

## The effect of note-taking and working memory on Iranian EFL learners' listening comprehension performance

Amini Asl, Zeinab ✉

Sobhe Sadegh Institute of Higher Education, Isfahan, Iran ([zeinab\\_aminiasl@yahoo.com](mailto:zeinab_aminiasl@yahoo.com))

Kheirzadeh, Shiela

Sobhe Sadegh Institute of Higher Education, Isfahan, Iran ([sh.kheirzadeh@yahoo.com](mailto:sh.kheirzadeh@yahoo.com))



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### Abstract

This study was designed to investigate the effect of note-taking and working memory on Iranian EFL learners' listening comprehension. The primary purpose of this study was to see whether there was any difference among the listening and note-taking participants in the application of note-taking strategies and whether there was any difference in listening comprehension test performance of listening only and listening and note-taking groups. Also, this study explored whether the participants' working memory capacity correlates with their listening comprehension performance. In so doing, 44 lower-intermediate L2 learners were selected from Sobhe Sadegh Institute of Higher Education in Esfahan, Iran. The experimental and control groups, twenty two students in each, included both female and male native speakers of Farsi, of the age range between 18 and 30. The data were collected based on listening sections of TOEFL. All the participants listened to one listening passage in each session, each passage was accompanied by multiple-choice, essay and recall questions. Then, a test was administered at the end of the sessions to find the difference between the achievement of the experimental group (listening and note-taking) and the control group (listening only). The results indicated that there were differences among the participants' listening comprehension test scores and their note-taking strategies. Comparing the mean scores of the two groups of students, by independent samples T-test indicated that the note-taking group outperformed the listening only group. Additionally, the data analysis via correlation indicated a positive correlation between working memory and listening comprehension performance.

**Keywords:** note-taking; listening comprehension; working memory

## **The effect of note-taking and working memory on Iranian EFL learners' listening comprehension performance**

### **1. Introduction**

Note-taking, as a helpful strategy to help students' attention and retention of the academic discourse, has been identified as significant in educational institutions, particularly in colleges and universities. Teachers place a great emphasis on the significance of taking good lecture notes because they believe that note-taking is one of the essentials to obtaining acceptable grades in examinations (Lin, 2006). Therefore, college students try to develop note-taking strategies in order to take notes during a listening activity or a lecture. Note-taking is a process that takes place at the same time with the listening process. According to what they listen to, note-takers need to take down some notes in their own ways. Boran and Yi (2012) believed that note-taking consists of four skills, namely "listening, cognitive processing, recording passage content in written form and reviewing noted information" (p. 507). Note-taking helps listeners to understand and combine their interpretations of new data into their cognitive structure.

As indicated by Ferris and Tagg (1996), cited in Kim (2004), listening comprehension and remembering the content of lecture will become problematic and hard when students listen to a lecture without note-taking. Therefore, students' lack of understanding may decrease their confidence in classes. All in all, it is very important for students to learn note-taking for school, work, and life. The best reason to take notes is that learners can never re-listen to a talk or a presentation and taking note allows them to keep and record data, they can utilize later. A further problem that students encounter in the process of listening comprehension is easily forgettable content of what they listen. Numerous language learners mentioned that when they listen, they can follow the speaker without understanding what they hear; thus, they cannot take notes and answer the questions but if they comprehend the passage, they can answer every question (Lin, 2006). Despite the recognition of the helpfulness of note-taking, some students acknowledge that in the middle of a lecture, their listening comprehension is hampered by taking notes. This is an important problem that must be taken into account in studies on retention or maintenance. One way to ease the problem is to teach note-taking strategies to learners while they are listening.

