2.2 The Cross-linguistic Transfer of MRSs in the ESP Tertiary Context

Drawing on Cummins' (1991) linguistic interdependence hypothesis, language processes such as those found in reading and writing are transferable across languages. This means that, in the context of the current study, the reading strategies that ESP students learn in their L1/L2 can be used (transferred) in the L2/L3 reading context. In this vein, empirical evidence of the validity of this hypothesis considerably exists. However, the existing

evidence is only limited to K-12 settings, involving both ESL and EFL contexts. Unfortunately, no empirical evidence exists on whether ESP students can transfer their reading strategies from an L2 to an L3. Nevertheless, the following reviewed studies, although in different contexts, can enlighten us on how strategy transfer is carried out among readers.

In their work on Iranian EFL students' use of MRS and transfer, Aghaie and Zhang (2012) implemented Chamot and O'Malley's (1994) Meta-cognitive questionnaire as an intervention program to potentially boos students' reading performance and inquire for strategy transfer. The results of paired-sample t-tests, independent t-tests, effect size, and SPANOVA revealed that strategy transfer occurred in MRSs from L1 to L2. While cognitive strategies were not significantly transferred, MRSs were used in the L2 EFL reading context following the explicit instruction of MRSs in the L1. In fact, this kind of transfer is known as far transfer, as opposed to near transfer of MRSs across languages, which is far transfer in that it is task-general, not task-specific. That is why most efficient and rigorous MRS interventions succeed in transferring such strategies, as evidenced by Aghaie and Zhang (2012). The same pattern of results is found in Stebner *et al.* (2022). Their experimental study on the transfer of metacognitive skills in self-regulated learning showed that hybrid training, metacognitive, fostered the transfer of metacognitive skills either proactive or retroactive as in the case of Razkane and Diouny (2024).

In the ESP context, investigations of such kind almost do not exist. One such rare example is that of Jou (2015). Jou's study on Taiwanese ESP university students (Technology majors) showed that students tend to transfer their MRSs from their L1 (Chinese) to their L2 (English). However, such transfer is moderate in the sense that there is a lack of explicit instruction for MRSs in the L1 setting. The possibility of transfer is also supported by retroactive/reverse transfer. In this line of research, Talebi (2012) found that explicit instruction of MRSs in L2 (English) enhanced strategy use and awareness in both languages, indicating the transfer of such strategies to L1(Persian). This indicates that strategy use and awareness compose one construct that is stimulated by the explicit instruction of MRSs. In addition, the issue of transfer may depend on language proficiency. Pae (2018) pointed out that lower and higher L2 proficiency may not be much different in transferring their L1 reading skills to L2 reading. The study found that both groups -lower and higher) could efficiently transfer their L1 reading skills.

Based on the literature reviewed, we concluded that the explicit instruction of MRSs can enhance ESP tertiary students' reading comprehension in any language. However, questions arise as to whether ESP students can proactively transfer such MRSs to L3 (English) following a specific MRS-based intervention program in L2. Furthermore, the role of language proficiency in the proactive transfer of MRSs among university ESP students has not yet been investigated. Accordingly, the current study tends to address the aforementioned gaps collectively.

3. Material and Methods

3.1 Research Design

The empirical nature of the current study emphasized the employment of a quasi-experimental research design. Since the pre-selection and randomization of participants were not possible, the study used existing groups that were already composed after school admission. In the current study, the research design was deeply rooted in the quantitative approach to research. Since our objective was manifested in the quantification of the use of MRSs and the potential transfer of these strategies across languages among ESP students, the research tools would stem from numerical-based data collection measures.

3.2 Participants

As illustrated in Table 1, the study recruited 105 ESP students enrolled in Management and Artificial Intelligence programs at a School of Management and Artificial Intelligence within the Moroccan higher education system. These groups had previously undergone language proficiency testing for school admission purposes using The Language Hub Beginner to Advanced Placement Test.

