Academic Journal of Education
ISSN: 3080-9940 (Print), ISSN: 3080-9959 (Online) | Vol. 2, No. 1, 2026

Building Interpreting Memory Capacity: Tiered Training Methods and Scenario-Based Chunking Practices

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Abstract: Against the backdrop of globalization, interpreting, as a crucial bridge for cross-cultural communication, imposes high demands on interpreters' information processing capabilities. Memory capacity, as the core mechanism underpinning information retention and real-time processing, directly determines interpreting performance and output quality. Grounded in cognitive psychology and empirical research, this study examines the operational mechanisms and principal constraints of interpreting memory, constructs a tiered training framework centered on chunking strategies, and explores scenario-based implementation pathways across consecutive and simultaneous interpreting as well as specialized professional domains. The findings aim to provide systematic, actionable guidance for interpreting learners and practitioners seeking to enhance their mnemonic efficiency.

Keywords: Memory Capacity; Scenario-Based Practices; Interpreting Training; Chunking.

1. Introduction

In the context of globalization, interpreting plays an irreplaceable role in promoting international exchanges, and its quality directly affects the accuracy and efficiency of information transmission. The immediacy and one-time nature of interpreting activities place extremely high demands on interpreters' information processing capabilities, among which short-term memory is a key factor determining interpreting performance [1]. Short-term memory refers to the ability to temporarily store and process information within a limited time (usually 30 seconds), and its capacity is constrained by Miller's "7±2 chunks" theory, which often leads to problems such as incomplete memory and information omission in interpreting practice.

Zhang Wei and Liu Yubo confirmed through empirical research that logical memory tests have significant predictive validity for consecutive interpreting performance, especially in the Chinese-English direction ($r=0.50$, $p<0.01$), providing empirical evidence for the targeting of short-term memory training [2]. Meanwhile, Sheng Dandan (2024) pointed out in a survey of 192 domestic interpreting textbooks published between 2011 and 2022 that only 3.1% of the textbooks specifically set up skill training modules, and most of them fail to reflect the gradient design of memory training. This highlights the weak link of short-term memory training in teaching practice [3].

This paper, from the interdisciplinary perspective of cognitive psychology and interpreting studies, combines core theories of short-term memory with the latest empirical findings, constructs scientific training strategies, and explores their application in different interpreting scenarios, in order to provide a theoretical basis and practical reference for improving interpreters' short-term memory efficiency.

2. Theoretical Basis and Operational Mechanisms of Short-Term Memory in Interpreting

2.1. Core Theories of Short-Term Memory

Short-term memory (STM) in interpreting is governed by distinct cognitive mechanisms that dictate how verbal inputs are retained and processed. To construct an effective training paradigm, it is essential to explore its core theoretical foundations, which primarily encompass its inherent cognitive boundaries, its dynamic operational architecture, and its collaborative reliance on existing mental schemata.

2.1.1. Capacity Limitation and Expandability

The memory system model proposed by Atkinson and Shiffrin (1968) points out that short-term memory, like an "information channel" in the brain, has limited capacity and is easily replaced by new information [4]. The capacity of human short-term memory is approximately 7±2 independent items (such as numbers and words), but this limitation can be broken through chunking. Lu Juan (2011) emphasized that chunking is the process of integrating fragmented information into meaningful units. For example, splitting a long string of numbers "60484818126401186216653852l" into chunks like "064 (area code) + 848181264 (IP card number) + 011 (international prefix)" can significantly improve memory efficiency [5]. Zhang Wei and Liu Yubo further verified this mechanism in their study: subjects who could chunk discourse according to logical levels performed significantly better in Chinese-English consecutive interpreting than other subjects, which confirms that chunking is an effective way to expand short-term memory capacity [2].

2.1.2. Extension of Working Memory Model

Baddeley and Hitch's working memory model expands short-term memory into a dynamic system consisting of "central executive system + phonological loop + visuospatial sketchpad", emphasizing the simultaneous storage and

processing of information [6]. In interpreting, this model is reflected in: interpreters need to temporarily store source language sound information through the phonological loop, analyze logical relationships using the central executive system, and construct semantic images with the help of the visuospatial sketchpad, with the three collaborating to complete information processing [7]. Li Xixi found in a longitudinal study of MTI students that in Chinese-English consecutive interpreting, the development of learners' strategic competence (such as syntactic restructuring and simplification) is positively correlated with the improvement of the central executive function of working memory. Especially during the critical period of 3-7 months of learning, the number of strategy uses and memory capacity increase simultaneously, reflecting the interactive relationship between working memory and interpreting skills [8].

2.1.3. Synergistic Role of Long-Term Memory

Guo Yingmin found that "chunks" (such as fixed collocations and set phrases) stored in long-term memory can reduce the load on short-term memory [9]. For example, frequently used chunks in conference interpreting like "on behalf of..." and "first/second" can be directly retrieved and integrated into the target language, reducing the pressure of real-time processing. However, Sheng Dandan pointed out in the survey that only 2.1% of existing textbooks involve chunk training in national conditions and culture, resulting in learners' difficulty in quickly activating relevant memory chunks in cross-cultural scenarios, which urgently needs to be improved [3].

2.2. Operational Processes of Short-Term Memory in Interpreting

The cognitive utility of short-term memory during interpreting is not static but functions as a continuous, multi-stage pipeline. This section delineates the real-time operational sequence required to successfully process bilingual inputs, tracing the cognitive trajectory from initial sensory capture to structural organization and final target output generation.

