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Complex Interplay of Cognitive and Strategic Processing in EFL Listening: Implications for Teaching

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Abstract

Although listening is key to communication, it remains the least studied skill compared to other skills, both at the national and international levels, among learners of English as a foreign language (EFL). There is also often a lack of awareness among scholars and teachers of how listening takes place, how it is best taught, and how it can be studied. To fill this gap, this study investigated the process of listening activated by Thai EFL learners while listening for comprehension. Twenty-four undergraduate participants were asked to complete a 30-minute multiple-choice listening test, with stimulated recalls conducted immediately afterward. Their stimulated recall transcriptions, listening notes and test responses were analyzed to identify which cognitive processes and strategies they used while listening and to investigate the extent that they were successful as listeners. The results showed that although the participants activated cognitive processes for listening at both the lower and higher levels, the majority, both high and low ability listeners, reported relying more on processes at the lower level (word recognition and parsing). Common strategies used by the participants are inferencing, elaboration, and comprehension monitoring. The activation of the cognitive processes and strategies was interactive and interrelated in a very complex way. Based on the findings, implications are discussed for how effective listening skills are best taught in the EFL classroom, what kinds of materials should be used, and how listening skills can best be assessed.

INTRODUCTION

While developing learners' ability to communicate in English is today one of the main focuses of Thai education, the instruction and assessment of English has in practice largely emphasized teaching and assessing knowledge of English structure and lexis. This can be seen in the design of national English tests, such as O-NET, as well as in the widespread popularity of TOEIC. Both of these tests allocate a high percentage of the total score to decontextualized testing of grammar and vocabulary rather than directly assess test-takers' ability to enter into communication in English. Studies of classroom practice have also pointed to a predominant focus on reading,

vocabulary and grammar, in part due to the washback effect of these tests (Prapaisit de Segovia & Hardison, 2009). Another major contributing factor is teachers' own lack of oral skills, as well as their uncertainty with the kinds of techniques needed for communicative teaching (Hayes, 2010; Imsa-ard, 2020). In acknowledgment of this, attempts have recently been made to create more stringent language proficiency requirements for teachers (Franz & Teo, 2017) as well as to provide training opportunities in communicative language teaching methodology (Sunyakul & Teo, 2020).

Among the four core language skills needed for successful communication, listening presents a significant challenge in the Thai context, since it is key to successful oral interaction yet appears to be under-developed in most English classrooms. Several problems related to Thai students' ability to listen for comprehension have been reported in existing research. Tanewong (2018), for example, revealed that low proficient EFL learners have difficulty with perceptual processing, or the ability to identify linguistic information of what is heard (e.g., distinguishing between sounds and recognizing words and meaning). The researcher explained that this is because they have limited L2 vocabulary knowledge and are not familiar with the linguistic features of texts in the target language, such as sound system and text structure. As a result, they cannot recognize words, phrases or idea units in listening, which largely precludes their ability to make sense of what they hear. Cubalit (2016) found that in addition to the problems related to the language in listening texts, Thai EFL listeners had difficulty with listening speed and accents. They could not follow English speaking at a normal speed or understand unfamiliar accents (Cubalit, 2016). Additionally, most of them seemed unaware of the listening strategies that could be useful and could enable them to successfully complete a task. Rather, they were found to pay attention to every single word and experience anxiety when not understanding it; as a result, they did not pass to a higher level of processing and were not able to understand any of the text (Cubalit, 2016).

Such problems with listening comprehension are not merely characteristic of Thai learners, and indeed seem to be a global issue among language educators. In response, several attempts have been made to develop methods which could improve students' listening abilities. Some studies (e.g., Chien & Wei, 1998; Dong, 2016) compared listening strategies used by low-and high-ability listeners in order to provide a catalogue of listening strategies that should be targeted in a training course. Relying on the information about cognitive and metacognitive strategies used by successful listeners, other studies (e.g., Mahdavi & Miri, 2016; Ngo, 2019; Tanewong, 2018) trained listeners to use those strategies with the aim of improving their listening performance. However, the results do not seem to be satisfying as the participants did not appear to improve their comprehension, despite the fact that they were more explicitly aware of particular listening strategies (see e.g., Ngo, 2019; Tanewong, 2018).

One reason that could explain why these studies were not as successful in their attempt to improve EFL listening performance is the fact that they only focused on strategic processing. In fact, the cognitive processes which learners have developed through their life are key agents of listening processing (Field, 2013) and thus cannot be disregarded. Strategies are made use of alongside cognitive processes, understood as general cognitive actions that learners activate to learn or understand new information (Rubin, 1981; Vandergrift & Goh, 2012). Strategic

processing are specific actions learners activate to assist and monitor cognitive processing in order to increase their learning or understanding (Rubin, 1981). Therefore, focusing on strategies alone may not fully tap into mental processes that occur when one is using the target language (O'Malley et al., 1989; Rubin, 1981; Vandergrift & Goh, 2012).

While the use of strategies has received great research attention, other types of cognitive processes activated during listening processing remain largely uninvestigated. This could be because of the difficulty in tapping into cognitive processes which are activated automatically and thus not as easily observable as strategies (O'Malley et al., 1989). However, as Purpura (1999) points out, the fact that cognitive processes are less noticeable does not mean that they are unimportant, particularly when activated alongside strategies. To fully understand what takes place when listeners are trying to understand spoken text and what contributes to L2 listening success, it is therefore important to investigate the complex interplay between cognitive processes and strategies by the application of innovative methodology.

This study aims to examine, first, the way that L2 English listeners of varying abilities activate different cognitive processes and strategies, and second, to consider the implications this has for classroom practice. It begins by examining the theoretical background of L2 listening processing. The results of a study of Thai English learners' use of cognitive processes and strategies while listening is then presented. Findings about the way successful and unsuccessful listeners engage with what they hear are then used to make concrete suggestions regarding the types of materials, methods and assessment that may be most successful in developing listening ability in the Thai context.