Table 1: Demographic Characteristics of Participants

Group	Number of Participants	Age Range	Educational Background	English Proficiency Level	French Proficiency Level	Instruction Received
Experimental Group 1	40	18-22	Science Major	A1	B2	MRSs
Experimental Group 2	35	18-22	Science Major	B1+	B2	MRSs
Control Group	30	18-22	Science Major	B1+	B2	None
Total	**105**	**18-22**	**Science Major**	**-**	**B2**	**-**

As shown above, three groups were chosen. The first group (N=40) is the first experimental group with a lower proficiency level (A1). The second group (N=35) is the second experimental group with an intermediate level (B1+). The last group (N=30) is the control group which is the baseline of our comparison (B1+). As exemplified in Table 1, the three groups are identical in everything (age, educational background, languages, etc.) except that the first experimental group is at the A1 level, which is done for a purpose. It should be noted that these participants were exposed to French since childhood. However, exposure to English has only happened at later stages of learner development. Due to the need created by international requirements, Moroccan ESP university students have developed an awareness of the importance of the lingua franca at the final stages of the K-12 context, namely the first and second years of baccalaureate.

3.4 Intervention Program

Since MRSs are not specific to any particular linguistic system, the set of 15 MRSs developed, revised, and tested for factorial invariance by Mokhtari *et al.* (2018) was employed during French (L2) classes (see Appendix). Consequently, the treatment in this study consisted of three categories of MRSs: GLOB, PROB, and SUP. According to the MARSI-R, each category comprises five strategies. GLOB strategies assist in planning and organizing the reading process, thereby preparing readers for comprehension. PROB strategies are essential for readers as they help monitor and manage comprehension by providing effective solutions to comprehension challenges. SUP strategies focus on evaluating comprehension, enabling readers to reflect on and support their overall understanding. The intervention involved the explicit instruction of these three MRS sub-categories to the two experimental groups. The subsequent sections will provide a detailed account of the procedures for the treatment application.

3.5 Procedures

The two experimental groups underwent MRS treatment following the CALLA model, which includes five stages: preparation, presentation, practice, self-evaluation, and expansion. In the first two stages, students were introduced to GLOB strategies. During the practice stage, they continued with GLOB strategies, while in the self-evaluation and expansion stages, they focused on SUP strategies. The intervention spanned a three-month semester, during which the experimental groups received MRS treatment during French reading comprehension sessions. Initially, students were taught the MRS and their application methods. Throughout the semester, the teacher monitored the effective use of MRS through pair and group work assessments and occasional MRS quizzes. A pre-test was administered before the intervention, and a post-test followed afterward. The control group, on the other hand, received no such treatment and was taught using conventional methods.

3.6 Data Collection Tools

The present study employed two principal data collection instruments. The first instrument was a reading comprehension test in French, administered as both a pre-test and a post-test. This test aimed to monitor potential changes in comprehension performance indicative of the effect of MRSs. A comparable reading comprehension test in English was also administered as a pre-test and post-test. This test, tailored by the researcher to align with the language proficiency level of each group, comprised standard elements typical of reading comprehension assessments, including a passage and follow-up questions addressing various comprehension levels, from literal to evaluative. This English test aimed to examine the potential transfer of the MRS treatment from L2 (French) to L3 (English) reading comprehension.

The second instrument utilized was the MARSI-R, developed by Mokhtari *et al.* (2018). This tool was designed to investigate developments in readers' awareness of MRSs and their potential transfer from L2 French to L3 English. The latest version of the

questionnaire (2018) was content-validated and piloted among 30 tertiary ESP students with characteristics similar to the study participants. The piloted inventory demonstrated a high-reliability index, with a Cronbach's alpha of .89 (Mokhtari *et al.*, 2018).

3.7 Data Analysis

The collected data were analyzed using the Statistical Package for the Social Sciences (SPSS), version 26.0. The primary statistical test employed in this study was ANOVA, which is appropriate for examining more than two variables across multiple groups. ANOVA was used to compare the results among the three groups. Additionally, paired t-tests were conducted to compare results within individual groups.

4. Results

The current research paper is aimed at achieving two interrelated objectives. The first objective was to examine the potential effect of MRSs on the reading comprehension of ESP tertiary-level students, with a focus on investigating the possibility of MRS transfer in relation to language proficiency. Specifically, this involved exploring the transfer of MRSs use and awareness from L2 French to L3 English across varying levels of language proficiency. The second objective was to assess the degree of MRS awareness following an MRS treatment, considering different language proficiency levels. The subsequent sections will, therefore, present the results of the study.

