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The Use of Metacognitive Strategies within a Mobile-Assisted Language Learning Context: Enhancing Chinese EFL Learner's Listening Skills

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ABSTRACT

In the field of English as a Foreign Language, the development of listening skills is undeniably crucial, not only in an academic context but also for a learner's professional career. These skills can enhance students' comprehension, subsequently improving their writing and speaking abilities. This mixed-methods study, grounded in Metacognitive Theory, investigates whether the use of Metacognitive Strategy Instruction (MSI) within a Mobile-Assisted Language Learning (MALL) context would foster metacognitive awareness of listening and listening skills of Chinese college EFL students. In total, sixty-two students from two homogenous intact classes participated in a 13-week quasi-experimental study. The experimental group received the MSI, while the control group received traditional instruction, both within the MALL context. Quantitative data were analysed using t-tests, and qualitative data were analysed thematically. Results of the study indicated significant improvements in the experimental group's metacognitive awareness of listening and listening skills compared to those of the control group. Thematic analysis revealed the students' positive perceptions on how the MSI within MALL was used to improve their metacognitive awareness of listening and their listening skills. Overall, the findings of the study suggest the effectiveness of the MSI in enhancing both the metacognitive awareness and listening

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skills of Chinese EFL undergraduate students. Thus, it is recommended that Chinese educators and instructors incorporate the MSI in their EFL listening classes to empower students with the use of appropriate strategies for mastering listening skills.

Keywords: English as a Foreign Language; Metacognitive Awareness; Metacognitive Strategy Instruction; Listening Skills; Quality Education

1. Introduction

Competence in English requires English as a Foreign Language (EFL) learners to master receptive skills (listening and reading) and productive skills (speaking and writing)[1]. Among these skills, listening skills are considered the most fundamental language skills, as they could enhance students' comprehension in speaking and writing[2–4].

However, numerous studies have highlighted challenges in mastering listening skills among EFL learners. For instance, such challenges are prevalent among college students learning EFL in China, which is often linked to a lack of awareness of effective learning strategies and insufficient control over learning processes[2, 5]. The inability to overcome such challenges also seemed to result in underperformance and diminished learning motivation[4, 6].

In light of the problems highlighted above, some scholars have proposed explicit metacognitive strategy instruction as a means of improving listening comprehension[7–9]. Such an intervention could help students become much more self-regulated learners and identify the most effective ways to practise and consolidate their learning[10]. Moreover, research has also demonstrated that metacognitive strategy instruction can positively impact the development of other language skills, such as reading[11, 12] and writing[13]. However, the number of studies on metacognitive strategy instruction and its effects on EFL learners' listening skills is limited[14]. To date, very few experimental studies have examined the effects of metacognitive strategy instruction on listening skills e.g., reference[15, 16]. Moreover, studies focusing on Chinese EFL students in the higher education context are rare[17, 18].

Considering the limited studies on listening skills, particularly in the Chinese EFL context, the current study, therefore, addresses the gap by focusing on the effectiveness of metacognitive strategy instruction within a Mobile-Assisted Language Learning (MALL) environment on Chinese EFL students' metacognitive awareness of listening and their listening skills. A study within a Chinese EFL context would not only give insights into the impact of the metacognitive intervention and how the MSI could be utilised effectively but would also be valuable to students in knowing how to use appropriate strategies effectively to improve performance in listening skills. Furthermore, the findings could be useful for teachers to guide students in self-regulating the learning process. In light of the aforementioned purpose, the following research questions guided the study:

(1) To what extent does Metacognitive Strategy Instruction (MSI) within MALL foster EFL undergraduate students' metacognitive awareness of listening?
   a. Within the experimental group, is there any significant difference between the pre-and post-test mean scores on the metacognitive awareness of listening?
   b. Is there any significant difference between the experimental group's post-test mean score on the metacognitive awareness of listening and that of the control group after the intervention?

(2) To what extent does MSI within MALL foster EFL undergraduate students' listening comprehension?
   a. Within the experimental group, is there any significant difference between the pre-and post-test mean scores on listening comprehension?
   b. Is there any significant difference between the experimental group's post-test mean score on listening comprehension and that of the control group after the intervention?
   c. How do the students in the experimental group perceive the use of the MSI within MALL fostered their metacognitive awareness of listening and their mastery of the listening skills?

2. Literature Review

2.1. Theoretical Framework

Metacognitive theory serves as the theoretical framework in this study, as it is often used to explain and direct cognition, metacognitive knowledge, and regulatory skills. The theory provides a foundation for understanding how metacognition operates, its components, and its impact on learning and cognition [19].

The concept of metacognition was introduced by reference [20] as thinking about one's own thinking and taking control of one's own learning. Metacognition encompasses a general theory that explains how we learn and acquire knowledge. According to the theory, humans can actively exert control and regulate aspects of their cognition by being aware of their own thinking and actions. Reference [20] explains that metacognition or metacognitive awareness includes two important parts: (1) metacognitive knowledge, and (2) metacognitive strategies, which involve planning for language acquisition objectives, monitoring language acquisition tasks, and evaluating language acquisition performance [21]. Reference [21] point out that without metacognitive strategies, students have little plan for how to begin or monitor their performance. They would also have no idea how to control their performances, thus losing future learning advantages. In fact, metacognition promotes learning in all areas [22].

2.2. Metacognitive Strategy Instruction in Listening Skills

The manipulation and regulation of students' own thoughts about what learning strategies they should adopt may not be easy. Thus, it is not surprising that students sometimes struggle with these acts. It is noteworthy that an essential aspect of enhancing students' learning strategies involves the effective teaching of metacognitive strategies [23, 24]. By effectively teaching metacognitive strategies, students can become aware of how they monitor and control their learning. Having this awareness would enable them to accomplish a specific task more effectively and consciously [25, 26].

Several studies have demonstrated the benefits and positive impact of metacognitive strategy instruction on mastering EFL listening skills. For instance, reference [27] found that metacognitive strategy instruction had a significant effect on students' listening comprehension. When being instructed with metacognitive strategies, the students, particularly the less-skilled listeners, displayed raised awareness of the listening process, enhanced listeners' confidence and improved listening skills.

In the same vein, a sequential mixed-method study by reference [28], which examined the effects of metacognitive strategy instruction (MSI) with a pedagogical cycle on Thai EFL students' listening comprehension performance and metacognitive awareness in listening (MAL), found a significant effect of the MSI on the students' metacognitive awareness in listening. Furthermore, the students had positive perceptions of the intervention, specifically stressing the use of certain metacognitive listening strategies in accomplishing the assigned tasks.