LITERATURE REVIEW

Listening comprehension processing

Theoretically, the process of listening is regarded as a type of cognitive function (see e.g., Halone et al., 2012; Hauser & Hughes, 2012). However, the classification and description of strategies used in listening seems to present a challenge. To define what the process of listening entails and what strategies are involved, Cohen (1998) points out that it is important to consider the situation where the target language is used. Relying on this idea, Cohen (1998) divided strategies into two broad categories: language learning strategies and language use strategies. Language learning strategies refer to steps or methods that learners take to develop their learning process and increase the quality of their performance in learning. Language use strategies, on the other hand, are specific actions that learners rely on in real-time communication, in the completion of a particular action. Oxford (2017), from a different perspective, suggests that there is a no clear-cut distinction between these two categories, as both language learning and language use strategies are employed for purposes of both learning and communicating. Following this line of thought, this study, therefore, conceptualizes cognitive actions for listening processing as processes that listeners engage in while they are attempting to comprehend what they hear, regardless whether they are for language use or language learning purposes.

With regard to the process of EFL listening for comprehension, the literature (e.g., Field, 2013; Vandergrift & Goh, 2012) suggests that it entails two types of processing: cognitive and strategic processing (Figure 1), each of which will be explained below.

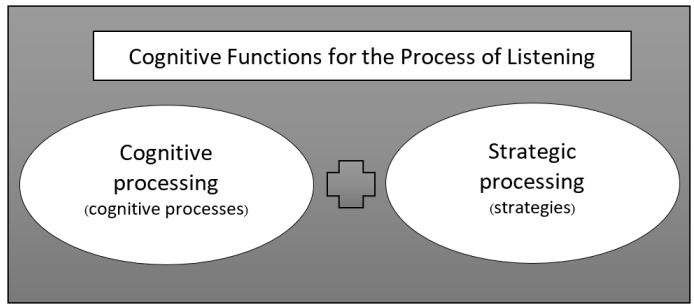

Figure 1 Cognitive functions for the process of listening derived from Vandergrift and Goh (2012) and Field (2013)

Cognitive processing

Cognitive processing refers to processes that occur automatically, with listeners hardly recognizing what processes they engage in while processing a listening text for comprehension. As a result, a careful and innovative research design is needed to tap into listener's cognitive processing. Comprehension processing, according to Anderson (1985), entails three stages: perceptual processing, parsing, and utilization. Perceptual processing is related to sound decoding and grouping sounds into words. It is a form of bottom-up processing which occurs when listeners recognize sounds in listening texts. These sounds go to listeners' working memory to allow listeners to identify words or groups of words in the sound stream, before being replaced by other sounds/words in the incoming texts. Parsing occurs when listeners segment the sound stream into meaningful units. In this process, listeners rely on their syntactic knowledge and semantic cues to identify chunks of information. Utilization concerns interpreting the meaning of what is listened to. Listeners rely on the meaningful units that they obtained from the previous stages of listening processing to conceptualize the global meaning of the text. These three processes do not occur in a linear way, but in a parallel and interrelated manner (Vandergrift & Goh, 2012). That is, while one process is going on, its output could be passed on for higher-level processing or sent back for further processing together with more incoming text (Vandergrift & Goh, 2012).

In reality, it is not yet clearly understood how the process of listening comprehension takes place. Does it follow the form of bottom-up or top-down processing? Bottom-up processing, as explained by Buck (2001), is when the process of listening follows the three stages (perceptual processing, parsing, and utilization) in a linear order. Listeners start from decoding acoustic-phonetic input, recognizing words, parsing, semantic processing and pragmatic processing and rely on the output from the previous stage to be an input for the processing at the higher level. Top-down processing, on the other hand, does not follow a fixed order but is interactive and interdependent in many ways (Buck, 2001). Several sources of information, e.g. linguistic knowledge, acoustic input, and world knowledge, are used for processing, depending on what information is available at that particular moment and what listeners think will help them

understand a listening text better.

Cognitive processes occur extremely rapidly, moving back and forth between top-down and bottom-up processes (Buck, 2001). L1 listeners engage in these processes automatically with little or no conscious attention to them. However, L2 listeners have limited knowledge in the target language, so they are not able to process texts as automatically as L1 listeners. In addition, several factors seem to contribute to the automaticity of the processes performed by L2 listeners, such as topical, lexical and grammatical knowledge. When listeners cannot process texts automatically, they are reported to activate strategies to overcome problems and to understand the texts, the process of which Vandergrift and Goh (2012) refer to as a controlled process or strategic processing.

Strategic processing

Strategic processing, or use of strategies for listening, is activated when L2 learners have more limited linguistic, contextual and cultural knowledge than L1 learners, meaning that the use of strategies, both cognitive and metacognitive, plays an important role in enabling listening comprehension (Goh, 2002; Graham et al., 2008; O'Malley et al., 1989; Rubin, 1981; Vandergrift & Goh, 2012). Cognitive strategies that are useful in L2 listening include inferencing, or relying on linguistic information to infer the missing information or unknown words/meaning, and elaboration, or using background knowledge to explain or understand the meaning of the input. These strategies are essentially useful in helping listeners to bridge gaps in knowledge that may occur due to failure to obtain all information, thus increasing text comprehension. However, some learners might have developed false beliefs about language learning that negatively affect listening comprehension processing (Færch & Kasper, 1986). For instance, they may think that in order to have a complete understanding of a text, they have to decode and understand every linguistic element in the input. This is not likely to be necessary or possible in authentic listening situations which need rapid online processing. To successfully understand a text, learners may thus need metacognitive strategies to manage their listening behaviours in order to catch up on what they are listening to.