Taking notes gives a chance to both encoding and recording the data introduced in an oral lecture which highlight the effect of note taking on listening comprehension and memory. Summarization of listening and utilization of notes, as an aid, provide an opportunity for students to process the data from the lecture more profoundly (Lin, 2006). This study attempts to add to the available information by examining the impact of note-taking and memory on Iranian EFL college learners' listening comprehension. With the results of this study, the researchers plans to add quality to the current findings on note-taking by either supporting its adequacy or dismissing its importance. Furthermore, another aim of the researchers is to indicate whether the process of note-taking facilitates the process of learning and remembering lecture materials. Above all, the suggestions provided in the present study help EFL learners take care of their problems in listening comprehension.

### **2. Literature Review**

According to Carrell, Dunkel and Mollaun (2004), students' answers to the question about the use of note-taking indicates that it has a positive impact on students. Most of them believe that note-taking is more useful for lecture in class than in test. Moreover, note-taking aids students to comprehend the lecture presented in class. In most academic listening activities, students are allowed to take notes when they listen to a lecture and answer questions at the same time (e.g. TOEFL, IELTS) or utilize note-taking itself as a measure of listening ability (e.g. the Occupational English Test); therefore, it has been considered imperative to investigate the relationship between L2 learners' note-taking and their resulting listening test performance (e.g. Carrell, 2007;

Carrell, Dunkel, & Mollaun, 2004; Hale & Courtney, 1994).

Dror (2007) believes that note-taking is the first and established cognitive technology. It forms cognitive procedures and expands cognitive abilities (Dror & Harnad, 2008). Despite the fact that participants depend tremendously on their information acquisition and representational proficiencies (Armbruster, 2000), their note-taking productivity is just around 20–40% in an ordinary lecture circumstance (Kiewra, 1985). Indeed, a study discovered that the level of details in lecture notes represented a large portion of the differences in students' previous test scores (Titsworth & Kiewra, 1998). In this way, a lot of learning is dependent on using suitable strategies during information acquisition. According to Piolat and Boch (2004), note-taking is a process to write details and helps listeners to remember material. However, this is oversimplification of note-taking process. In fact, cognitive processing is very important in note-taking; there are five cognitive processes in note-taking, namely listening, understanding, analysis, choice, and composing (Lin, 2006). Since listeners listen to the content of lecture and take notes; in fact, note-taking makes them more dynamic by involving listeners in higher-order cognitive abilities, for example, evaluation, decision-making, interpretation, and summarizing.

A significant part of the studies carried out on note-taking has been accomplished with students (e.g., Baker & Lombardi, 1985; Kiewra, 2002) and has analyzed its impacts on data review. However, the insufficient research on the relationship between cognitive parts and note-taking has generated variable results. In a recent study, college students were asked to take notes from a lecture and, after a short pause, to compose a precise report of the lecture based on those notes (Pevery, Ramaswamy, Sumowski, Alidoost, & Garner, 2007). Notes and reports were scored for both nature of articulation of those thoughts (quality was measured for every thought on a size of 0 to 3, as per measure of elaboration) and the amount of thoughts (despite the fact that points and fundamental thoughts were not recognized). The researchers found that the amount and quality measures were profoundly corresponded to both notes and summaries/reports ( $r = .93$  and  $r = .94$ , individually). The relationships between the nature of the notes and reports and the accompanying factors including: translation abilities, containing handwriting clearness (alphabet task) and compositional clearness (simple sentence composition task); sound-related verbal working memory (listening span task); verbal clearness (phonetic and semantic); and spelling were investigated.

Carrell, Dunkel, and Mollaun, (2002) allowed their subjects to take notes while listening to half of the lectures and the results indicated that the students who took notes performed significantly better on test items. Both lower and higher proficiency participants (proficiency estimated by organized TOEFL listening comprehension part, higher scores  $\geq 49$ ; lower scores  $< 49$ ) indicated the same advantage of note-taking, but note-taking had an additional effect on performance for short (~2.5 minutes) passages than for the long (~5 minutes) passages and for lectures with less familiar topics. The findings indicated that note-taking can be helpful in listening comprehension tests, however, it may be less beneficial for longer texts or those having more known topics, although in neither case is note-taking possibly harmful to performance.