To sum up, the review of related literature revealed the benefits of teaching metacognitive strategies in listening instruction. Such strategies would enable students to be better equipped to plan, monitor, and evaluate their own learning and improve their listening skills.

2.3. Metacognitive Strategy Instruction within MALL in an EFL Context

In order to facilitate the application of metacognitive strategies of Metacognitive Strategy Instruction (MSI) intervention, a MALL context was used to enhance students' vocabulary learning [29, 30] and improve receptive skills [31], including listening skills [7] and reading skills [15, 16, 32–34]. The MSI within MALL facilitates EFL learners' metacognitive strategies use in different phases: planning, monitoring and evaluation. In the planning stage, it supports resource management, organisational planning, environmental management, and advanced organisation experiences [35–38]. During the monitoring phase, comprehension monitoring, production monitoring, time management, selective attention and directed attention can be taught through the MSI within MALL [36]. In the evaluation phase, students can assess their language learning progress in comparison to established standards following the MSI within MALL [38]. Therefore, the MSI within MALL is essential for transforming the learning experience of EFL students and enhancing their English language proficiency [7].

Research on improving listening skills in EFL contexts has explored various methods, including metacognitive strategy instruction within MALL. Reference [39] conducted a study using Task-based Metacognitive Instruction for Listen-

ing (TBMIL) in a TED Talks-based lesson, and reference [40] conducted a study using metacognitive instruction through a podcast named "BBC sounds". Both of their studies demonstrated the effectiveness of the intervention in enhancing listening comprehension and metacognitive awareness. Reference [41] and reference [28] also found that metacognitive strategies within MALL can significantly improve EFL learners' listening comprehension and metacognitive awareness. However, some studies, such as reference [8], have reported no significant differences in metacognitive awareness or listening proficiency between experimental and control groups after the intervention.

Although previous studies have shown that metacognitive strategy instruction within MALL contributed to language acquisition and learning outcomes, some findings of the studies, such as reference [8], lack persuasiveness and fail to substantiate or disprove the effects of MSI. Furthermore, regarding the impact of the MSI on learners' metacognitive awareness, several studies indicate a positive effect resulting from such instruction, e.g., reference [42–44]. There are also studies in the EFL context, e.g., reference [22, 45], that found no immediate impact on the enhancement of metacognitive awareness as a result of this instruction. Besides, by reviewing the previous studies, it was found that only a few experimental studies using quantitative data have examined the effects of the MSI within MALL on listening comprehension [7]. Similarly, even though some studies have shown the positive effects of the intervention on students' listening skills, applications like WhatsApp are not available in mainland China.

Based on the positive findings of studies conducted within MALL, the current study focuses on the use of metacognitive strategies within MALL in teaching EFL students' listening skills in mainland China. Likewise, students' metacognitive awareness of EFL listening skills will be studied in a Chinese college to provide not only insight into the effectiveness of metacognitive intervention but also guidance for students in utilising appropriate strategies, and improving the acquisition of receptive knowledge, motivation and self-regulation.

3. Methods

3.1. Research Design and Sampling

This study employed an explanatory sequential mixed-methods research design. It comprised a quantitative approach, specifically a quasi-experimental study, and a qualitative method involving a semi-structured focus group interview to collect the required data [46, 47] to determine whether the metacognitive intervention would enhance the Chinese college intermediate-level students' metacognitive awareness of listening and listening skills.

In total, sixty-two (62) intermediate-level second-term college English students from two homogenous intact classes at a college located in Jinhua City, Zhejiang Province in China participated in this study. The students' English proficiency level was gauged by the China English Test-4 (CET-4) which is a standardised English test developed and validated ($\alpha = 0.90$) by the Department of Higher Education, Ministry of Education China [48]. All the students majored in International Business and were between 18 and 20 years old, and have Chinese as their mother tongue. For the qualitative focus group interview, six students in the experimental group were randomly chosen to participate in the interview.

3.2. Data Collection

This study collected both quantitative and qualitative data. Aligned with the research questions, the quantitative data were obtained through the Chinese College English test and metacognitive awareness listening questionnaire. Specifically, pre-and post-tests using the listening components of the CET-4 were administered to assess the impact of metacognitive strategy instruction within MALL on listening comprehension. Before the main intervention, a past version of the CET-4 was also used to gauge the students' proficiency level. The CET-4 test has been aligned with the Common European Framework of Reference (CEFR) by the National College English Testing Committee, China. The CET-4 alignment to CEFR B1 and B2 levels is shown in **Table 1**.

Table 1. CET-4 score alignment to CEFR B1/B2.

CEFR Level of B	Listening Comprehension	Reading Comprehension	Writing and Translation	Total Score
CEFR B1 (Intermediate)	135	149	104	388
CEFR B2 (Upper-Intermediate)	197	194	158	549

Source: Adapted from reference [49].

In addition, the adapted Metacognitive Awareness Listening Questionnaire (MALQ) was used to measure the participants' metacognitive awareness in listening for both the pre-test and post-tests. The 21-item MALQ [50] has five factors, namely, planning and evaluation, directed attention, personal knowledge, mental translation, and problem-solving. It has a 6-point Likert scale ranging from strongly disagree (1) to strongly agree (6). The CET-4 test and questionnaire were all pilot tested among a group of students with similar characteristics to the participants of the main study. To establish the content validity of all instruments, a panel of two experts in language education and assessment was invited to rate and give feedback on the instruments. The instruments demonstrated high reliability, with Cronbach's alpha coefficients of 0.85 and 0.89. The interview protocol was also assessed by the two experts. Based on their feedback, the interview protocol was revised to improve the clarity of the questions. The qualitative data of this study, which involved six participants selected randomly from the experimental group, were gathered through a focus group interview after the quantitative data collection.

3.3. Pedagogical Intervention Design

The pedagogical intervention in this quasi-experimental study mainly adopted a blended teaching approach, which involved the combination of traditional face-to-face instruction with online learning resources and activities. It was regarded by many scholars as 'the new normal' approach in education (i.e., reference [51–53] due to its high rate of adoption, popularity and perceived benefits. This approach was chosen to offer students a flexible and dynamic, environment, allowing them to engage with the material in both synchronous and asynchronous settings.