The role of metacognition in language processing is emphasized by a number of previous studies (e.g., Bachman & Palmer, 2010; Graham et al., 2008; Tanewong, 2018; Weir, 2005). It helps regulate cognitive processes and enable language learners to solve problems in language processing. In listening specifically, Vandergrift and Goh (2012) explain that the use of metacognition involves some degree of consciousness in that listeners activate metacognitive strategies with particular purposes. According to Vandergrift and Goh (2012), the metacognitive processing for listening is activated for four main purposes: 1) planning for listening, 2) monitoring comprehension, 3) solving comprehension problems, and 4) evaluating the approach and outcomes, some of which entails sub-strategies. First, to plan for listening, listeners prepare to listen and establish the necessary conditions to listen successfully. Listeners may 1) bring to their consciousness their knowledge of the topic and relevant cultural knowledge, 2) predict words and ideas that they may hear in the listening, and 3) anticipate what they will hear in the listening input. Second, to monitor comprehension, listeners listen to a message and evaluate how much they understand what they hear. They may appear to check if their

predictions are consistent with the incoming text and their on-going interpretation matches world knowledge, reassess inaccurate predictions, assess the comprehension of desired information and necessary details, and determine the effectiveness of their approach in understanding the text. Next, to solve comprehension problems, the listeners adjust the on-going listening approach which does not seem to work well and activate other strategies to eliminate listening problems. These strategies include 1) inferencing (relating different pieces of decoded information to interpret the meaning of a chunk of a text that is not understood), 2) elaborating (adjusting inferences by relying on the listeners' world or topical knowledge to reflect new possibilities), 3) using L1 to record the ideas in the listening (internalize the meaning of the listening text into L1), 4) fixation (stopping to think or focus attention on understanding a small part of a text), 5) directed attention (bringing attention back to the incoming text), and 6) evaluating the listening approach and outcomes (evaluating how successful they are in their problem-solving efforts and in that listening task).

To conclude, this study describes the process of listening in relation to two components of language processing, i.e., cognitive processing and strategic processing (see Figure 2). Cognitive processing, which is operated on the basis of listeners' knowledge, is a category of mental actions that contribute directly to text comprehension. Following Field (2013), it is sub-divided into six processing types, consisting of 1) acoustic-phonetic decoding, 2) word decoding, 3) parsing, 4) semantic processing at the local level, 5) semantic processing at the global level, and 6) pragmatic processing. On the other hand, strategic processing refers to the use of both cognitive and metacognitive strategies to solve problems occurring during listening and to facilitate the listening process. Strategies are different from cognitive processes in that they involve some degree of consciousness and as a result listeners are able to explain their strategic processing although not being able to identify the type of each strategy whereas cognitive processes are automatic processing (Vandergrift & Goh, 2012). Following Vandergrift and Goh (2012), strategic processing in this study are 10 strategies activated for four different purposes in listening tasks. They are 1) psychologically prepare to listen, 2) prediction, 3) comprehension monitoring, 4) note-taking, 5) inferencing, 6) elaboration, 7) using L1, 8) fixation, 9) directed attention, and 10) evaluation listening comprehension.

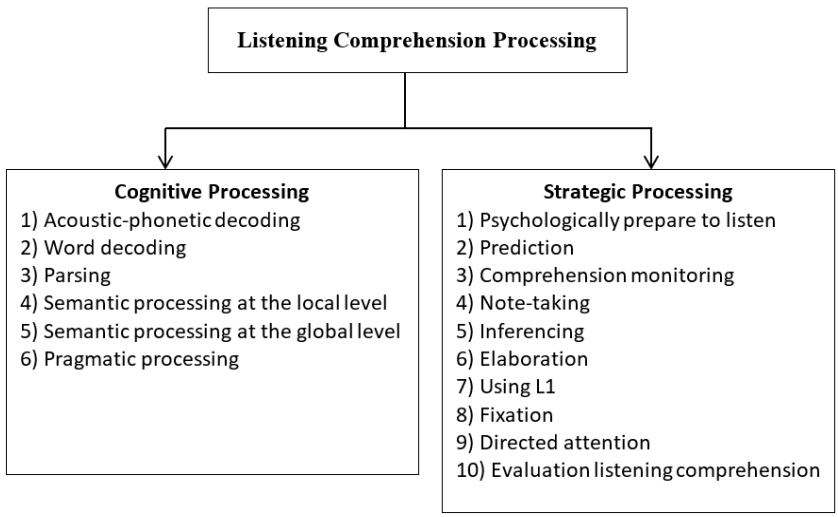

Figure 2 Components of listening comprehension processing adapted from Field (2013) and Vandergrift and Goh (2012)

Relationship between processing behaviors and success in language use

Studies that focus on investigating the relationship between strategy use and achievement in learning or task performance provided inconclusive findings about the relationship between the two. Phakiti (2003) studied the relationship between cognitive and metacognitive strategies used and performance on a multiple-choice reading test with a group of 384 EFL learners. With a cognitive-metacognitive questionnaire and retrospective interviews, the researcher found a positive association between the cognitive and metacognitive strategies used and reading performance. The highly successful test-takers used metacognitive strategies more often than moderately successful and unsuccessful test takers. Zhang et al. (2014) investigated the relationships between the use of metacognitive and cognitive strategies by 593 Chinese college test-takers and their test performance on an EFL reading test. A 38-item questionnaire capturing metacognitive and cognitive strategies was used to collect data together with a 50-item reading test. The results suggest that there are relationships between metacognitive and cognitive strategies used in a test context and the use of metacognitive and cognitive strategies in combination was found to help improve the test-takers' scores on the reading test.

While some studies (e.g., Phakiti, 2003; Zhang, et al., 2014) support the positive relationship between cognitive and metacognitive strategies and language performance, others found a weak relationship between the two. Purpura (1999) investigated the relationship between the use of cognitive and metacognitive strategies, as reported by the participants through a questionnaire, and their performance on language tasks. The study found the relationship between the use of cognitive and metacognitive strategies. However, weak and no relationships between the use of the strategies and the performance were found. Barkaoui et al. (2013) explored the relationship between strategic behaviors reported by 30 Chinese students and their speaking ability on integrated and independent speaking tasks. Overall, the study showed no significant relationship between the number of strategies used and the speaking performance. When considering the relationship between the strategies used in each task type (independent vs. dependent tasks) and performance scores, both negative and positive relationships were found. Weak correlations between the use of metacognitive strategies and academic success were also found in Poole (2016), which investigated reading strategies of 113 male students of English as their first language and their comprehension of academic texts. A questionnaire was used to tap into their metacognitive reading strategies and an academic reading test used for assessing their reading ability.