Students commonly do listening exercises at school in order to gain knowledge; such exercises are dependent upon storing majority of the data by utilizing mental listening comprehension instruments and later recall those stored data. Listening activities helped students gain knowledge (Boch & Piolat, 2005). Students take notes while listening in order to prevent forgetting nearly 80% of the content of a listening material (Lin, 2006). Generally, note-taking aids students not only in developing writing skills, but also in learning (Boch & Piolat, 2005). While, Jalilifar (2009) indicated the relationship between note-taking strategy and students' listening comprehension ability. The result of study showed a direct relationship between listening comprehension and note-taking strategy. Carrell (2007) examined the relationship between note-taking strategies and performance on a multiple-choice listening comprehension and integrated listening/speaking and listening/writing tasks and whether the brief instructional intervention affected participants' notes and performance on the three tasks. She found that the participants made little use of efficiency and marked organizational note-taking strategies; moreover, intervention had no impact on participants' task performance or note-taking strategies use. In addition, there was a relationship between note-taking and test performance. The

number of test answers recorded in the notes and the number of content words in the notes were influenced by note-taking strategies that consistently related to performance on all three tasks.

Moreover, Piolat, Olive, and Kellogg (2005) examined the interaction between note-taking and working memory. In their study, participants took notes quicker in their first language (French) than second language (English) when listening to English texts. It indicates that listening to second language texts and taking note need more cognitive effort than taking notes from first language texts, because of the extra cognitive load work in L2. Moreover, they found no important interaction between note-taking and working memory; although, Dunkel and Davy (1989) indicated that working memory capacity significantly impacts data review. Lin (2006) investigated the effect of note taking on learners of English as a Foreign Language (EFL) in Taiwan. He found working memory capacity as an important indicator of general listening comprehension, whereas note taking was not. However, for participants who listened to a passage once, taking notes had some advantages, because taking notes allowed them to record some information of the passage (Chaudron, Loschky, & Cook, 1994; Lin, 2006), and when second language speakers take notes and use them, in fact, they can transfer information from the passage into their notes instead of holding all data from a solitary presentation.

Therefore, the present article reports the findings of a study on two groups of participants, namely listening and note-taking group (experimental group) and listening only group (control group) which focuses on the following research questions:

- Is there any difference among the listening and note-taking participants in the application of note-taking strategies?
- Is there any difference in listening comprehension test performance of listening only and listening and note-taking groups?
- Does the participants' working memory capacity correlate with their listening comprehension performance?

### **3. Method**

#### *3.1 Participants*

44 lower-intermediate EFL learners were selected from two listening classes at Sobhe Sadegh Institute of Higher Education, Esfahan, Iran. The experimental (listening and note-taking) and control (listening only) groups, twenty two students in each, included both female and male native speakers of Farsi, of the age range between 18 and 30. None of the participants had the experience of residence in English speaking countries. All participants completed a questionnaire about the background knowledge and their prior experience with note-taking in general and some information about their experience of taking notes during tests in special. Note-taking questionnaire and a TOFEL listening test were administered to both groups to guarantee the homogeneity of the participants.

#### *3.2 Instruments*

**Note-taking questionnaire** - At the first session, participants took a note taking questionnaire developed by Dunkel and Mollaun (2002). The questionnaire consisted of 14 items which intended to provide information about the participants' previous experience of taking notes during tests as well as their impression of the helpfulness of note taking in answering test items. Moreover, researchers could separate students with the same background knowledge and prior experience of note-taking from the participants who did not have the experience of note-taking with the aim of choosing homogenized participants for the study.