The intervention was designed based on positive findings of past studies concerning metacognitive strategy instruction in language learning [51–53]. This current study's intervention aimed to foster a more self-directed and reflective learning approach to enhance the students' metacognitive awareness of listening and improve their mastery of listening skills, which provided the students with the necessary metacognitive strategy instruction to plan, monitor, and evaluate their learning process effectively.

The tailored metacognitive strategy instruction intervention was aligned with the diverse learning goals of different language teaching sessions. It was conducted for a duration of thirteen weeks during the second semester of the academic year 2022–2023. Each session lasted for 80 minutes (refer to **Appendix A** for a sample of detailed treatment procedures). This intervention consisted of three phases, as shown in **Figure 1**.

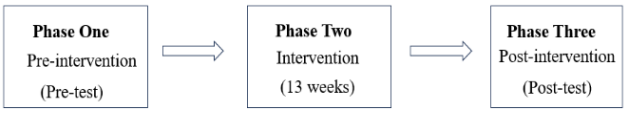

Figure 1. Intervention process.

In the pre-intervention phase, weekly teaching plans comprising four stages were developed and integrated into the classroom activities over thirteen weeks (see **Figure 2**). These plans were aligned with the listening content in the Intermediate textbook used at the chosen college to prevent any disruption of the actual schedule or teaching plan. Besides, baseline assessments (pre-tests) using the CET-4 and metacognitive awareness questionnaire for listening were conducted to assess students' English proficiency and awareness levels before the intervention.

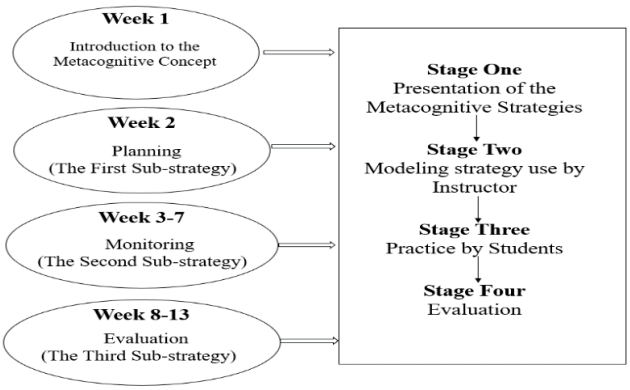

Figure 2. Treatment procedures.

As can be seen in **Figure 2**, each lesson has four stages. Specifically, the first stage, which took approximately seven to ten minutes, involved exposing metacognitive strategies. The focus was on simplifying the definition, explaining metacognitive strategies in an easy-to-understand manner, and providing examples of good metacognitive strategies. Metacognitive strategies were taught using authentic listening activities. The second stage focused on the teacher's modelling metacognitive strategy use. This linked metacognitive strategies to the listening activities in the classroom, and took twenty-five minutes. The third stage emphasised students'

practice of each metacognitive strategy in developing listening skills. This activity took another twenty-five minutes. The fourth stage consisted of reflections on metacognitive strategy instruction, including the following:

i) difficulties encountered by the teacher when teaching metacognitive strategies;
ii) suggestions from the teacher, particularly on the problem encountered;
iii) students' feedback and recommendations regarding the encountered issue.

The intervention phase commenced with an introduction to the study's objectives, highlighting the importance of EFL listening skills and metacognitive awareness of listening. During this phase, instructional sessions introduced and explained metacognitive strategies for listening, including planning, monitoring, and evaluation strategies. Students were encouraged to apply these strategies in various contexts. Each lesson followed a structured approach comprising four stages: introduction to metacognitive strategies, teacher modelling, student practice, and reflections on strategy use (see **Figure 2**).

In the post-intervention phase, post-tests using the CET-4 and metacognitive awareness listening questionnaire were administered to evaluate the effectiveness of the intervention on students' metacognitive awareness of listening and their listening skills.

3.4. Data Analysis

The Exploratory Data Analysis (EDA) is fundamental for identifying the characteristics of the data and determining which appropriate statistical analysis methods to utilise for data analysis. Two key tests were conducted on the data related to metacognitive awareness of listening and listening comprehension, namely the Shapiro-Wilk (SW) test for normality and Levene's test for homogeneity.

Following these tests, data were analysed quantitatively using descriptive and inferential statistics and qualitatively using thematic analysis. The paired and independent samples t-tests, statistical tests for comparing the means, were utilised to evaluate the outcomes of the intervention within the experimental and across the groups, respectively. The tests were run to evaluate the students' metacognitive awareness of listening and their performance in listening comprehension before and after the intervention.

A thematic analysis based on reference [46] five-step approach was used to analyse the semi-structured focus group interview data, that is how the students perceived the MSI intervention within MALL. The inclusion criteria for the thematic analysis was the relevance of the data to the participants' experiences with the intervention. Conversely, the exclusion criteria focused on the omission of data which do not directly address the research objectives or lacked clarity and specificity in relation to the focus of the study. The thematic analysis was facilitated by the NVivo 14 software, which had features for the organisation, coding, and analysis of the interview responses. Initial codes (see **Table 2**) were derived from the data through open coding, which captured descriptive meanings.

These labels were then organised into categories to identify themes in subsequent analysis. After coding all the data, initial codes were generated from the first cycle of coding (see **Appendix B**). A total of twelve codes were generated from the first cycle of coding.

Subsequently, the secondary coding involved axial coding, whereby codes were grouped into several categories, namely Planning and evaluation strategies, Monitoring strategies, Evaluation strategies, Facilitation of Metacognitive Awareness of Listening, Enhancement of Listening Comprehension, as well as Challenges and Difficulties in fostering students' metacognitive awareness of listening and their listening comprehension through the MCI (see **Appendix C**). Each category encompasses related codes that emerged during the line-by-line coding process, providing a comprehensive understanding of the participants' views regarding the use of metacognitive strategy instruction for the intended outcomes.

The validity of the qualitative data was enhanced through member checking, which allowed participants to review and confirm the accuracy of their statements, thus enhancing the credibility of the findings [54].

Additionally, themes and subthemes were verified by two experts in qualitative research to ensure objective data analysis [55] and inter-coder reliability. This involved the two experts reviewing the codes derived from data analysis done by the researcher and initially generated by the NVivo, reaching a consensus to minimise subjective bias and ensure consistent application of coding across the data set [56].

Table 2. Examples of initial coding.