The lack of consensus on the relationship between strategy use and language task performance in the previous research might be related to several factors, including different contexts of study, different learning experiences and linguistic background, different skilled investigated, and different types of tasks used to measure ability. In addition to these factors, definitions and classifications of strategies used and the complex interaction between them, as pointed out by Oxford et al. (2014), could also add to the differences. This study was conducted in order to explore the complexity of how EFL learners use cognitive processes and strategies.

Research questions

The research questions asked in this study are:

1) What cognitive processes and strategies do EFL listeners activate in a listening comprehension test?
2) Are there any differences in cognitive processes and strategies when compared across levels of listening achievement?

METHODOLOGY

Despite all the challenges indicated in the previous section, the literature has suggested that both cognitive and strategic processing significantly contribute to success in listening comprehension. It is aimed specifically to provide a better understanding of how these two processing types interact in listening processing. Although conducted in a testing context, the results of the study are expected to provide insight into how EFL listeners approached and processed their listening for comprehension. This is on the basis that the participants were informed to take the test seriously and that the score obtained is used to indicate their listening ability.

Participants

The participants in this study were 24 Thai L1 students at a university in the South of Thailand. Twelve of them were in Social Science and Humanities and the other 12 were in Sciences. Their age ranged between 18 and 22, with an average of 19.5 years old. Eight of them were male and 16 were female students.

The participants were purposively selected on the basis of two criteria: their study area and their English performance level. Considering that the field of study might affect how listeners approached a listening text, the students from both Sciences and Social Science and Humanities were selected. As the study also aimed to compare the process of listening with learners of different abilities, their average score from compulsory English courses was used to roughly indicate their English ability. This was to ensure that high, average and low ability participants were recruited. Participation in this study involved completing one of the four versions of a listening test which contained 15 listening inputs and participating in stimulated recalls after each listening.

Research materials: Listening comprehension test

Four parallel versions of a listening comprehension test which were designed based on the same construct and used as a university proficiency English test, launched in four rounds of test administration in 2017, were used to collect data. Each version consisted of 30 multiple-choice items and took 30 minutes to be completed. The test was divided into three parts:

Part I (Items 1-10), composed of 10 short interactions, aimed to measure ability to listen for main points. Each conversation was about 15-20 seconds long, the content of which varied

from airport pick-up to leisure activities.

Part II (Items 11-20), consisting of three longer conversations (1.00-1.15 minutes long), aimed to assess the ability to understand specific details of discussion. After listening to each conversation, test-takers were required to answer 3-4 items.

Part III (Items 21-30) was made up of two interviews/advertisements (about 1.5-2.0 minutes long) and five questions were asked about both the details and the main idea of each talk.

To complete the test, test takers had to first listen to the spoken texts and then listen to the questions that followed and answer the questions, question by question. No question preview was allowed in this test and test-takers listened only once. The reliability of the tests after the pilot study and the item revision, as measured by Cronbach's Alpha, was 0.85 for version 1, 0.78 for version 2, 0.81 for version 3, and 0.81 for version 4, suggesting the reliabilities at an acceptable level.

Data collection: Stimulated recalls

Stimulated recalls were organized on a one-on-one basis with 24 participants by the researcher and were conducted immediately after the participants finished listening to each conversation and answering the related questions. In this process, the researcher first explained to the participants what the stimulated recall would entail and what they were supposed to do in the data collection. While each participant was completing the test, a video recording was made. After the participants finished listening to each input and answering the question(s) pertaining to it, the listening test was paused and a stimulated recall was conducted. Specifically, each participant was asked to watch the video of themselves taking the test, look at their answers as well as any notes taken, and explain to the researcher what they had been thinking about while listening, what they had paid attention to, why they took notes (if any), how they had decided to select the answer, and what they understood/knew about the input texts. Prior to actual data collection, the participants were asked to complete a sample listening item and engaged in stimulated recall immediately after. This was to ensure that they understood the entire process of data collection.

As each version of the test contained three parts with 15 listening inputs and the 24 participants were assigned to perform one of the four versions of the tests, 360 stimulated recalls were organized in total (see Table 1).

Table 1
The number of stimulated recalls organized in total

Listening test	Number of listening inputs	Number of questions (items)	Number of stimulated recalls organized	
			Per each participant	In total
Part I	10	10	10	240
Part II	3	10	3	72
Part III	2	10	2	48
Total	15	30	15	360

Data analysis

The stimulated recall data were analyzed to investigate the cognitive processes and strategies the participants activated to complete the test. A coding scheme drawn from previous literature (see Figure 3) was used with codes classified into two categories, cognitive processes and strategies. To ensure the reliability of verbal data analysis, an external coder was used to analyze 25% of the data. The inter-coder reliability, as measured by Cohen's kappa, was .82, suggesting an acceptable reliability.

As indicated in the literature review, cognitive processes are automatic and are not easily observed. Thus, this study took a triangulatory approach to coding: what the participants said they had heard or knew about the text during the stimulated recall was analyzed together with their listening notes and considered in light of their performance in the tasks. A frequency count of cognitive and strategic processing was made when the participants showed the evidence of action in their stimulated recalls or in the notes they took, checked against their answer and/or what they said they understood about the text.

For example, in the following note the participant wrote 'good city and business', indicating three counts of word identification. This and other information in the note show that this participant had engaged in parsing by identifying six chunks of information, i.e., 'Good City business', 'far city', 'Philippine จ้างคนรู้ภาษาอังกฤษ', 'Manila แพง', 'Bangkok-great night life', and 'Bali-relax environment'. In the stimulated recall, he explained that he had made a list of city names and specific information about each city because they related to 'good city business', and this recall, therefore, contributed to one count of semantic processing at the local level. This also shows the participant had semantically processed the text in order to understand its meaning. Based on the notes, he said he had understood that the text was mainly about cities in Southeast Asia that were good for running business, which was the correct main point of the text. As a result, this recall added one count to semantic processing at the global level. To summarize, the notes and stimulated recall transcription show that this participant engaged in cognitive processes at both the lower and higher levels.