**Listening passages** - The passages used in this study were the listening sections of TOEFL matched with the

level of the participants. All the participants listened to one listening passage each session, each passage was accompanied by four multiple-choice, one essay, and two recall questions. Multiple-choice questions aimed at assessing the listening comprehension ability of the participants, i.e. by the use of multiple-choice questions, teacher could understand whether participants understood the content of listening. For this study, we selected a verbatim recall task in which examinees wrote a target word about everything they heard, similar to a cloze test. The sentences were taken directly from the transcription of the passage, with a single target word deleted. The recall questions were included not only to provide additional information about the participants' comprehension of the passage but also to indicate the effect of note-taking on listening comprehension and working memory. Furthermore, the essay questions helped showing the effect of not taking and listening comprehension on working memory.

**Final test** - A researcher-made test was administered at the end of the sessions to find the difference between the achievement of the listening only and listening and note-taking groups. This test consisted of twelve multiple-choice (to measure listening comprehension), four recall (to measure not only listening comprehension but also the effect of note-taking on listening comprehension and memory), and four essay questions (to indicate the relationship between working memory and listening comprehension).

### 3.3 Procedure

This study was conducted in fall 2015 at Sobhe Sadegh Institute of Higher Education, Esfahan, Iran. In this institute, each session lasts 90 minutes and the classes meet twice a week. TOFEL test was administered to all groups to guarantee the homogeneity of the participants. In addition, the participants in experimental group were allowed to take notes and use them while the participants in control group received listening without note-taking.

In the first session, all the participants filled in a questionnaire on their experience of note-taking which also provided some information about their prior experience and background knowledge. After listening to a passage twice, both control and experimental groups completed a test which consisted of four multiple-choice (to measure listening comprehension), one essay question (to show the effect of not taking and listening comprehension on working memory) and two recall questions (to measure not only listening comprehension but also the effect of note-taking on listening comprehension and memory). In addition, the participants of the experimental group were allowed to use their notes when they were answering the test. In the last session of the semester, the participants completed a test which included 12 multiple-choice, four recall, and four essay questions. By the use of essay and recall questions, through the semester and in the last session, the researcher could find the relationship between listening comprehension and working memory.

### 3.4 Data Analysis

The purpose of this study was to describe the effect of note-taking and memory on EFL learners' listening comprehension performance. Therefore, after administering the post-test, the scores of the two groups were compared and contrasted by using Independent Sample T-Test with the aim of any significant difference exists between the two groups. Moreover, Pearson correlation co-efficient was run to analyze the data to find if there is any relationship between working memory and listening comprehension.

## 4. Results

The first research question was to find the possible difference among the participants in the experimental group (listening and note-taking) considering the note-taking strategies they apply. In so doing, at the end of each session, all notes were collected to be analyzed for content and quality. The experimental group participants were divided into two groups (students with high score and students with low score), after estimating the average or mean of the listening test score. Then, both groups were compared with each other in terms of note-taking strategy and the effect of notes on listening comprehension. The notes of first group (high group students or students with high score) demonstrated that the note-taking strategy of content writing (writing important facts

and main ideas instead of writing every point presented in the passage or avoiding writing irrelevant comments) was the most frequent and helpful strategy. While the notes of the second group (low group students or students with low score) showed that most of their notes did not include important facts and main ideas, in other words, a large portion of their notes consisted of irrelevant comments or every trivial point of the passage. Moreover, high group students used other note-taking strategies in their test including:

Abbreviations: *“He is a Dr.”*

Paraphrases: *“When their teacher comes to the class, they stand up and sit.”*

Content words: *“Lunch, oldest, and classroom”*

Eliminating function words (of, at, and he): *“They have seven brother- six sister.”*

Whereas, the notes of low group students included:

More phrases: *“Number phone, her name, and father’s gift”*

Function words (she, who): *“Who is she?”*

No abbreviations: *“She sells foods, eggs, sugar, milk, bread, and juice.”*

Content words: *“Wallet, garden, and tell”*

In addition, they wrote the summary of lecture, instead of writing paraphrases:

*“Interviewer asked: what today? The child answered today is my birthday. Then, she said to that child your birthday happy, your birthday happy. Then the child become happy. The child like cake and ice cream.”*

And their notes were full of incomplete sentences: *“Taxi driver could not -----.”*

The low group could not benefit from their notes at the end of exam because their notes were mostly irrelevant and unhelpful. In addition, some of the notes were in students’ native language: *“Ranandeh Taxi, Tokhememorgh, and To Bagh Kar Mikard.”* However, none of the groups used note-taking strategies such as, using diagram, lists, highlighting, and arrows. Furthermore, they did not pay attention to general note-taking strategies like, a neat handwriting or writing unconnected words.