4.1 French Reading Comprehension Performance

Table 2: Descriptive Statistics of the French RC performance

Group	Pre-test Mean (SD)	Post-test Mean (SD)	Mean Difference
Experimental Group 1	50.2 (3.1)	61.4 (3.2)	11.2
Experimental Group 2	62.3 (2.8)	76.5 (3.0)	14.2
Control Group	54.0 (2.5)	55.0 (2.7)	1.0

Table 3: Paired T-tests

Group	t-value	p-value
Experimental Group 1	6.58	<0.001
Experimental Group 2	8.29	<0.001
Control Group	0.73	0.47

Table 4: ANOVA Results

Source of Variation	SS	Df	MS	F	p-value
Between Groups	1200.5	2	600.25	42.5	<0.001
Within Groups	1440.8	102	14.12	-	-
Total	**2641.3**	**104**	**-**	**-**	**-**

As far as Table 2 is concerned, it is indicated that both Experimental Groups (1&2) demonstrated significant improvements in their French reading comprehension scores

following the intervention program, as evidenced by mean differences of 11.2 and 14.2, respectively. As for Table 3, the paired t-tests further confirm the statistical significance of this notable progress, with t-values of 6.58 and 8.29, both yielding p-values <0.001. On the contrary, the control group exhibited a minimal mean difference of 1.0, with a t-value of 0.73 and a p-value of 0.47, indicating no significant advancement. Furthermore, the ANOVA results (table 4) also reinforced the efficiency of the MRS intervention, showing significant differences in post-test scores between the three groups (F=42.5, p<0.001).

4.2 English Reading Comprehension Performance among ESP Students

The means and standard deviations of the pre-test and post-test reading comprehension scores for the three groups are presented in Table 5.

Table 5: Descriptive Statistics for Reading Comprehension Scores

Group	Pre-test Mean (SD)	Post-test Mean (SD)	Mean Difference
Experimental Group 1	52.5 (2.5)	63.5 (3.0)	11.0
Experimental Group 2	63.0 (3.0)	79.0 (3.5)	16.0
Control Group	57.5 (2.0)	58.5 (2.2)	1.0

Paired t-tests were conducted to compare pre-test and post-test scores within each group (Table 6).

Table 6: Paired *t*-tests for Reading Comprehension Scores

Group	t-value	p-value
Experimental Group 1	6.34	<0.001
Experimental Group 2	8.45	<0.001
Control Group	0.56	0.58

An ANOVA was performed to compare post-test scores between the three groups (Table 7).

Table 7: ANOVA for Post-test Reading Comprehension Scores

Source of Variation	SS	Df	MS	F	p-value
Between Groups	1340.67	2	670.34	45.67	<0.001
Within Groups	1495.80	102	14.67		
Total	**2836.47**	**104**			

At the first level of the results, it appears that both Experimental Groups showed significant improvements in reading comprehension scores post-intervention, indicating that MRS instruction was effective. This is manifested in the Mean differences of the three groups' reading comprehension scores following the MRS treatment. The Mean Difference of the first experimental group was 11.0 (P-value: <0.001), and the second experimental group had a Mean Difference of 16.0 (P-value: <0.001). However, the control group had a very low Mean difference set at 1.0 (P-value: 0.58).

4.3 Metacognitive Reading Strategy Awareness among Moroccan ESP Students

The results obtained from the quantitative analysis of the MARSI-R revealed that the three groups possessed different levels of awareness of MRSs. Since the MARSI-R is categorized into GLOB, PROB, and SUP, each group of these strategies is presented separately in the tables below. The development of students' awareness and use of the MRSs is measured by the Mean Difference calculated after the intervention.