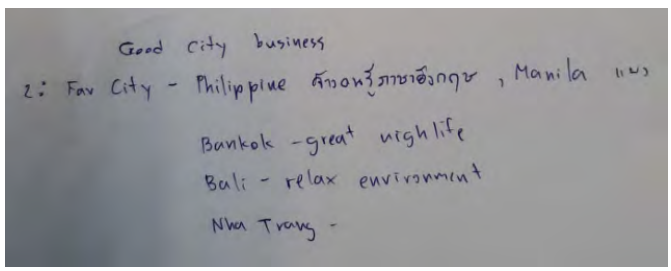

Figure 3 Participant's listening notes

RESULTS

To provide an overview of the cognitive and strategic processing that the participants engaged in while completing the listening tasks, this section begins by presenting frequency counts of

each processing type, followed by a comparison of cognitive processes and strategies activated by participants with different performance levels. It is important to note that due to the complexity of the cognitive processes which occur automatically and may not be identified in the data set, the number of frequency counts obtained may only suggest the minimum counts of processing taking place. The second part of the section reports the interdependent use of cognitive and strategic processing, as evident in the stimulated recalls.

1. Cognitive and strategic processing activated during a listening comprehension test

The analysis of stimulated recall transcriptions and the participants' listening notes showed that the participants had engaged in both cognitive processes and strategies while listening to answer MC comprehension questions (see Figure 4). Focusing specifically on cognitive processes, the higher frequencies were found for processing at the lower level, i.e., word identification and parsing. This is, however, not surprising as these cognitive processes were used to obtain words, phrases, or chunks of information in a spoken text, which assists the listeners to form a concept of the text they are listening. Cognitive processes at the global level, e.g., semantic and pragmatic processing, which enable the listeners to conceptualize the meaning of the text, were used less frequently than those at the local level.

Regarding strategies, the results show that their overall use was less than half of the total count of cognitive processes. Among several types of strategies, inferencing was the most frequent, followed by note-taking, comprehension monitoring, and elaboration, though these were less frequent compared to the cognitive processes. Other strategies, namely prediction, directed use of L1 and directed attention appeared to be used with low frequencies. Three strategies were not evident being used by the participants in this study, i.e., psychologically prepare to listen, fixation, and evaluation listening comprehension.

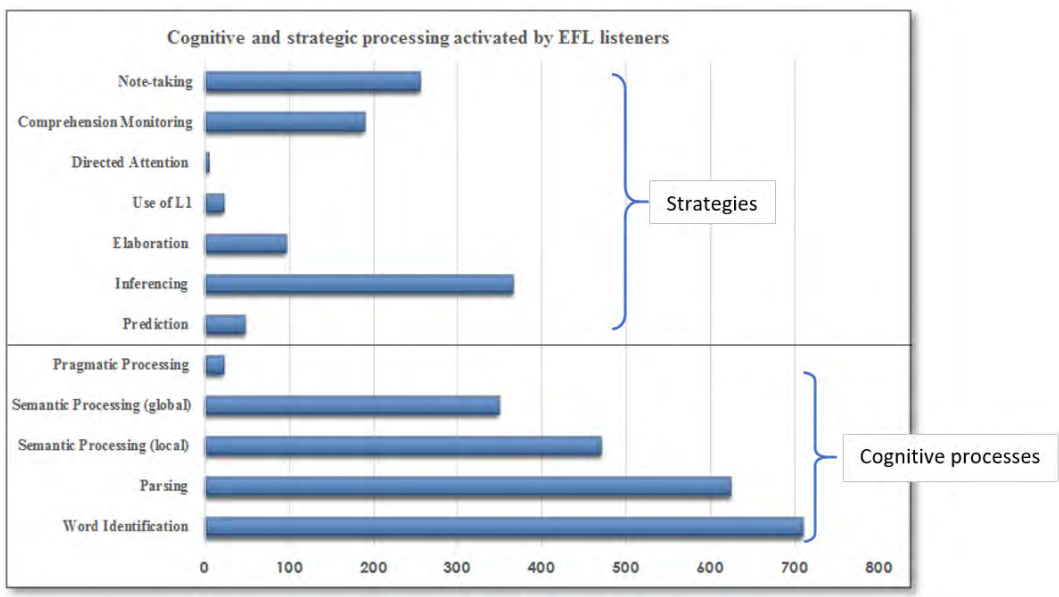

Figure 4 Frequency of cognitive processes and strategies activated by EFL learners for listening comprehension processing

2. Differences in cognitive processes and strategies used when compared across levels of listening achievement

The literature suggests that to successfully understand listening texts, listeners have to engage in not only lower-level but also higher-level processing. In order to obtain a clearer picture, the listening processes activated by the participants across performance levels in the tasks (low, average, and high), were compared. For this purpose, the total scores of the 24 participants were ranked in descending order, and 6 participants whose scores were at the top 25% were classified as high scoring participants, 6 participants at the bottom 25% were low scoring participants, and 6 participants at the middle were considered as moderate scoring participants. Six participants at the boundary of each cut-off point were excluded in the analysis in order to place clear focus on typical patterns and background borderline cases.

The comparison shows that participants with different performance levels generally activated similar types of processes and strategies (see Figure 5). However, the proportions of processes and strategies each group activated were found to be different. The high-scoring participants activated cognitive processes the most frequently (40%), followed by the moderate- and low-scoring participants respectively (36% and 24% respectively). The moderate-scoring participants relied the most heavily on strategies (39%), followed by the high- and low-scoring participants (34% and 27% respectively).

Figure 5 Proportion of cognitive processes and strategies the participants with different performing levels relied on

When considering the types of each process and strategy, it was found that different numbers of participants with different performance levels activated three types of listening processing at different rates (see Figure 6). The high- and moderate-scoring participants activated cognitive processing at the higher-level (semantic and pragmatic processing) almost three times more often than the low-scoring participants. The fact that the higher-level processing is important for the listeners to understand the main point of the texts may explain why the two former groups were more successful in the test completion.

