

Working memory ability and second language input learning

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Abstract. In second language learning, reading and listening as language input are important skills that learners should have. There are many factors that affect the development of language ability. Among them, working memory belonging to individual differences has less opportunities to discuss. However, it does have a certain relationship with the cultivation of these two skills. This paper aims to first explain the current situation of these two skill difficulties, and then discuss the impact of working memory on them from different angles. Then, other factors affecting the relationship between working memory and second language reading and listening ability were mentioned. On the basis of these analyses, the relevant measures to improve working memory and other influencing factors leading to the development of these two skills are finally put forward.

Keywords: Reading, listening, working memory, relationship, measures.

1. Introduction

There are many factors affecting second language acquisition. Individual differences are one of them containing aptitude, age, intelligence, motivation, attitude, personality, and cognitive style. Working memory is somehow the cognition activity, which has an influence on second language acquisition in some researches but not so many. Therefore, it is necessary to conduct a review of prior research results. Due to the obstacles learners always confront in reading and listening, it is significant to figure out whether working memory has something to do with them.

2. Working memory and second language reading

2.1. The second language learners' difficulties in reading

Reading is one of the important skills in language learning. Second language reading is not only a learning path for second language acquisition learners, but also a way to test the effectiveness of school. The selection of reading content, researchers have many research results. Jiayanti (2016) believes that reading is a complex process of reconstructing writers' thoughts in order to obtain the meaning of the text. Hou (2007, as cited by Wu, 2021) said that reading requires readers to use their prior knowledge to understand, emphasizing not only vocabulary and grammar, but also background knowledge and culture. Duke (2003, quoted from PourhoseinGilakjani & Sabouri, 2016) pointed out that reading comprehension produces meaning through interaction with the text, combined with previous knowledge, experience, text information and readers' views on the text. Generally speaking, reading is a dynamic process, which is affected by some factors.

With regard to second language reading, it is more complex than native language reading because it involves not only reading ability, but also language ability and use (Alderson et al., 2015, as cited in Brevik et al., 2016). Therefore, there are some problems in the practice of second language reading. They involve vocabulary, grammar, discourse, background knowledge, reading skills and reading habits, which are subjective factors (Wu, 2021). Among these factors, the questionnaire proposed in two studies shows that vocabulary deficiency is considered to be the most critical factor leading to reading problems (Jayanti, 2016; Ni et al., 2020). This is because words are the smallest and most basic part of an article. In addition, some teachers also put forward the effects of individual differences in learners' memory, short-term memory capacity and memory duration. Therefore, in order to deal with reading difficulties, the goal is to solve these obstacles in order to read effectively.

2.2. The relationships between working memory and second language reading

Unlike short-term memory, working memory is an ability to store when processing cognitive demand activities (Baddeley, 1986, as described by Peng et al., 2018). It is a temporary information processing system with limited ability to process new information and search known information at the same time (Shin et al., 2019). Under Baddeley's model, it consists of two subsystems: information maintenance (oral, digital and visual space) and central execution system. Among them, the plot buffer can combine the long-term memory with the information in the short-term storage system. In addition, the central executive controls attention to relevant sources to avoid irrelevant and inappropriate behavior.

With regard to the relationships between working memory and second language reading, they have strong connections. It is because first reading comprehension demands processing and storing information simultaneously (Peng et al., 2018). Kintsch (1988, as cited in Shin et al., 2019) is in agreement and emphasizes the importance of integrating the active information in working memory with the currently input ones in order to understand the meaning of the text. During the incorporation process, the central executive exerts a role in directing the attention and retaining the needed information rather than making irrelevant resources to fill up the working memory storage (Cowan, 2010). Therefore, working memory has more to do with saving resources and updating constantly so that readers could accomplish the reading integration.

2.3. Second language reading affected by working memory and other factors

There are some moderating variables in the relationship between working memory and second language reading. Firstly, Joh and Plakans (2017) proposed that background knowledge and working memory jointly affect reading. Sedivy (2014) pointed out that even if the language content can be decoded, the background knowledge will affect the understanding of the text. Perfetti (1989, cited by Shin et al., 2019) also recognized the need to use relevant background knowledge and expand text content through working memory. Indeed, the interaction and integration of second language reading need the interaction between these two factors. In addition, Hambrick and Engle (2002, cited by Shin et al., 2019) proposed three models to describe their relationship. The compensation model shows that a person with a high level of background knowledge can cover his lower working memory. In this case, background knowledge and reading show a closer relationship. In other words, when the background knowledge is sufficient, there is no difference between high-level working memory and low-level working memory.

In addition, the richer the model shows that background knowledge is conducive to working memory. This can be further explained by automatic processing and control processing (McLauhlin, 1987, as cited in Xie, 2018; Evans & Stanovich, 2013, as cited in Peng et al., 2018). Among them, automatic reading means using known and familiar knowledge and technology, which consumes less time and working memory capacity, so as to save more energy and psychological ability to deal with new information in reading materials.