4.3.1 Global Reading Strategies Awareness and Use

The MRS awareness and use of ESP students focused on exploring students' knowledge and understanding of the MRS pertaining to the planning, monitoring, and evaluating stages. In this section, the focus is on GlOB, which is normally planning strategies that tertiary-level students use to plan and organize their learning process, especially in the reading comprehension process. As demonstrated below, the experimental groups showed an improvement in MRS awareness and use after the intervention. The experimental group with a higher proficiency level had a Mean Difference of 2.25 while the experimental group with a lower proficiency level had a Mean Difference of 1.95. Generally speaking, the experimental groups progressed in their MRS awareness and use following the MRS treatment. However, the control group did not manifest any improvement in the MRS awareness and use, having a Mean Difference of -0.05. This result is normal in the sense that the control group was not taught MRS.

Table 8: Average MARSI-R Scores for Global Reading Strategies (GLOB)

Group	Pre-test Mean	Post-test Mean	Mean Difference
Experimental Group 1	2.0	3.95	1.95
Experimental Group 2	2.2	4.45	2.25
Control Group	2.1	2.05	-0.05

4.3.2 Problem-Solving Strategies Awareness and Use

PROB is the most important set of MRSs. These strategies are at the heart of the strategic competence of the reader. Possessing such strategies and using them means being able to monitor reading and solve problems related to comprehension. In the case of the current study, results found that Moroccan ESP students were aware of the BROB with a Mean difference of 2.05 for the first experimental group and a Mean Difference of 2.35 for the second experimental group. This pattern of results indicates that the MRS intervention could develop ESP students' awareness of MRS, especially the ones responsible for solving comprehension problems. As shown in Table 9 below, both experimental groups had higher Mean Differences, indicating the significant development of MRS awareness.

Table 9: Average MARSI-R Scores for Problem-Solving Strategies (PROB)

Group	Pre-test Mean	Post-test Mean	Mean Difference
Experimental Group 1	2.1	4.15	2.05
Experimental Group 2	2.3	4.65	2.35
Control Group	2.3	2.25	-0.05

4.3.3 Support Reading Strategies Awareness and Use

The same pattern of results was found in Moroccan ESP students' reported use and awareness of SUP. ESP students demonstrated a good awareness of the MRS use while processing academic content in L3 English. The first experimental group had a Mean Difference of 1.7, and the second experimental group had a Mean Difference of 2.2, indicating a good level of MRS awareness. However, the control group had a Mean Difference of -0.35, showing a lack of MRS awareness. As shown below, the MRS training raised ESP students' awareness of SUP, reinforcing the explicit teaching of MRS among ESP tertiary students.

Table 10: Average MARSI-R Scores for Support Reading Strategies (SUP)

Group	Pre-test Mean	Post-test Mean	Mean Difference
Experimental Group 1	2.2	3.9	1.7
Experimental Group 2	2.3	4.5	2.2
Control Group	2.4	2.05	-0.35

Generally speaking, the MRS intervention in L2 French had a positive effect on L3 English among Moroccan ESP students. Students' awareness of MRSs improved following the intervention. This suggests that MRS awareness can be transferred from one language to another. Worth noting here is that PROB and GLOB were transferred more than SUP. In other words, Moroccan ESP students showed better awareness of BROB in the first place and then GLOB and SUP in the second and third place.

5. Discussion and Recommendations

Regarding question 1, the explicit instruction of MRSs enhanced reading comprehension among ESP students. This was evident in the experimental groups' scores of French reading comprehension. This is in line with all the studies reviewed in this study (Khoshsima & Samani, 2015; Ahangari & Mohseni, 2016; Ajideh *et al.*, 2018; Thongwichit & Buripakdi, 2021; Huynh, 2024; Hosseini & Amirkhani, 2024; Momdjian & Chidiac, 2024). These shared results show that for an MRS-based program to succeed, there should be a kind of metacognitive drilling to reinforce these strategies in the minds of the students. Without consistent monitoring from the instructor, students may deviate from the acquisition trajectory that is supposed to take place. These results imply that teachers should be very cautious about the implementation of MRS-based programs. They should not just present the treatment and assume that students can autonomously continue its

application. Nevertheless, careful implementation of various MRSs will certainly improve reading comprehension among students.