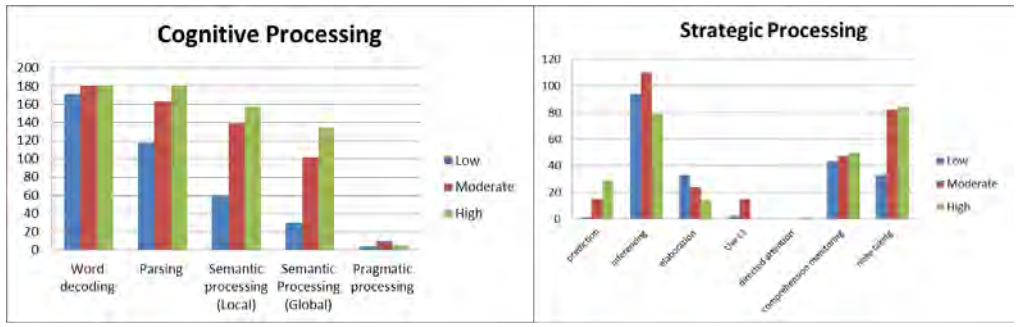

Figure 6 Listening processes compared between the participants with different performing levels

Regarding the activation of strategic processing, the analysis shows that three types of strategies popular among the participants were inferencing, note-taking (one frequency count when the participants wrote one note), and comprehension monitoring. Among the three strategies, inferencing was used the most frequently by the moderate-scoring participants and the least frequently by high-scoring participants. Comprehension monitoring and note-taking, on the other hand, were used the most frequently by the high-scoring group and the least by the low-scoring group. It is important to note that, in addition to cognitive and strategic processing, the low-scoring participants evidently used three types of test-wise strategies, choice deletion, word matching, and blind guessing.

3. The complex interplay of cognitive processes and strategies for listening comprehension processing

The previous section presents the cognitive processes and strategies activated by the participants in a list of individual sub-skills to provide an overall picture of cognitive processes and strategies used. However, it is important to point out that those cognitive processes and strategies were found to be used in an interactive and interdependent manner. Commonly observed was the combination of cognitive processes at lower level (acoustic-phonetic processing, word recognition and parsing) and the inferencing and elaboration strategies. The participant, for example, stated:

> Excerpt 1
> I was trying to think whether it was *'a coat'* or *'a coach'*. I'm not sure whether he [the speaker] was looking for a coat or a coach, …here the speaker said '*going to the hotel*' and '*going to buy something*'. It could be that he wanted to buy a new coat. Um…it could be also 'a coach' because he wanted to go to the downtown. I'm not sure, but I think he asked for a vehicle. Here I heard 'is the hotel near the downtown?'. I understood that he is a tourist and is going to stay at a hotel. I think it [the listening] is about 'how to get to downtown'. I don't think he wants to buy a new coat. As a tourist, I think he has a coat. *[Participant 4, Listening 1]*

As can be seen from this excerpt, the participant had identified words/chunks in the speech stream such as 'a coat', 'a coach', 'going to the hotel' or 'going to buy something'. However, he could not tell what the main point of the text was, based on the information available to him.

He was not sure which word was used in the listening, 'a coat' or 'a coach', so he had to infer by using other pieces of information he could parse, i.e., 'is the hotel near here'. Also, he had to rely on his background knowledge that a tourist usually stays at a hotel and usually travels with a coach to decide that the word should be 'a coach', not 'a coat'. Based on this information, he then thought that the speaker was asking 'how to get to the downtown' rather than 'where to buy a new coat'. With all these processes, this participant managed to get a correct answer.

Another example of interactive use of cognitive processes and strategies, reported by almost all of the participants who successfully completed a listening task, was the use of the higher-level cognitive processes (semantic and pragmatic processing) in combination with the inferencing, elaboration, and comprehension monitoring strategies. For example, one participant recalled:

> Excerpt 2
> Here I was trying to tell where the speakers were and what the point of their conversation was. I don't think it was at a university. It was probably at their accommodation close to the university. I don't think they were talking at a supermarket. There was no such a noise that you hear when you go to the supermarket. From the way they talked to each other, I think the woman was an office worker, not a friend. I heard the sound from a bus and then the woman said it was difficult to get the kind of the room that the man wanted with the amount of money he could afford. She said '*it was too little*'. Then the man said '*live on my own*'. I think the man did not want to share a room with anyone. So, to summarize, I think the man was talking an apartment manager or officer, and he wanted to get a room to stay on his own. *[Participant 2, Listening 2]*

In an attempt to understand what the point of the conversation was, this participant relied on different parts of information and engaged different cognitive processes and strategies. First, she used pragmatic processing, identifying where the speakers were and what the relationship between the speakers was to scope the possible theme of the conversation by relying on background noise. Then she relied on the idea units she had parsed, i.e., '*it was too little*' and '*live on my own*' to successfully conceptualize the main point of the conversation. At the same time, the strategies, i.e., inferencing and elaboration, were used to relate independent idea units the participant had obtained, and all the processes and strategies involved in this process was monitored by comprehension monitoring.

To conclude, the results suggest listening comprehension is interactive and interdependent processing where several cognitive processes and strategies come into play. Although the activation of cognitive processes and strategies may vary, depending on the purpose of each listening, i.e., to understand specific details or to identify the main point of the listening text, a visualization of the common processes and strategies used by participants can be generated (see Figure 7). In terms of cognitive processing, the results showed that the participants engaged in processes in line with those presented in Field's (2013) cognitive processing framework for listening, derived from Levelt (1989). In the listening process, most participants started from decoding the information in the continuous speech. Whether it was acoustic-phonetic decoding, word recognition, or parsing, depends on their lexical and syntactical knowledge. The processing outputs at the lower level were then used for text processing at the higher level (semantic and

pragmatic). At this level, the listeners related pieces of information in order to comprehend the overall meaning of the message. To be successful in this act, the listeners had to infer missing links between individual idea units they had obtained (inferencing). In addition to the linguistic information obtained from listening, the listeners appeared to use their background knowledge and/or knowledge of the topic to act as a basis for text conceptualization (elaboration) in order to obtain the main point of the text. It is, however, important to note that when listening to unfamiliar texts or topics, listeners tend to activate the lowest level of language processing, acoustic-phonetic processing, trying to identify phonemes and based on the output, they identify the possible words. For a more familiar text, some listeners rely on text's ideas they could parse and contextual knowledge to frame their listening ideas.

