



## A REVIEW OF SHORT-TERM MEMORY AND LISTENING COMPREHENSION

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### ABSTRACT

Short term memory is an important topic in the field of second language acquisition. Listening comprehension is a basic skill in English learning. In recent years, more and more scholars at home and abroad pay attention to the relationship between them. It has been shown that short-term memory is an important part of listening comprehension, and it is of great significance to improve second language listening comprehension. In this paper, the internal relationship between short-term memory and listening comprehension is analyzed.

**Keywords:** short term memory; second language acquisition; listening comprehension

### 1. Introduction

In English listening, there is a phenomenon worth pondering. Many students have good accuracy when they do listening comprehension questions, but if they are allowed to retell the listening materials, their performance will not be satisfactory. Even the students with good oral English report that it is difficult to retell the materials they just heard. Students are also very distressed, some of them can't even remember what they understood at that time. One of the important factors causing this phenomenon is the limited capacity of short-term memory.

### 2. Short term memory overview

Memory plays an important role in cognitive psychology. According to the duration of memory and the different ways of encoding, storing and processing information, memory is divided into

three types: sensory memory, short-term memory and long-term memory. The upsurge of short-term memory research began in 1950s to 1970s. Short term memory refers to the part of memory that temporarily stores the received information. Short term memory is a kind of mental activity process of information processing, which is the instantaneous reflection of human to objective things (Chen Jitang, 2002). At the same time, the information is analyzed and understood. When the information or content in the sentence is understood, the data will become permanent memory, that is, long-term memory, while the original sentence itself may gradually disappear from short-term memory (Richards, Platt & Platt, 2000:283).

Short term memory has two basic characteristics:

(1) Limited capacity. American psychologist Miller (1956) first proposed that the capacity of short-term memory is  $7 \pm 2$ , and proposed the concept of chunk, which means a group of meaningful information units stored in memory, one of which can help to remember the other. Chunking can effectively expand the capacity of short-term memory. Block is a meaningful unit of information; chunk is a process of repeatedly organizing items, which is based on similarity or other organizational principles, or based on the information stored in long-term memory to form a larger block. Cowan (2000) put forward different views after careful research, and he thought that the short-term capacity was 4. Lin Hong (2005) proposed that three variables play an important role in the effectiveness of listening: one is the amount of information noticed in sensory memory, the other is the amount of information stored in short-term memory, and the third is the amount of information with relevant background knowledge in long-term memory. Therefore, the feature of chunk integrity extraction is helpful to increase the capacity of short-term memory and speed up listening comprehension. The improvement of chunking ability is helpful to overcome the problem of isolated listening and memorizing words. In the process of listening and memorizing, it can reduce the memory burden of the brain, and reduce the link of absorbing and recombining information alone when answering questions.

(2) The time is short. The retention time of short-term memory is only 5-20 seconds without retelling, and the longest time is not more than 1 minute. Learners can't keep information permanently in short-term memory, because there will always be new information coming in and old information will be excluded from short-term memory at any time. In the case of short-term memory with retelling, the learning materials kept in short-term memory will transfer to long-term memory. Retelling is a method of storing information in short-term memory, which can be divided into retention retelling (also known as simple retelling and mechanical retelling) and fine retelling (also known as integrated retelling). The latter enables the information in short-term

memory to be further processed and organized to establish a connection with the existing knowledge of the individual, so that the information can be transferred into long-term memory.

From 1963 to 1976, Conrad and Wickelgren & winkens (quoted from Chen Jitang, 2002:37) conducted experiments from different perspectives and concluded two coding forms: auditory code form and semantic code form. The auditory code based on sound is the main memory code of short-term memory, and the semantic code based on meaning is the main code of long-term memory.

Craik and Lockhart (1972) proposed the principle of deep processing. It is emphasized that rote learning is not an effective way of memory. Forgetting begins at the moment when recitation stops. Therefore, only through deep meaningful memory processing can we better remember.