3. Working memory and second language listening

3.1. The second language learners' difficulties in listening

As one of the key skills in language learning, listening should become the focus of language learning. Morley (1972, Gilakjani & Sabouri, 2016) defined listening as including auditory discrimination, listening grammar, selecting necessary information, memory and the process of connecting sound and formal meaning. It can also be regarded as one of the sources of language input. According to Hamouda (2013, as described by Gilakjani & Sabouri, 2016), learning will not happen without any input. Guan (2019) further explained that any language learning should start with listening and then penetrate into all-round development. From this perspective, listening plays a vital role in language learning, which is a difficult skill for learners in second language learning.

However, listening is placed in the lowest position, which shows that listening is ignored in second language teaching. Therefore, second language listening has become a weak link for second language learners, especially Chinese students. The factors that hinder the process of listening comprehension include subjective factors and objective factors, which are related to learners' language ability and listening materials respectively. Guan (2019) described several factors, including accent, vocabulary, grammar, cultural background, psychology, memory and listening skills. In terms of memory, she proved that memory level can affect second language listening. One phenomenon is that students always keep the first part and the last but middle part of listening. Li and Bao (2022) agree and point out that one failure of teaching is the failure to carry out routine exercises to enhance memory. One reason to trace its origin is the speed of listening. Tursunova (2017) and Gilakjani and Sabouri (2016) propose that the biggest difficulty is that the hearing speed is out of control. Walker (2014) also recognized the importance of rapid processing of content. In this way, it requires the listener to remember the information faster and more accurately with the rhythm of the listening material.

3.2. The relationships between working memory and second language listening

To some extent, there is indeed a connection between working memory and second language listening. It is evidenced by the report from Miyake and Friedman (1998, as cited in Masrai, 2020). They claim that working memory supports second language syntactic listening comprehension. Wu (1998, as cited in Namaziandost et al., 2018) agrees and explains that comprehension depends on memory competence from the aspect of information-processing perspective. And also she emphasizes that when there are high requirements for assignments, the speed would slow down due to the necessity of storing and processing these two functions of working memory.

Apart from this, the central executive portion of working memory copes with the listening sound being stored temporarily (Satori, 2021). Simultaneously, this limited processing resource becomes the focus that cognitive processes compete for. It is supported by Daneman & Carpenter (1980, as cited in Liu & Yan, 2017). They put forward the resources-sharing hypothesis which indicates that the total amount of cognitive resources is certain. Therefore, when the learners consume a lot of resources in processing, in turn, the left would be less for retaining the information, which affects the capacity of working memory. In this scenario, native language learners take advantage of their linguistic capacity so that they have the spare space for processing the listening contents. By contrast, lower-level language learners leave more space for vocabulary and grammar processing (Vandergrift & Goh, 2012). From this aspect, their processing is not much active as those of higher-level foreign language learners.

On the other hand, some studies display the weak relevance between working memory and second language listening. Wallace (2020) suggests when the working memory variables and others are examined together, working memory predictors exert no direct or indirect influence on second language listening comprehension. It is consistent with Hulstijn (2019)'s discovery. He considers the linguistic knowledge variables such as vocabulary, and syntactic has more to do with second language listening than non-linguistic factors (working memory, intelligence).

3.3. Second language listening affected by working memory and other factors

One of the problems learners might confront is concentration in second language listening. Gass (1988, as cited in Xie, 2018) emphasizes the importance of attention in the processing of language input. It is well-known in listening that even a slight pause or distraction in attention would hinder listening comprehension (Tursunova, 2017). The capacity which monitors attention is connected with the cognition level (Colwick & Conway, 2007, as cited in Satori, 2021). Besides it, one domain of working memory is to control the focus. From this perspective, those who have higher working memory capacity would manage their focus to resist interference (Satori, 2021). Hence, working memory has an influence on second language listening by controlling attention.

Another factor is listening anxiety, which is related to working memory and affects listening comprehension. Chen and Chang (2009) have shown that when anxiety leads to distraction, it often

affects activities that require high concentration and working memory. In this way, learners' anxiety will indeed affect second language listening activities and working memory. From this point of view, their relationship is often negative. In terms of the storage function of working memory, listeners' anxiety makes them worry about failure and distract them. In this case, when they do not focus on listening tasks, their ability to store new information is very poor (Zhang, 2012). In addition, in the processing function of working memory, anxiety will consume working memory resources for processing, and the space for cognitive tasks is small. This makes processing more difficult. There is a correlation between working memory and second language listening ability.

4. Working memory promotion

4.1. Measures for promoting second language reading competence

Due to the advantage of automatic processing in working memory operation, there is indeed the necessity to enrich second language learners' prior knowledge which involves linguistic factors and non-linguistic ones.