The second research question was to uncover the differences between the control (listening only) and experimental (listening and note-taking) groups considering their listening comprehension test performance. In so doing, an independent samples T-Test was run (Tables 1 and 2).

**Table 1**

*Descriptive statistics of note-taking/ listening comprehension*

	Note	N	Mean	SD	Std. Error Mean
score	Note-taking group	22	45.27	6.90	1.47
	Listening only group	22	38.14	7.75	1.65

**Table 2**

*Independent T-Tests for listening comprehension test performance*

	Levene's Test for Equality of Variances		t-test for Equality of Means			
	F	Sig.	T	Df	Sig.	Mean
					(2-tailed)	Difference
Equal variances assumed	.932	.034	3.226	42	.002	7.14
Equal variances not assumed			3.226	41.451	.002	7.14

An independent-samples t-test was conducted to compare the listening comprehension test scores of the

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participants in the experimental group (listening and note-taking) and control group (listening only). The experimental group were allowed to take notes and use them and the participants in control group received listening without note-taking. The results of the analysis indicated a significance difference in mean scores for experimental group (Table 1) ( $M = 45.2727$ ,  $SD = 6.90191$ ) and control group ( $M = 38.1364$ ,  $SD = 7.74778$ ;  $t(3.226) = 42$ ). As observed, the value in the Sig. (2-tailed) was calculated to be .002 which is significant at  $p < .05$  (Table 2). Moreover, as it can be inferred from Table 1, the listening and note-taking group outperformed the listening only group.

The third research question concerned the possibility of the relationship between working memory capacity and listening comprehension test performance of both experimental (listening and note-taking) and control (listening only) groups. In so doing, Pearson Correlation was run (Tables 3-6).

**Table 3**

*Descriptive statistics of short-term memory/ listening comprehension (experimental group)*

	Mean	SD	N
Listening Comprehension	45.27	6.90	22
Short-term memory	39.77	10.57	22

Table 3 shows the mean scores of listening comprehension ( $M=45.2727$ ,  $SD=6.90191$ ) and short-term memory ( $M=39.7727$ ,  $SD=10.56919$ ) in experimental group.

**Table 4**

*Pearson Correlation between short-term memory and listening comprehension (experimental group)*

Short-term memory		
Listening Comprehension	Pearson Correlation	.691**
	Sig. (2-tailed)	.000
	N	22

Note. \*\*. Correlation is significant at the 0.01 level (2-tailed).

The correlation between working memory and students' (experimental group) listening comprehension performance was investigated using Pearson product-moment correlation coefficient. The results indicated a large, positive correlation between the two variables [ $r = .6901$ ,  $n = 22$ ] ( $p < 0.01$ ) with high levels of working memory capacity associated with listening comprehension performance (Table 4). It means that higher working memory capacity leads to higher listening comprehension performance.

**Table 5**

*Descriptive statistics of short-term memory/ listening comprehension (control group)*

	Mean	SD	N
Listening Comprehension	38.14	7.75	22
Short-term memory	32.50	7.91	22

The mean scores of listening comprehension ( $M=38.1364$ ,  $SD=7.74778$ ) and short-term memory ( $M=32.5000$ ,  $SD=7.90871$ ) in control group is presented in Table 5.

**Table 6**

*Pearson Correlation between short-term memory and listening comprehension (control group)*

Short-term memory		
Listening Comprehension	Pearson Correlation	.872**
	Sig. (2-tailed)	.000
	N	22

Note. \*\*. Correlation is significant at the 0.01 level (2-tailed).