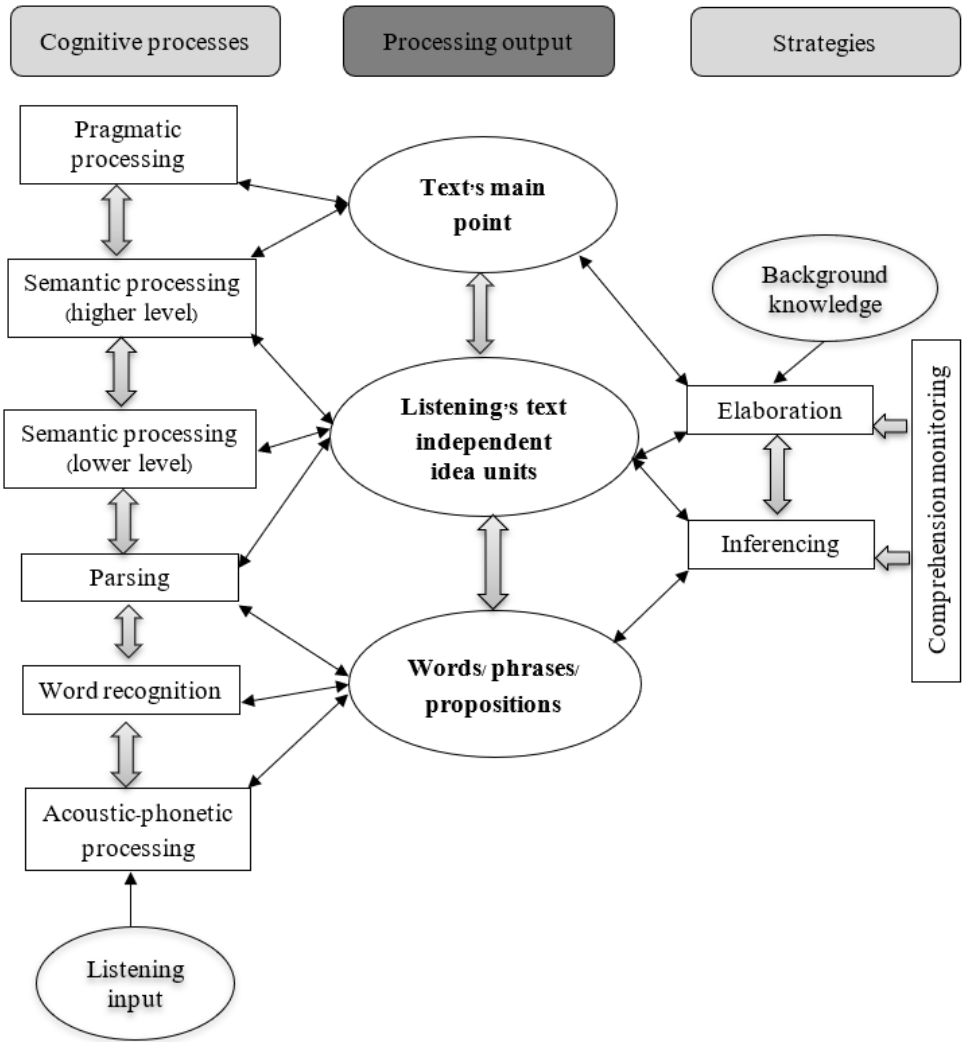

Figure 7 Interactive use of cognitive processes and strategies for EFL listening comprehension derived from Field's (2013) and Vandergrift and Goh (2012)

In terms of strategies, although several were reported by the participants, those used the most often were inferencing, elaboration, and comprehension monitoring. When the listeners had difficulties understanding particular information in the text because of gaps in their knowledge, they went back to the input or referred back to the output from the lower level to try to eliminate their problems. What controlled this processing, as showed in stimulated data, was comprehension monitoring, or learners' awareness of their own problems in understanding and attempts to solve them. Comprehension monitoring found in this study included participants evaluating whether specific unknown words were important and selectively engaging in inferencing, if necessary, to conceptualize the meaning of words. Inferencing was another strategy that the listeners relied on heavily in their attempt to complete their listening tasks. The participants used the parsed information to infer the answer to almost every question in the test. Stimulated recall data showed that the listeners made an inference based on the listening details they were able to decode while listening. The data, in addition, showed that inferencing was heavily activated particularly when the listeners wanted to understand specific details which are important elements that the listeners used to form global understanding of the listening text.

PEDAGOGICAL IMPLICATION

The results showed that the majority of the participants relied heavily on cognitive processes at the lower level, especially when they listened to short conversations and answered a few comprehension questions, suggesting that this group of EFL listeners are in a great favor of bottom-up processing. According to Buck (2001) and Field (2013), this can also be interpreted as an indication of having a limited linguistic repertoire and not being able to automatically process the text to a higher level to conceptualize the global meaning of the message. Although some of them appeared to activate top-down processing, using background knowledge or topical knowledge to compensate for the missing information or to conceptualize the meaning of what they listened to, they were not entirely successful in this processing. This is partly because their word decoding and parsing, which provide linguistic ground for further processing, were not always successful. Occasionally, what they thought were the (key) words in the listening were in fact not the correct words. To improve listening performance of the listeners with these problems, it is, therefore, important to help them increase their linguistic repertoire. Below are some possible suggestions for more effective EFL listening education.

1. Organizing pre-listening activities

One way to help EFL listeners to increase their linguistic knowledge, as suggested by several language educators (e.g, Rost, 2011; Vandergrift & Goh, 2012) is through carefully structured listening instruction. That is, before assigning the students to listen to an input text, teachers should spend some time on the linguistic elements of the text, both in written and spoken form, to lay the groundwork for students to refer to while listening. Some basic tasks, such as dictation or gap filling, where the learners are supposed to listen, look at the script, and fill in missing words, would be important to help learners become familiar with the sounds and linguistic features in the listening input.