Initial Codes	Description	Original Text
Long conversations	Understanding context and detailed information.	"Metacognitive strategies have greatly enhanced my ability to understand long conversations by encouraging reflection..." S5
Enhanced engagement	Increasing involvement and participation	"The interactive nature of the activities presented by metacognitive strategy instruction within MALL enhances engagement..." S6
Advanced organisation	Structuring study sessions effectively, prioritising tasks, and maintaining a balanced learning pace.	"Advanced organisation really allows me to set clear objectives and structure my study sessions effectively. For instance, I prioritise difficult topics early in my study schedule to ensure a thorough understanding." S1
Directed attention	Focusing on specific areas before engaging in listening tasks to maintain concentration.	"Directed attention during monitoring helps outline specific areas of focus." S2
Selective attention	Filtering out irrelevant information to focus on key details that contribute to comprehension.	"Selective attention is crucial during monitoring, enabling me to filter out irrelevant information." S2
Performance evaluation	Gauging proficiency levels after practice sessions to identify areas needing improvement.	"Performance evaluation helps gauge my proficiency levels after each practice session." S4
Strategy evaluation	Reflecting on and refining the effectiveness of different approaches to enhance learning efficiency.	"Strategy evaluation helps me in reflecting on the effectiveness of different approaches." S4
Enhanced metacognitive awareness	A deeper level of metacognitive awareness facilitated by the use of metacognitive strategies.	"Engaging with metacognitive strategies has profoundly enhanced my awareness of the strategies used in listening comprehension." S1
Challenges	Identifying challenges faced while applying strategies.	"One major difficulty was initially maintaining consistent focus during extended listening sessions." S3

Source: Authors' own work.

4. Results

4.1. Exploratory Data Analysis

The results of the Shapiro-Wilk and Levene's tests for both groups are presented in **Tables 3** and **4**, respectively.

As shown in **Table 3**, the results of the Shapiro-Wilk test indicate that the p-values for all data sets were greater than the significance level of 0.05. These results suggest that the distribution of the data aligns with a normal distribution, a crucial assumption for many parametric statistical tests. The normal distribution of the data is encouraging, as it allows for the use of tests that rely on this assumption, such as the independent samples t-test or analysis of variance (ANOVA).

In addition, both the experimental and control groups' pre-test mean scores were compared using Levene's test to ensure the students' homogeneity in metacognitive awareness of listening and listening comprehension before the actual study. The results of Levene's test (**Table 4**) provided evidence for the equivalence of the two groups based on the non-significant p-values ($p \geq 0.05$). This finding suggests that the groups were equivalent in terms of their metacognitive awareness of listening strategies, and their listening comprehension before the intervention. The homogeneity in the pre-test scores is essential for ensuring that any differences observed after the intervention can be attributed to the treatment rather than pre-existing group disparities.

In view of the aforementioned results, it can be concluded that the data met the assumption of normality and

Table 3. Results for test of normality.

Variable	Group	Kolmogorov-Smirnova			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Metacognitive Awareness of Listening	Experimental	0.126	29	0.186	0.956	30	0.201
	Control	0.134	31	0.152	0.943	32	0.116
Listening Comprehension	Experimental	0.133	29	0.155	0.935	30	0.077
	Control	0.134	31	0.152	0.962	32	0.307

Source: Authors' own work.

Table 4. Results for tests of homogeneity.

Variable	Group	df	Levene's Test for Equality of Variances	
			F	Sig.
Metacognitive Awareness of Listening	Experimental Control	60	0.877	0.353
Listening Comprehension	Experimental Control	60	0.647	0.424

homogeneity, allowing for appropriate parametric tests in the subsequent quasi-experimental research.

4.2. Metacognitive Awareness of Listening

Table 5 presents the paired sample t-test results for metacognitive awareness of listening. The table displays a comparison of the students' pre-and post-test overall mean scores on metacognitive awareness of listening and the different MALQ strategies after the intervention within MALL for the experimental group.

As can be seen in **Table 5**, the paired sample t-test analysis revealed a significant difference between the experimental group's post-test MALQ overall mean score (M = 4.21, SD = 0.45) and that of the pre-test (M = 3.35, SD = 0.49); t(29) = 6.75, p = 0.000. The calculated effect size, Cohen's d, is 1.83, indicating a very large and significant effect. Therefore, the result of the study indicated a significant difference between the students' pre-and post-test overall mean scores on the metacognitive awareness of listening after the MSI within MALL.

The results displayed in **Table 5** also revealed significant differences between the pre-and post-test mean scores for four out of five MALQ strategies: "Planning and evaluation" (t(29) = 5.54, p = 0.000, d = 1.68), "Directed attention" (t(29) = 7.61, p = 0.000, d = 1.78), "Person knowledge" (t(29) = 4.67, p = 0.000, d = 1.37), and "Problem-solving" (t(29) = 5.57, p = 0.000, d = 1.45). These results suggest that metacognitive listening strategy instruction within the MALL context in this study enabled the students to plan, monitor, and evaluate their listening tasks in a more effective way.

However, the difference between the Chinese EFL undergraduate students' pre-and post-test mean scores for "Mental translation" was not significant (t(29) = 1.97, p = 0.059). The result suggests that the metacognitive strategy instruction within the MALL context had not facilitated the students' aware of their perceived use of mental translation in EFL listening.

Table 6 presents the independent sample t-test results for metacognitive awareness of listening. The table displays a comparison of the students' post-test overall mean scores on metacognitive awareness of listening as well as those for the five MALQ factors between the experimental and control groups.

As shown in **Table 6**, the experimental group's post-test mean score on metacognitive awareness of listening (M = 4.21, SD = 0.45, t = 6.84, p = 0.000) is significantly higher than that of the control group (M = 3.36, SD = 0.53). The results indicated that the use of the Metacognitive Strategy Instruction (MSI) within MALL demonstrates better improvement in the students' metacognitive awareness of listening.

In addition, the results displayed in **Table 6** show that there was a significant difference in the post-test scores of

Table 5. Paired sample t-test analysis results for MALQ.

MALQ Strategies	N	M	SD	df	t	Sig.	d
Planning−evaluation (pre) Planning−evaluation (post)	30	3.51 4.47	0.54 0.60	29	5.54	0.000**	1.68
Directed attention (pre) Directed attention (post)	30	3.49 4.38	0.54 0.42	29	7.61	0.000**	1.78
Person knowledge (pre) Person knowledge (post)	30	3.56 4.49	0.79 0.54	29	4.67	0.000**	1.37
Mental translation (pre) Mental translation (post)	30	3.00 3.47	0.87 0.76	29	1.97	0.059	
Problem−solving (pre) Problem−solving (post)	30	3.19 4.12	0.64 0.64	29	5.57	0.000**	1.45
Overall (pre) Overall (post)	30	3.35 4.21	0.49 0.45	29	6.75	0.000**	1.83

Table 6. Independent sample t-test analysis results for MALQ scores.