Waugh and Norman (1965) tested whether the disappearance of short-term memory information was due to loss or interference. Experiments show that interference is an important reason. We can reduce the interference to the lowest degree by arranging the information structure, that is, reducing the similar items in the information.

### **3. Short term memory and second language acquisition**

With the development of cognitive psychology, short-term memory plays an important role in the field of second language acquisition. In recent years, some researchers have begun to explore the cognitive and psychological activities of second language learners from the perspective of psychology, and carried out theoretical and empirical research around language input and output.

The impetus of foreign research mainly comes from the following two theoretical viewpoints: on the one hand, many second language acquisition researchers (such as Skehan, 1998) take the classical information processing theory as the basis, and infer that the different learning stages of second language acquisition and their secondary cognitive processes are limited by the Limited

Second Language vocabulary and grammar knowledge of second language learners, and need to rely more on working memory. On the other hand, many second language acquisition researchers have abandoned Chomsky's general grammar theory in recent years, and turned to learn from the booming cognitive science theory to explain the process of second language acquisition, such as connectionism, dynamic system theory (DST), surge The theory of expressionism and language use. Among them, Ellis (1996, 2012) advocated to study second language acquisition from the cognitive perspective of connectionism and construction grammar, and further explored the influence of working memory on mother tongue and second language acquisition from the theoretical and practical level, and then thought that working memory (especially

Working memory plays an indispensable role in the chunking process of language sequences or constructions (such as vocabulary, lexical chunks and morphological syntactic constructions) at all levels involved in the whole language learning and in the consolidation process of the newly acquired speech sequences into learners' long-term knowledge.

Since the concept of working memory was introduced into SLA by Skehan and Ellis, many SLA researchers began to learn from the research paradigm commonly used in cognitive psychology (especially the theories and measurement methods of the two working memory camps in Europe and North America), and through different experiments, they studied the relationship between working memory and SLA from multiple levels. More and more researches show that working memory of speech and executive memory not only play an important role in the acquisition of mother tongue, but also play an important role in the acquisition and development of different second language categories and the learning of second language skills (Linck, 2014). First of all, these studies further confirm Baddeley's (1998) and Ellis's (1996, 2012) argument that phonological working memory not only affects mother tongue learning (especially vocabulary acquisition and development), but also applies to second language learning (Baddeley, 2015); secondly, many empirical studies also show

that executive working memory is closely related to the development of various second language skills, especially for second language learning. The complex cognitive skills involved in the process, such as listening, speaking, reading and writing, have significant impact, and can effectively suppress interference from the mother tongue (Linck, 2014).

The study of short-term memory started late in China. Researchers have demonstrated the influence of short-term memory on second language learning from different perspectives. Wu Qianlong analyzes the process of second language acquisition from the perspective of cognitive psychology and proposes a working memory centered model. GUI Shichun believes that memory plays a central role in language learning and that input should be optimized by increasing intelligibility. Wen believes that working memory is an important component of foreign language learning ability, which has a significant impact on foreign language / second language learning. Dai Yuncai and Cai Jinting quoted Robinson's point of view, and proposed that working memory itself cannot be equated with linguistic ability, because learning ability complex also contains other cognitive abilities.

#### **4. Short term memory and listening comprehension**

Among the four basic skills of listening, speaking, reading and writing, listening is the initial perception link and the main way to obtain information. In actual foreign language teaching, listening is the weak link of most learners and the main obstacle to normal communication (Yang Xueyun, 2009). This situation still exists. Some students in the classroom will be faced with the difficulty of retelling the listening materials. Even if they understand at that time, they will not remember what they hear later. One of the important reasons for this kind of phenomenon is that the limited capacity of short-term memory leads to the blocked information extraction (Chen Jitang, 1997).

In recent years, foreign language researchers have paid attention to the role of long-term memory in the memory system in listening comprehension, and the importance of short-term memory has been

gradually recognized by people (Wang Hongyang, Zhou Xiancheng, 2011). Understanding the characteristics of memory, especially short-term memory, and analyzing the relationship between short-term memory and listening comprehension can guide learners to use short-term memory theory to improve memory capacity and English listening level, which is of great practical significance.