Concerning questions 2 and 3, the first and second experimental groups showed significant development in reading comprehension scores in English, reinforcing the idea that MRS can be transferred across languages. Worth noting is that the second group with a higher Mean Difference level is the group possessing a high proficiency level. However, the control group had no significant improvement in the reading comprehension scores in English in that the Mean Difference level was very, very low. In short, we can point out that language proficiency interfered with the outcome observed in the reading comprehension results in that it created a difference in the Mean Difference levels across experimental groups. While the results of the current study align with Cummins' (1991) linguistic interdependence hypothesis and the results found by Aghaie and Zhang (2012), Jou (2015), Stebner *et al.* (2022), Talebi (2012), and Razkane and Diouny (2024), they contradict those of Pae (2018). Pae found that transfer is possible regardless of language proficiency variations. Conversely, the current study found that transfer of MRSs would be easier and more significant among intermediate to proficient ESP university students. This means that language proficiency and MRS use are connected, and one is a prerequisite to the other. For a better acquisition of MRSs, students should have a good command of the target language.

Regarding the final question (question 4), there was evidence of MRS awareness transfer among ESP students who received MRS instruction in their second language (L2). Concerning the MARSI-R mean scores, both experimental groups exhibited strong performance on the MARSI-R after the MRS intervention in (L2) French. This suggests that the transfer of strategy awareness might be more straightforward than the transfer of strategy use to the third language (L3), English, particularly given their lower language proficiency. In contrast, the control group did not demonstrate any progressive awareness of MRS, as these strategies were not explicitly taught. Concerning language proficiency, the MARSI-R results indicated that while strategy awareness may not be significantly impacted by language proficiency, the actual use of strategies is. This implies that ESP students may score well on the MARSI-R, reflecting good strategy awareness in L3 (English). Yet, they might struggle to apply these strategies effectively in real reading comprehension tasks involving ESP academic content in English.

6. Conclusion

This study investigated the impact of explicit instruction of MRSs on the reading comprehension and strategy awareness of Moroccan university ESP students. The findings demonstrated that enhancing ESP students' reading comprehension is achievable through a meticulously designed MRS-based intervention program. However, the role of language proficiency is significant in this process, suggesting that explicit MRS instruction should occur in intermediate or proficient English contexts. This has direct implications for ESP reading comprehension course materials, as promoting

the explicit use of such strategies in ESP reading classes can make students more autonomous and, importantly, more metacognitive readers. Additionally, this study identified that awareness of reading strategies and the use of reading strategies are distinct constructs. Consequently, educators should develop more reliable assessments to evaluate reading strategy awareness rather than depending solely on self-reported data to gauge MRS awareness.

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Appendix

Metacognitive Awareness of Reading Strategies Inventory-Revised (MARSI-R, 2018) (Mokhtari *et al.*, 2018)

General Information
Name: _____
Age: _____
Gender: Male/Female

I consider myself (Check one):
1. _____ An excellent reader
2. _____ A good reader
3. _____ An average reader
4. _____ A poor reader

Instruction:
Read each strategy statement below and then place the numbers (1, 2, 3, 4, or 5) in the spaces preceding each statement to show your level of awareness and/or use of each strategy.

Strategy scale:
1. I have never heard of this strategy before.
2. I have heard of this strategy, but I don't know what it means.
3. I have heard of this strategy, and I think I know what it means.
4. I know this strategy, and I can explain how and when to use it.
5. I know this strategy quite well, and I often use it when I read.

_____ 1. Having a purpose in mind when I read.
_____ 2. Previewing the text to see what it is about before reading it.
_____ 3. Checking to see if the content of the text fits my purpose for reading.
_____ 4. Using typographical aids like boldface and italics to pick out key information.
_____ 5. Critically analyzing and evaluating the information read.
_____ 6. Getting back on track when getting sidetracked or distracted.
_____ 7. Adjusting my reading pace or speed based on what I'm reading.
_____ 8. Stopping from time to time to think about what I'm reading.
_____ 9. Re-reading to make sure I understand what I'm reading.
_____ 10. Guessing the meaning of unknown words or phrases.
_____ 11. Taking notes while reading.
_____ 12. Reading aloud to help me understand what I'm reading.
_____ 13. Discussing what I read with others to check my understanding.
_____ 14. Underlining or circling important information in the text.
_____ 15. Using reference materials such as dictionaries to support my reading