The correlation between working memory and students' (control group) listening comprehension

performance was investigated using Pearson product-moment correlation coefficient. As indicated, there was a large, positive correlation between the two variables [( $r = .872$ ,  $n = 22$ ) ( $p < 0.01$ )] with high levels of working memory capacity associated with listening comprehension performance (Table 6). It means that higher working memory capacity leads to higher listening comprehension performance. Therefore, by comparing Pearson Correlation between short-term memory and listening comprehension in both groups, the researchers found that correlation between working memory and listening comprehension ( $r = .87$ ) in control group is higher than the correlation in experimental group ( $r = .69$ ).

## 5. Discussions and Conclusion

Considering the first research question, all participants in the experimental group took notes during test sessions; however, the researcher divided them in two groups (high scores vs. low scores), according to their scores. The notes of participants with high scores were written using abbreviation and paraphrase strategies, though the participants did not use these two strategies a lot. Although, some researchers, such as Faraco, Barbier, and Piolat (2002) believed that paraphrasing or reformulation of words generated by the lecturer is negatively related to listening comprehension test performance, Liu (2001) found that the use of paraphrasing exerts a positive influence on listening comprehension test performance. In line with Liu (2006), the first group of students (with high scores) tried to reformulate or paraphrase everything they listen when they face with time limitation. Therefore, reformulating or paraphrasing is a kind of effective note-taking strategy; however, the participants of the high group could not enjoy the full benefits of this strategy since paraphrasing not only needs more language proficiency but also more experience. In general, paraphrasing was not frequently used by students of this study because of their language proficiency level (lower-intermediate).

According to notes and scores of both groups of students in experimental group (high and low scores), researchers found that there is an important relationship between number of important points in the notes and performance on the different questions (multiple-choice, recall, and essay questions) in such a way that writing more important notes led to higher test scores. This implies that students with good scores were able to write relevant information in their notes, comparing with the students with low scores. Thus excluding function words, summarizing, incomplete sentences, and irrelevant phrases, as unhelpful note-taking strategies, has a direct relation with the listening comprehension and scores of the students. In other words, excluding unhelpful strategies positively affects participants' listening comprehension while the larger amount of helpful notes like content words, paraphrasing or abbreviations show that students have understood the content of lecture. Along the same lines, Lin (2006) confirmed the positive relationship between the amount of useful notes and listening comprehension. To answer the second research question, the outcome of study demonstrated that there was a significant difference in mean scores of experimental (listening and note-taking) and control (listening only) groups which indicate the effect of note-taking on listening comprehension test performance.

Carrell (2007) mentioned that note-taking is an extra cognitive load on second language listeners. Therefore, in first five sessions, the participants of the experimental group could not divide all their attention during the process of listening to both listening and note-taking. They attempted to concentrate all their attention on the aural stimuli; though, at the same time, they had to take notes which were inevitably distractive for them. Moreover, the encoding function of note-taking assumes that the participants have to listen and take notes at the same time which were a daunting task. Thus, as it was observed by the researchers, some participants got confused as they could not focus their attention during the process. They usually ignored notes and concentrated on listening because score was important for them. In general, most students felt disappointed because of the dual tasks of comprehending the aural stimuli and encoding them in written form which is in line with Jalilifar (2009) who stated that, "students often acknowledge the difficulty they experience in simultaneous listening and note taking. Some students contend that taking notes during a lecture hampers their listening comprehension. These students state that they are so busy writing down one point that they do not hear the others. They wonder if they would be better off just focusing on listening and not taking notes" (p. 104).