#### (1) Foreign research

From the perspective of foreign language learning, foreign researchers started to explore the relationship between short-term memory and listening comprehension early, but few studies focused on speech and syntax.

Phonology is the premise of sentence understanding, and phonological awareness helps to improve short-term memory. Cook (1977) pioneered this research. He took native language learners as subjects to investigate the memory capacity of short-term speech memory and pointed out that the width of short-term speech memory was significantly related to second language listening comprehension. Yano, Shibuya, Kondo & Nakagawa (2010) also conducted a speech awareness test on native language, and found that speech awareness is related to short-term memory, which is consistent with the results of later studies (Linke & Cusack, 2012; odelius, 2015).

Syntax is the core of sentence understanding, which is of great significance to the understanding of foreign language input. Among the existing achievements, the most famous one is call (1985). He takes Spanish and Arabic English learners as subjects. After listening experiments, the results show that short-term memory is an important part of listening comprehension, and syntactic memory can predict listening skills. Ohata (2006) also believes that listening comprehension is initially limited by short-term memory capacity, but syntactic connection can improve its ability. This is consistent with other empirical studies (Xu, 2009; Robertson & joanisse, 2010; Hagiwara & kuzumaki, 2013). In fact, listening comprehension is a kind of passive speech input, the listener can not control its speed, and the load of short-term memory is high in the process of listening

processing, which leads to the significant correlation between listening skills and listening comprehension, which has been confirmed in relevant research. It can be seen that short-term memory plays an important role in the process of English listening comprehension.

#### (2) Domestic research

The research of domestic scholars started late, mainly focusing on the solvable input (syntactic structure (chunk memory) (listening question type (objective choice question and subjective question and answer question)) in listening comprehension.

In terms of comprehensible input, language acquisition is generated by comprehensible information. For listening, Xu Fang (2005) took the second year non-English major as the subjects and tested the memory of short sentences, sentences, words and numbers in turn. The experimental results show that the best prediction for listening is the memory of sentences in isolated sentences and short passages with plots. The validity of dictation input to second language learners' listening and the importance of syntactic memory have been confirmed by relevant research institutes (Yang Xueyun, 2009; Qiu Donglin, Li Hongye, 2010; Zhang Xiaodong, 2014; Zhang Xiaodong, Chen Yinghe, 2014).

The storage of short-term memory is related to chunking. The limited capacity of short-term memory can be increased by using chunking units. Bao Xiaoying (2005) applied the rule of short-term memory to the practice of interpretation. Through experimental research, it was found that the unit of interpretation is also chunk, and processing information in chunk can improve short-term memory ability, which is consistent with later research (Feng LAN, 2012; Kang Zhifeng, 2016).

In addition, the setting of listening questions is also an important factor affecting the listening comprehension of the second language learners. There are few studies about this, but it is still recognized by some empirical research institutes (Lei Haiyan, 2007; Wang Hongyang, Zhou Xiancheng, 2011). The research shows that the accuracy of multiple choice questions is higher than that of Q

& A questions, because listeners can make predictions through pre listening reading questions and pay attention to key words, so as to reduce the short-term memory span of listeners.

To sum up, a survey of domestic and foreign studies shows that there is a significant correlation between short-term memory and listening comprehension in terms of voice memory, comprehensible input, syntactic structure, chunk memory and listening question types, and the conclusions are consistent.

### 5. Summary

This paper reviews and analyzes the research on short-term memory and listening comprehension at home and abroad. The research shows that short-term memory is an important part of listening comprehension and plays an important role in its process. In addition, the research in this field in China is still insufficient, and there is still a lot of room for expansion in the future. In a word, in the future, we should learn from the advanced theories and methods of foreign countries, and carry out targeted exploration in combination with the actual foreign language teaching in China, so as to make memory research develop better.

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