MALQ Factors	Group	N	M	SD	df	t	Sig.	d
Planning−evaluation	Experimental Control	30 32	4.47 3.52	0.60 0.59	60	6.26	0.000**	0.60
Directed attention	Experimental Control	30 32	4.38 3.65	0.42 0.56	60	5.28	0.000**	0.50
Person knowledge	Experimental Control	30 32	4.49 3.61	0.54 0.82	60	4.99	0.000**	0.70
Mental translation	Experimental Control	30 32	3.47 2.70	0.76 0.69	60	4.16	0.000**	0.73
Problem−solving	Experimental Control	30 32	4.12 3.24	0.64 0.63	60	5.48	0.000**	0.63
Overall	Experimental Control	30 32	4.21 3.36	0.45 0.53	60	6.84	0.000**	0.49

Source: Authors' own work.
** Highly significant at $p < 0.001$ (two-tailed).

all five MALQ factors between the two groups, with the experimental group obtaining higher scores in the post-test. Specifically, the results show higher experimental group's post-test mean scores in "planning and evaluation" ($M = 4.47$, $SD = 0.60$, $t(60) = 6.26$, $p = 0.000$, $d = 0.60$), "directed attention" ($M = 4.38$, $SD = 0.42$, $t(60) = 5.28$, $p = 0.000$, $d = 0.50$), "person knowledge" ($M = 4.49$, $SD = 0.54$, $t(60) = 4.99$, $p = 0.000$, $d = 0.70$), "mental translation" ($M = 3.47$, $SD = 0.76$, $t(60) = 4.16$, $p = 0.000$, $d = 0.73$), and "problem-solving" ($M = 4.12$, $SD = 0.64$, $t(60) = 5.48$, $p = 0.000$, $d = 0.63$). Overall, the metacognitive strategy instruction within MALL significantly contributed to the enhancement of metacognitive awareness in EFL listening, as evidenced by both the overall scores and individual MALQ sub-strategies.

4.3. Listening Comprehension

Table 7 presents the paired sample t-test analysis results for the overall CET-4 pre-and post-listening test mean scores, as well as those on the three parts within the control and experimental groups.

As shown in **Table 7**, for the experimental group, there is a significant difference between the overall mean scores in the pre-test ($M = 149.58$, $SD = 36.77$) and post-test ($M = 192.88$, $SD = 52.27$); $t(29) = 2.76$, $p = 0.010$, with a medium effect size ($d = 0.73$). These results indicate that within the experimental group, the Metacognitive Strategy Instruction

Table 7. Paired sample t-test analysis results for CET-4 listening scores.

Group	Time	N	M	SD	df	t	sig.	d
Control	Pre-test Post-test	32	160.97 168.85	40.94 41.47	31	1.11	0.274	
Experimental	Pre-test Post-test	30	149.58 192.88	36.77 52.27	29	2.76	0.010*	0.73

Source: Authors' own work.
* Significant at $p < 0.05$ (two-tailed).

(MSI) within MALL had significantly improved the Chinese EFL undergraduate's listening comprehension.

In contrast, the result for the control group indicates no significant difference in the overall mean scores between the pre-test (M = 160.97, SD = 40.94) and post-test (M = 168.85, SD = 41.47), with a t-value of 1.11 and a p-value of 0.274. The results suggest that within the control group, the traditional instruction did not significantly improve the Chinese EFL undergraduate students' post-test mean score in listening comprehension.

Table 8 presents the independent sample t-test analysis results for the students' overall post-CET-4 listening test mean scores, as well as those on the three parts in the experimental and control groups.

As illustrated in **Table 8**, the experimental group's post-test mean score in listening comprehension (M = 192.88, SD = 52.27) is higher than that of the control group (M = 168.85, SD = 41.47). However, the calculated t-value of 1.16 and p-value of .251 indicate that this difference was not statistically significant. Nevertheless, it is noteworthy that there are significant differences between the two groups for certain parts of the listening test.

The displayed results in **Table 8** also show higher experimental group's post-CET-4 listening mean scores for all three parts. The independent sample t-test analysis revealed significant differences between the experimental and control groups' first two parts' mean scores: "Short News" ($t(60) = 2.18$, $p = 0.033$, $d = 0.55$) and "Long Conversations" ($t(60) = 2.54$, $p = 0.014$, $d = 0.65$). The results suggest that the metacognitive listening strategy instruction in this study had a significant impact on the participants' performance in these specific listening tasks. However, the difference between the post-CET-4 listening mean score on the "Passages" of the experimental and control groups was not statistically significant ($t(60) = 0.69$, $p = 0.495$). The result suggests that the metacognitive strategy instruction within the MALL context had not

improved the Chinese EFL undergraduates' listening comprehension of the "Passages" in the CET-4 exam.

4.4. Students' Perceptions Towards Metacognitive Strategy Instruction within MALL

In order to gain a deeper understanding of the effects of the Metacognitive Strategy Instruction (MSI) within MALL on the students' metacognitive awareness of listening and their listening skills, the analysed qualitative data complemented the quantitative findings. The thematic analysis of the Chinese EFL undergraduates' responses to the focus group interview questions generated three themes underlying the learners' positive perceptions of the way how the use of MSI within MALL fostered the students' metacognitive awareness of listening and enhanced their listening comprehension.

Theme 1: Facilitation of Metacognitive Awareness of Listening

The first theme, Facilitation of Metacognitive Awareness of Listening, which was revealed from the thematic data analysis of the students' interview response data, encompasses four subthemes: Directed Attention, Person Knowledge, Problem-solving Listening, and Selective Attention. These subthemes highlight how the MSI facilitated deeper engagement and effective strategy adoption for mastering listening skills.

The students reported that directed attention enhanced their metacognitive awareness of listening by helping them focus specifically on the cognitive tasks involved in listening. This is evident in Student 2 (S2) and Student 5 (S5)'s responses:

> *"For me, directed attention during monitoring helps outline specific areas of focus most be-*

Table 8. Independent sample t-test analysis results for CET-4 listening scores.