2. Introducing authentic texts

The well supported use of longer, complex, and authentic input texts is crucial in L2 listening instruction, though with an awareness of the potential challenges. The speed and complexity can easily overburden learners and thus such inputs need to be scaffolded through the introduction of relevant elements of language, such as vocabulary, key structures, and topical knowledge as part of pre-listening activities. If learners acquire this groundwork and feel a connection to the text before being asked to listen, this will increase their chances of success and, consequently, motivate them to try harder to engage more complex types of processing (Rost, 2011).

To encourage higher level of listening processing, i.e., semantic and pragmatic processing, listening inputs of various types (such as conversations, announcements, discussions, advertisements) and of different lengths should be integrated in listening lessons. Listening to short texts (conversations with 1 or 2 turns), as found in this study, only appeared to activate cognitive processing at the lower level, whereas the use of longer, more complex and authentic texts elicited more global processing. A similar contrast was also observed in the case of use of strategies, which are essential to improve listening performance. Scholars such as Bachman and Palmer (2010), Weir (2005), Taylor and Geranpayeh (2011) and Vandergrift and Goh (2012) indicate that metacognitive strategies, or the strategies used to manage or overlook comprehension processing, are particularly vital. In this study, it was found that when listening to inputs with different lengths, the participants activated different sets of processes and strategies. With inputs shorter than one minute, listeners appeared to rely heavily on word decoding, parsing and inferencing. In a longer input text, i.e., 1.5 minutes, the participants appeared to engage in prediction, directed attention, comprehension monitoring, note-taking, all of which are important in real-life listening. Therefore, it is important to include longer input texts as part of listening instruction. In addition to the provision of input with various text types and lengths, strategy training is also important. Ngo (2019) has suggested that to integrate strategy training in listening lessons, the teachers should first make learners aware of the useful strategies through explanation and modelling and discuss with them when it is useful to use each strategy before and after the listening.

3. Reconsidering testing and assessment policy and practices

Finally, although attempts are made to integrate the teaching of listening into classroom settings, such an attempt may not be successful if no change has concurrently been made in testing and assessment. What is important to enforce a change in classroom practice, as suggested in L2 and EFL testing literature (see Alderson, Clapham, & Wall, 1995), is a change in high-stakes testing practices. This is because success of teachers in the classroom is largely measured through the results of learners on tests. In Thailand, scores on O-NET (Ordinary National Educational Test) are used as measurements of quality of education management at all levels of compulsory education. In language testing, this is called a positive washback of the test used (Alderson et al., 1995). While listening ability is important in real-life communication, English language tests with high impact in a Thai context (e.g. English O-NET) has not yet included any kind of testing of listening ability. To encourage more practice in teaching listening,

it is therefore suggested that direct testing of listening should be included at all levels. This would make testing in Thailand more in line with Common European Framework of Reference (CEFR), which is currently used as a guideline for English education and assessment in Thailand (Hiranburana et al., 2018; Savski, 2020) and stresses the ability of L2 users for reception and production in both spoken and written form. To achieve this goal, the use of communicative tasks that integrated listening as an input, such as those which ask test-takers to listen to an input and retell its key points, summarize it, or discuss an issue it raises, would be particularly key to mirror the reality of communication, where listening does not take place in isolation but in an integrated manner (Rukthong, 2021; Rukthong & Brunfaut, 2019).

CONCLUSION

This study set off to investigate cognitive process and strategies EFL listeners used to complete their listening comprehension test and compared the use of such processes and strategies across performance levels. The results showed that with the aim of comprehending the texts delivered to them, the listeners relied mainly on text processing at the lower level, word recognition and parsing to decode words, phases, and chunks of information from the texts, indicating that the learners have limited knowledge of the target language to continue processing at the higher levels. Additionally, to try to understand the main point of the text, the listeners used the inferencing, elaboration, and comprehension monitoring strategies more often than others. The use of these processes and strategies, however, was not in a linear manner, but complex in many ways. While one process was going on, other processes and/or strategies were activated to solve problems and monitor the listening processes. Based on the findings, it is therefore recommended that a priority for teaching listening is to increase the listeners' linguistic knowledge of the target language and make them familiar not only with lexical chunks but how the words or chunks are delivered in a natural speed in communicative setting. In addition, it is important to make the listeners aware of useful strategies and train them how to use them effectively in their own listening.

The activation of cognitive processes and strategies in this study was found to be interactive in a very complex manner. While the cognitive processes are mainly activated to decode words, phrases and chunks of information, key strategies such as inferencing, elaboration, and comprehension monitoring, were used to bridge gaps in listeners' knowledge, facilitate and monitor the process of listening. The limitation of target language knowledge was reflected by a high frequency use of two cognitive processes, word decoding and parsing, with the help of strategies, inferencing and elaboration. The frequency of strategies used does not seem to associate with performing levels. The participants reported using a high number of the inferencing and comprehension monitoring strategies. However, the analysis of their answers showed that not all of them were successful in such processing without engaging in semantic processing at the global level. Based on these findings, it is therefore important to point out that a study that attempts to single out the use of strategies and investigate the relationship between independent use of each strategy and success in performance may not well represent the nature of language processing which involves several cognitive processes and strategies at the same time. To reveal the nature of listening processing, it is recommended that verbal

data reflecting what is going on when one is attempting a task at hand should be looked into. Despite having been carefully designed, this study has some limitations. One is related to listening tasks used, the multiple-choice listening comprehension questions. Different listening tasks (e.g., the tasks which require listeners to orally retell, summarize, or discuss what they listen may provide different results). Secondly, because of the nature of data collection methods (a stimulated recall, which was carried out on one-on-one basics), only 24 participants were included in this study. Although the obtained data were insightful, the generalization of the findings could be limited due to a small number of the participants and the context of study which was limited only in a test context. To provide a clearer picture of the process of listening, a bigger number of participants performing English listening in a real-world context should be focused on.

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