As stated above, in first five sessions, the participants of the experimental group believed that note-taking placed them in a hard situation in the process of listening comprehension because they had to accomplish two tasks at the same time (task-dual-task coordination). However, little by little, by exercising note-taking in class during the second five sessions, they understood that note-taking facilitates the process of listening comprehension. Consequently, they attributed their disappointment to low language proficiency and inability to balance between listening and taking notes more than blaming the act of note-taking itself. In addition, by passing time, they understood that note-taking help them not only to comprehend listening but also to get higher scores in tests, as observed in their test scores and note-taking during listening to second language may lead to a better performance on comprehension tests because note takers can bring information from the lecture into their notes rather than keeping all information in their mind. Tsai-Fu and Wu (2010) believes that note-taking during listening to the lecture provides an opportunity for students to organize their thoughts, make connections, and develop ideas.

The findings of the third research question indicated the participants with higher working memory capacity would have better listening comprehension performance than those with low working memory. Thus, the relationship between participants' working memory capacity and listening comprehension performance was investigated and approved by the findings. In a study conducted by Daneman and Merikle (1996) about listening comprehension and working memory, no correlation was found between working memory and listening comprehension. While, this finding is contrary to the findings of the present study. Daneman and Carptenter (1980) found a direct relation between working memory and listening comprehension. The working memory of the students acquired from listening test (recall and essay questions) demonstrated to have a statistically positive relationship with the participants' listening comprehension.

Working memory was selected as one of the variables of this study in order to measure the function of memory in listening classes. Working memory keeps information for a restricted time and executes different processes on the data, such as storage and processing of information. This might justify why, for both groups, a positive correlation was found. In control group both storage and processing of information happen in their mind while in experimental group, the participants store and process some part of information in their notes and some in their mind while still using their memory. Therefore, both groups have been using their working memory during listening comprehension, however, the degree of use differed. The working memory of the control group was much more active and involved during the listening tasks.

The statistical analysis from this study revealed that although there was positive correlation between working memory capacity and listening comprehension in two groups, note-taking during listening restricted working memory capacity. On the other hand, when participants listened to a lecture and took notes at a same time, they had to perform two tasks at the same time (task-dual-task coordination), and they might lose their concentration on the lecture and might not be able to recall information. While, in listening without note-taking, participants were not allowed to take notes; thus, they had to put all their attention on the listening and attempted to understand the content of lecture (to have deeper levels of comprehension) and they could remember information better than the participants of experimental group. In addition, for the listening only group, understanding the listening text, answering questions, and processing information in their mind happen simultaneously but in the listening and note-taking group, the participants relied heavily on taking notes and they did not allow their mind to keep much of the information; therefore, the process of language comprehension and answering essay and recall questions shared between notes and memory.

From the research findings in this study and from other studies, it becomes evident that the quality of note-taking is an important factor to determine the participants' listening comprehension. Thus, differences might be observed between participants' listening comprehension and the application of note-taking strategies. The importance of the findings of the present study lies in the fact that the use of note-taking affect performance on listening comprehension test. Moreover, according to the results presented, it can be claimed that there is a positive correlation between working memory capacity and listening comprehension performance.

### 5.1 Pedagogical implications

The results of this study might have implications for teaching and testing. According to the findings of this study, the teachers are recommended to have note-taking in their instruction in order to offer students some assistance with learning the main subject under instruction (Boch & Piolat, 2005). Teachers can prepare students for both listening class and tests by using note-taking strategies. For this reason, they should teach various note-taking strategies in class accompanied by lots of practice for their students in both class and home. Therefore, the use of note-taking increases their ability to write and listen at the same time. Meanwhile, when teachers insist on taking notes in English, the students feel anxious and uncertain because they do not have the experience of writing notes in English. During the sessions, teachers can introduce them to some vital skills of how to take notes and how to review and analyze notes in an organized manner. Only with such conditions can help overcome the barrier of both language and cognition; in addition, learning note-taking skills help them decrease their negative emotions during taking notes.

### 5.2 Limitations of the study and suggestions for further research

The participants in this present study were lower-intermediate university students of English language. This study could repeat with EFL students at a different academic level other than lower-intermediate. Moreover, this study could be replicated by employing note-taking methods, such as the Cornell method, the mapping method, the outline method, etc.

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