Listening Parts	Group	N	M	SD	df	t	sig.	d
Short News	Experimental Group Control Group	30 32	39.99 34.17	11.26 9.78	60	2.18	0.033*	0.55
Long Conversations	Experimental Group Control Group	30 32	44.97 37.50	13.49 9.41	60	2.54	0.014*	0.65
Essays	Experimental Group Control Group	30 32	107.92 102.95	24.62 31.65	60	0.69	0.495	
Overall	Experimental Group Control Group	30 32	192.88 168.85	52.27 41.47	60	1.16	0.251	

Source: Authors' own work.
* Significant at $p < 0.05$ (two-tailed).

fore engaging in listening tasks. This ensures I am mentally prepared and can maintain concentration throughout the session." (S2)

"Monitoring, specifically directed attention, plays a significant role in enabling me to stay focused during listening tasks." (S5)

In the above excerpts, it is evident that the directed attention was beneficial, as it enabled the learners to continue concentrating on their listening tasks. By maintaining a directed focus, the students were better equipped to process and comprehend the information presented, which in turn, facilitated a more targeted and effective approach to their activities of listening skills learning.

In addition, the analysed data indicated that the student interviewees felt that the advancement in person knowledge, which is the second subtheme, played an important role in the facilitation of the metacognitive awareness of listening. As several students (S1 and S5) expressed:

"Person knowledge not only boosts my academic results but also empowers me to manage my own learning path. I can better understand the challenges of listening and feel more confident in my listening abilities." (S1)

"Person knowledge has enabled me to continually improve and maintain a positive learning progression, as I develop a clearer perception of listening comprehension and reduce anxiety during listening tasks." (S5)

As reflected in the response excerpts, the enhancement of person knowledge through exposure to metacognitive strategies within MALL is a crucial factor in elevating students' metacognitive awareness of listening. The exposure enabled the EFL students to better understand their listening difficulties and improved their confidence in language learning.

As for the third subtheme, Problem-solving listening, the students emphasised their enhanced ability to solve problems when the listening tasks became difficult for them to deal with. The students' responses demonstrated that the MSI improved their problem-solving abilities by facilitating a deeper understanding of their own listening processes. As pointed out by several students (S2 and S6) in their responses:

"Metacognitive strategies have helped me gain clarity in solving problems, and adapt my strategies during challenging listening tasks." (S2)

"I've learned to identify problems in real time and adjust my approach to overcome them during difficult listening tasks." (S6)

The above excerpts illustrate the EFL students' improvement of their metacognitive awareness of listening. The two students' responses reflect that they were able to recognise certain issues in dealing with their listening tasks and to use appropriate strategies in listening to overcome such problems.

Selective attention, which is the fourth subtheme emerging from the thematic analysis, reflects the students' adept-

ness in selectively attending to pertinent aspects of their learning. The students felt that this strategy was useful to enhance their metacognitive awareness of listening. This can be seen in their emphasis on monitoring and refining their comprehension. For instance, several students (S2, S5, and S6) voiced out:

> *"Selective attention is crucial during monitoring, enabling me to filter out information and focus on key details that contribute to my comprehension." (S2)*

> *"Learning how to strategically focus on key elements during comprehension empowered me with a sense of self-regulation. It made me realise that language proficiency is attainable through consistent effort and well-selected strategies." (S5)*

> *"Learning selectively attending to and self-regulating certain aspects of my learning while listening was a game-changer. I used to feel lost in the texts, but now I catch myself when I drift away. It's like I have a steering wheel for my learning, and I can steer it in the right direction." (S6)*

These response excerpts clearly demonstrate that the exposure to metacognitive strategies during the intervention has fostered the awareness of their perceived use of selection attention, which seemed to play an important role in enhancing the students' metacognitive awareness of listening.

Theme 2: Enhancement of Listening Comprehension

The second theme, which was revealed from the analysis of students' interviews on how the Metacognitive Strategy Instruction (MSI) within MALL facilitated their mastery of the listening skills, encompasses one subtheme: Long conversations. The interview data contains the students' responses which indicated an improvement in their listening skills, especially in their comprehension of long conversations resulting from the MSI as evident in S1 and S5's responses:

> *"Engaging with metacognitive strategies has significantly improved my listening skills, particularly in comprehending long conversations. Unlike short news and passages, longer conversations provide more context and detailed information, which allows for deeper reflection on my learning approach and information processing. These strategies are particularly effective for understanding the complex information and logical connections within extended conversations." (S1)*

> *"Metacognitive strategies have greatly enhanced my ability to understand long conversations by encouraging reflection and understanding the reasons behind mistakes. This comprehensive approach has enabled me to continually improve and maintain a positive learning progression." (S5)*

As reflected in S1 and S5's response excerpts, the Metacognitive Strategy Instruction (MSI) has improved their ability to comprehend the long conversations. These strategies have enabled the students to better reflect on their learning approaches and information processing, as well as led to a positive learning progress. The perceived use of certain strategies also underscores the pivotal role of the MSI in developing an effective method for mastering listening skills.

Theme 3: Challenges and Difficulties

The third theme, Challenges and Difficulties, revealed by the thematic analysis, encompasses two subthemes: Evaluation of self-understanding and Focus during extended listening sessions. The analysed interview data revealed that the students encountered some challenges and difficulties during the Metacognitive Strategy Instruction (MSI) intervention, highlighting the importance of the MSI in addressing these obstacles and enhancing their overall learning experience.

The first subtheme, "Evaluation of self-understanding", which emerged from the students'responses, reflects that the students found it challenging to evaluate their own understanding accurately after completing the listening tasks. This is evident in S2 and S3's responses:

> *"Engaging with metacognitive strategies in my listening practices has presented challenges. One difficulty I encountered was initially struggling to accurately evaluate my own under-*

standing after completing listening tasks." (S2)

"I used to listen without much thought to my learning process, but now I actively engage in monitoring and evaluating my understanding, which is both challenging and rewarding." (S3)

In the above excerpts, the challenges faced by S2 and S3 in evaluating their comprehension of the listening texts demonstrate the importance of the MSI in facilitating this skill. This suggests that when students become more proficient in monitoring and evaluating their understanding, they are better equipped to take charge of their learning process, stay motivated, and maintain consistency in their studies, which ultimately leads to the enhancement of their listening skills[57].