First of all, the vocabulary learners master plays a vital role in reading. This is because learners need vocabulary knowledge to recognize words and their meanings. Most students agree that there are a series of unfamiliar words in the text, which will repeat their own steps (Ni et al., 2020). Therefore, there are some strategies for learners to refer to. First, they should strive to expand the vocabulary (Wu, 2021). Wu believes that learners can accumulate new words often used in English films, songs, newspapers, magazines and other materials in their extracurricular life. Also adapt to other foreign language learning. In this way, learners will have a strong memory, because these contents must meet their interests. In addition, we should find a suitable way to summarize them, such as affixes in English, so that learners can remember them in less time. Grammar understanding should be another key point of language knowledge acquisition (Wu, 2021). In class, teachers should cultivate the ability to understand the main sentence in a short time and the ability to analyze long and difficult sentences. Without these basic skills, they can't even understand the literal meaning, let alone the deep meaning that the author tends to express.

Second, in terms of non-linguistic factors, background knowledge is one of them indeed. It exerts an influence on reading comprehension when readers integrate the new information into the current knowledge base (Ni et al., 2020). To some extent, the scarcity of linguistic knowledge would be covered by background and cultural knowledge. These sorts of background knowledge contain individual experiences in the world, the conception of how the written texts work, and how the text is formed (Anderson & Pearson, 1984, as cited in Pourhosein & Sabouri, 2016). Therefore, when learners discover the organization of the text, they are able to have a better understanding of this text. For the sake of promoting background knowledge, in class, the teacher could integrate them into reading. For instance, teachers should introduce the relevant people, events, and other information. After knowing this information, students would have a preliminary impression that benefits their followed reading in terms of prediction. Out of the class, learners ought to watch more foreign movies in order to experience their folklore and value with stronger cultural meanings (Wu, 2021). And also meaningful literature deserves reading and learning unfamiliar slang.

4.2. Measures for promoting second language listening competence

Because language proficiency and second language listening have an impact on learners' working memory. Therefore, to improve learners' language level and enrich vocabulary is what learners should pay attention to. In addition to accumulating words and expressions every day, we must also learn new expressions with the help of teachers' support in the listening context (Guan, 2019). Teachers can use more effective learning methods to guide learners to memorize words. When students have a good grasp of words, they will help them with listening comprehension.

The difference between second language reading and listening lies in the difference in pronunciation. Therefore, it requires learners to master not only vocabulary knowledge, but also

phonetic knowledge. In this case, the teacher should master the pronunciation of the alphabet, and correct the pronunciation of the alphabet (2022, 2022). Due to different accent factors, teachers should also help learners recognize accents (gilakjani & sabouri, 2016). In addition, teachers can also cultivate students' pronunciation ability to distinguish between dominant words and difficult words (Guan, 2019). Through this training, learners will respond to the composition and meaning of words in a short time.

According to the influencing factors mentioned in the second part, listening anxiety is another influencing factor of second language listening because it interferes with the storage function of working memory. Krashen's hypothesis on affective filtering refers to the close relationship between second language acquisition and second language learners' positive attitude, self-confidence and intrinsic learning motivation (Li & Bao, 2022). It is normal for learners to feel anxious. However, if not handled, it will become a serious factor affecting learners' performance, making them unable to determine their true level. In this regard, Guan (2019) proposed that teachers should create a friendly learning atmosphere to reduce learners' anxiety and stress. For example, playing outstanding films and documentaries attracts students' attention, and to some extent, learners will feel less worried due to authenticity and entertainment. Teachers can also guide students to find out their own answers and deal with difficulties in second language listening. This will bring them pride and satisfaction.

In terms of strengthening the memory, Zhang and Chen (2014) indicate that direct interference and training of chunks could increase the capacity of short-term memory. It means that teachers should practice students not listening word by word, sentence by sentence but listening in language blocks. And then Xie (2018) emphasizes the importance of the time of retaining the information. It indicates that teachers ought to take advantage of listening strategies such as imagination, noting, and summarizing to extend the time of keeping information so as to increase the capacity of working memory.

5. Conclusion

Working memory does have an impact on second language listening and reading. By analyzing the current situation that students may encounter in daily learning, we can take corresponding measures to solve students' problems according to the function of working memory, such as language ability, background knowledge and listening anxiety. These measures also provide opportunities for teachers to use in daily teaching. In this way, they can combine the traditional teaching method and thinking mode with this new perspective. This is beneficial not only to teachers, but also to learners. The relationship between working memory and second language reading is a topic worthy of continuous exploration and research. The extent to which working memory affects second language reading is a key factor to be paid attention to. The scope of research resources needs to be expanded, so as to find more evidence to investigate the comprehensive relationship between working memory and second language listening.

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