As for the second subtheme, "Focus during extended listening sessions", the analysed data revealed that the students encountered difficulties in maintaining concentration over prolonged periods of time during the MSI intervention. This is reflected in the responses of S5 and S6:

"Engaging with metacognitive strategies during extended listening sessions has been a challenge for me. I often find it difficult to stay focused and attentive, especially when the content is lengthy or complex." (S5)

"When I first started using metacognitive strategies, I found it difficult to maintain sustained attention during extended listening sessions. Now I've become more aware of my cognitive processes and am better equipped to maintain my attention." (S6)

As illustrated in the excerpts above, the difficulties faced by S5 and S6 in focusing their attention during the extended listening sessions underscore the importance of the MSI in addressing this challenge. In this case, as students gained competence in applying their perceived use of certain metacognitive strategies to regulate their attention, they seemed to become more capable of directing their learning process, sustaining their motivation, and ensuring continuity in their academic efforts. This enhanced ability would ultimately result in the improvement of the listening skills.

5. Discussion

The results of the quantitative data analysis indicate that the Metacognitive Strategy Instruction (MSI) within a Mobile-Assisted Language Learning (MALL) context significantly improved the Chinese EFL undergraduate students' metacognitive awareness of listening and listening comprehension. Specifically, the paired sample t-test revealed a very large and significant effect size (Cohen's d = 1.83) for the overall post-test mean scores on the metacognitive awareness of listening compared to the overall pre-test mean scores, with significant improvements observed in four out of five MALQ sub-strategies. Additionally, the experimental group showed a significant improvement in listening comprehension, as measured by the overall mean scores of the CET-4 pre-and post-listening tests, with a medium effect size (d = 0.73). However, the difference between the groups in the overall mean scores and the "Passages" section of the listening test was not statistically significant. The thematic analysis of the qualitative data revealed that the MSI enhanced students' metacognitive awareness of listening, facilitated deeper engagement in dealing with the assigned tasks and effective strategy adoption for mastering and improving their listening skills, in particular in comprehending long conversations. The students' challenges and difficulties in listening during the MSI intervention were also eased through their heightened metacognitive awareness of listening which, therefore, stresses the importance of the MSI in addressing the challenges and enhancing their overall learning experience.

For metacognitive awareness of listening, the results in the current study concur with those revealed by some previous studies (e.g., reference[9, 39, 40, 42], suggesting that metacognitive strategies of planning, monitoring, and evaluation could contribute to the improvement of metacognitive awareness in listening. Furthermore, the results of the qualitative data analysis corroborate these findings, with the students reporting a heightened awareness of perceived strategy use throughout the intervention. This emphasises the importance of the personalised and facilitative learning environment provided by the MSI during the intervention, which

fostered engagement and cooperation with the instructor and peers.

In terms of listening comprehension, the significant improvement in the overall mean score on listening comprehension within the experimental group aligns with the results of several previous studies [27, 42, 58] (which also reported the effectiveness of metacognitive instruction in listening skills. However, the overall post-CET-4 listening test mean score between the experimental and control groups did not show a statistically significant difference. This finding concurs with those of reference [59], who also reported statistically non-significant results between-group comparison in listening comprehension after the Metacognitive Strategy Training (MST) in his study. A plausible explanation for the non-significant difference in the present study could be that metacognitive strategies, while important, are only one contributing factor to academic success. Their effectiveness might be influenced or moderated by various other factors. For example, vocabulary is essential to effectively handling listening tasks. In the current study, the Chinese EFL undergraduate students could have struggled to comprehend unfamiliar words, which could affect their overall listening performance.

Notably, the intervention in the current study led to the Chinese EFL students' improved listening comprehension in the "Short News" and "Long Conversations" sections of the CET-4 listening test. This positive result could be related to the activities utilised to enhance students' comprehension and processing skills, particularly in tasks that involve concise information and interactive dialogues. Metacognitive strategies, such as planning and monitoring, could have played a crucial role in addressing the challenges posed by the complex "Short News" and "Long Conversations" tasks in the related sections of the test [60]). This finding aligns with the findings of several previous studies (e.g., reference [27, 42]), which also reported the positive impact of metacognitive strategy instruction on students' ability to handle short, information-dense listening tasks. The qualitative data from the focus group interview further substantiated these findings, with the Chinese EFL students reporting increased confidence and motivation in their listening abilities, attributing their progress to the strategy use, especially in planning and monitoring during short and interactive listening tasks. Yet, the lack of significant improvement in the "Passages" section may be attributed to the demanding nature of this section, which involves listening to longer audio. It is likely that such a task requires a more focused approach, possibly incorporating domain-specific language instruction.

To sum up, this study has highlighted the effectiveness of Metacognitive Strategy Instruction (MSI) within a Mobile-Assisted Language Learning (MALL) environment in improving EFL students' listening skills. The result of the current study is noteworthy, educators are, therefore, encouraged to integrate explicit metacognitive strategies into their teaching, fostering self-regulated learning. Policymakers should also consider embedding these strategies in the EFL curriculum to address persistent challenges in related language acquisition. In light of the finding, future research could explore the long-term effects of MSI on other language skills, such as reading and writing, and investigating the impact of combining MSI with domain-specific language instruction, which would provide valuable insights for advancing metacognitive strategy application in language learning.

Limitations and Recommendations for Future Research

Despite the positive outcomes, two limitations must be acknowledged. Firstly, the subjects of the study were intermediate English proficiency Chinese college students, which may limit the generalisability of the findings. Thus, future research should include learners from diverse cultural and linguistic backgrounds and different English proficiency levels. Secondly, the study was not designed to evaluate the effect of MALL. Therefore, it could not make any claim regarding the effects of MALL on the Chinese students' listening skill performance. Thus, future studies could be designed for this purpose.

6. Conclusions

This study investigates the effects of the Metacognitive Strategy Instruction (MSI) within Mobile-Assisted Language Learning (MALL) on the Chinese college English as a Foreign Language (EFL) students' metacognitive awareness of listening and their listening skills. The findings highlight the significant role of this intervention in enhancing students' metacognitive awareness, in particular in strategies, such

as planning, monitoring and evaluation. These strategies have contributed to improved listening comprehension, particularly in tasks which involve concise information and dialogues, such as short news and long conversations.

Moreover, the implementation of the MSI within MALL has fostered increased motivation, self-regulation, and strategic learning among students, creating a more personalised and engaging learning experience. While the study confirms the efficacy of this intervention in improving listening skills in the Chinese EFL context, it also suggests that similar benefits could be achieved in other EFL contexts with students of comparable proficiency levels. However, further research is needed to explore the impact of Metacognitive Strategy Instruction (MSI) across diverse proficiency levels, cultural backgrounds, and learning environments to strengthen the generalisability of these findings.

This study offers valuable insights for both EFL instructors and policymakers. The positive effects of the MSI within a MALL environment on the intermediate-level students' listening skills suggest that instructors should integrate explicit metacognitive strategy instruction into their teaching practices. Continuous metacognitive support throughout learners' academic journeys is vital, and teachers should concentrate on nurturing skills in planning, monitoring, and evaluation, along with reflective practices that stimulate self-regulated learning. Assessment should be holistic, focusing not just on performance but also on the refinement of learning strategies through reflection.

For policymakers, the integration of metacognitive strategies in EFL curricula could be a pivotal step in overcoming recurring obstacles in language learning. A systemic approach to incorporating MSI into language education can bolster self-regulated learning and improve overall language proficiency. By adopting these pedagogical and policy recommendations, the landscape of EFL education could be meaningfully transformed.

Author Contributions

Conceptualization, C.P. and S.M.R.; methodology, C.P. and S.M.R.; software, C.P.; validation, C.P. and S.M.R.; formal analysis, C.P.; investigation, C.P.; resources, C.P., S.M.R. and L.J.; data curation, C.P.; writing—original draft preparation, C.P.; writing—review and editing, S.M.R. and L.J.; visualization, C.P.; supervision, S.M.R. All authors have read and agreed to the published version of the manuscript.

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Institutional Review Board Statement

The study was conducted in accordance with the Declaration of Helsinki, and approved by the Ethics Committee of Shanghai University of Finance and Economics Zhejiang College (protocol code IEC-2023-002 February 11 2023).

Informed Consent Statement

Informed consent was obtained from all subjects involved in the study

Data Availability Statement

The datasets generated during and/or analyzed during the current study are available from the corresponding author upon reasonable request.

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Conflict of Interest

The authors declare no conflict of interest.

Appendix A. Treatment Procedures (One-Week Sample)

Week	Teaching Content & Aim	Experimental Group's Teaching Method (Metacognitive Strategy Instruction within MALL)	Control Group's Teaching Method (Traditional Instruction within MALL)
1	**Unit 2 Jobs and Careers** **Listen and Talk** In this lesson, students will listen and talk about the introduction of jobs and the significance of job selection, as well as how to gain fun during the work.	**1. Greetings (5 min)**	**1. Greetings (5 min)**
		2. Listen and Talk (75 min) ***Step 1: Before Listening (20 min)*** (1) **Warming Up** (5 minutes) Begin the lesson with a brief discussion to engage students and activate their prior person knowledge by using Moso Teach APP (Students can share their ideas and give likes through that APP). • What are your dream jobs? • What factors will you consider when choosing a career? • Please share an enjoyable and fun job or task you have done in the past.	**2. Listen and Talk (75 min)** ***Step 1: Before Listening (20 min)*** (1) **Warming Up** (5 minutes) Begin the lesson with two job-related questions to engage students by using Moso Teach APP (Students can share their ideas and give likes through that APP). • What are your dream jobs? • What factors will you consider when choosing a career?
		(2) **Metacognitive Strategy Introduction within MALL** (5 minutes) Introduce the metacognitive concept, and provide specific examples of metacognitive strategies through a brainstorming activity on the Moso Teach APP. • Planning (before listening) • Monitoring (while listening) • Evaluation (after listening)	(2) **Traditional Learning Strategy Instruction within MALL** (5 min) Introduce general learning strategies and provide specific examples of these strategies through a brainstorming activity on the Moso Teach APP. • Previewing vocabulary, predicting content based on titles or headings (before listening) • Taking notes, underlining key information (while listening) • Summarising the main points, answering comprehension questions (after listening)
		(3) **Group Prediction** (5 minutes) Use Planning of Metacognitive Strategy Introduction • Divide students into small groups (3-4 students per group). • Provide a list of keywords related to jobs and careers on the board. • Instruct each group to predict what they might hear in the upcoming listening activity based on the keywords provided. • Encourage students to discuss their predictions within their groups, using metacognitive strategies to support their reasoning	(3) **Group Discussion** (5 minutes) Use Traditional Teaching Method • Divide students into small groups (3-4 students per group). • Encourage students to participate in an open discussion about the two job-related questions mentioned earlier.
		(4) **Class Sharing** (5 minutes) • Have each group share predictions with the rest of the class. • Guide a brief classroom discussion that stimulates critical thinking and prompts students to evaluate the likelihood of different possibilities.	(4) **Class Sharing** (5 minutes) • Have each group share key points with the rest of the class. • Guide a brief classroom discussion that prompts students to evaluate the different perspectives on the two job-related questions.
		Step 2: While Listening (35 min) • Listen twice, fill in missing words, and share answers on MALL with Moso Teach APP. • Encourage students to use monitoring of metacognitive strategies during the listening task. Emphasise techniques such as self-monitoring and note-taking to enhance their listening comprehension.	***Step 2: While Listening (35 min)*** • Listen twice, fill in missing words, and share answers on MALL with Moso Teach APP.
		Step 3: After Listening (15 min) • Check answers and address any questions or mistakes based on the answers on Moso Teach APP. • Instruct students to critically evaluate the information from the listening task. • Guide students to evaluate listening process, identify strengths, and areas for improvement in comprehension.	***Step 3: After Listening (15 min)*** • Check answers and address any questions or mistakes in front of the whole class.
		3. Review (5 min)	**3. Review (5 min)**

Appendix B. Initial Codes from First Cycle Coding

Initial Codes from First Cycle Coding			
Metacognitive awareness of listening	Listening comprehension	Difficulties	Selective attention
Directed attention	Evaluation strategies	Self-management	Long conversations
Person knowledge	Comprehension monitoring	Focus during extended listening sessions	Problem-solving listening

Appendix C. Categories and Codes from Second Cycle Coding

Categories	Codes	Description
Facilitation of Metacognitive Awareness of Listening	Selective attention	Developing self-discipline and organisational skills to enhance consistent learning practices.
	Problem-solving listening	Applying problem-solving skills during listening activities to enhance understanding.
	Person knowledge	Utilising person knowledge and experience to improve listening comprehension.
	Directed attention	Focusing attention on specific aspects during listening for improved comprehension.
Enhancement of Listening Comprehension	Comprehension of long conversations	The ability to understand and retain information from extended conversations.
Challenges and Difficulties	Focus during extended listening sessions	Enhancing focus and attention during extended listening activities for better comprehension.
	Evaluation of self-understanding	Assessing personal understanding of materials and adjusting strategies as needed.

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