2.2.1. Information Reception and Preliminary Encoding

After source language information is input through auditory or visual channels, it first enters sensory memory (lasting 0.25-2 seconds), and then key information is filtered into short-term memory. At this point, interpreters need to quickly convert phonetic or textual symbols into semantic representations. For example, encoding "economic globalization" into the concept of "global economic interdependence" [10].

Zhang Wei and Liu Yubo showed in their logical memory test that subjects with strong semantic encoding ability achieved significantly higher scores in English-Chinese interpreting ($r=0.33$, $p<0.01$), confirming the direct impact of encoding quality on memory effectiveness [2].

2.2.2. Logical Integration and Chunk Storage

Lu Juan (2011) demonstrated through case analysis that effective memory in interpreting depends on the logical reconstruction of information. For example, splitting the long sentence "A rise in divorce rate and the increase of single-parent households indicate a crisis" into three chunks: "rising divorce rate + increasing single-parent households → crisis signal" can significantly improve memory retention. Li Xixi further found that the frequency of learners using the "hierarchical transfer" strategy (converting subordinate clauses into main clauses) in consecutive interpreting is positively correlated with the completeness of memory information ($\beta=0.418$, $p=0.021$), indicating that logical integration is crucial for enhancing short-term memory effects [8].

2.2.3. Information Retrieval and Target Language Conversion

After chunk information in short-term memory is retrieved, it needs to be combined with language knowledge in long-term memory (such as grammatical rules and vocabulary collocations) to be converted into the target language. In this process, the "updating ability" of working memory (i.e., replacing redundant information with new information) is crucial, especially in simultaneous interpreting, where interpreters need to discard processed information in real-time to make room for new content[11]. Huang Min and Wang Binhua found in their study on CATTI scoring that raters' judgment of "information completeness" is highly correlated with interpreters' memory updating speed, suggesting that the dynamic processing ability of short-term memory is a hidden indicator in interpreting quality assessment[12].

3. Main Challenges of Short-Term Memory in Interpreting.

3.1. Capacity Limitation and Information Overload

The 7±2 chunk limitation of short-term memory makes it difficult to completely store long speeches or high-density information (such as numbers and professional terms). For example, in business interpreting, the sentence "In the third quarter of 2023, sales increased by 18.7% year-on-year, and the market share rose to 23.5%" is likely to exceed the capacity limit if each number is taken as a memory unit (Guo Yingmin, 2020). Sheng Dandan (2024) pointed out in the textbook survey that 69.8% of comprehensive textbooks do not classify the information density of corpus, leading to frequent memory overload for beginners when processing complex data.

3.2. Multitask Interference and Cognitive Load

Gile's Effort Model points out that interpreting needs to coordinate three tasks: "listening and analysis (L), memory (M), and production (P)". If one link consumes too many resources, the overall efficiency will decrease. For example, if interpreters over-focus on grammatical analysis when processing complex sentences, they will occupy memory resources, resulting in the omission of key information. Li Xixi found that MTI students in the early stage of learning (1-2 months) have increased cognitive load due to improper strategy use (such as over-correcting target language), leading to a 15%-20% decrease in short-term memory retrieval accuracy [8].

3.3. Information Decay and Retrieval Barriers

Information in short-term memory will decay rapidly within 30 seconds if not processed in time. In addition, interference from similar information (such as synonyms and cognates) may lead to retrieval errors. For example, in medical interpreting, the confusion between "myocardial infarction" and "angina pectoris" may stem from the ambiguity of semantic representation in short-term memory

Zhang Wei and Liu Yubo showed that subjects with high language anxiety had a 24% higher memory retrieval error rate than those with low anxiety in English-Chinese interpreting due to emotional interference ($p<0.05$), indicating that psychological factors also affect the stability of short-term memory [2].

4. Training Strategies for Short-Term Memory in Interpreting

4.1. Basic Training Based on Chunk Theory

To overcome the cognitive limits of human memory retention, interpreting pedagogy must prioritize the optimization of information units. This section introduces foundational training strategies grounded in Chunk Theory, focusing on pedagogical techniques that enable learners to expand their immediate memory span through structural, numeric, and mental representation adjustments.

4.1.1. Logical Stratification Method

Trainers can select structured texts (such as speeches and news) and guide learners to extract information hierarchically according to "theme → argument → evidence". For example, a speech on "environmental protection" can be decomposed into three chunks: "current situation (pollution data) → causes (industrial emissions) → measures (policies and regulations)". Lu Juan showed that after 8 weeks of training, learners' memory completeness of 500-character texts improved by 40% [5]. Zhang Wei and Liu Yubo further confirmed in their logical memory test that this method has significantly higher predictive validity for Chinese-English interpreting ($\beta=0.50$) than for English-Chinese direction ($\beta=0.30$), suggesting that training should take into account differences in language directions[2].

4.1.2. Number and Term Chunking

For number-intensive scenarios (such as economic and technological interpreting), the "unit + magnitude" chunking method can be adopted. For example, "125,000,000" is remembered as "125 million"; for professional terms, "term + explanation" associated chunks can be established, such as "blockchain (distributed ledger technology)" Sheng Dandan suggested that textbooks should add special modules for "number conversion" and design gradient exercises with reference to CATTI examination standards (such as from 2-digit numbers to 6-digit numbers) [3].

4.1.3. Visual Chunking

Strengthen memory by constructing "semantic images". For example, "widening gap between the rich and the poor" can be transformed into the visual image of "expanding bottom and shrinking top of the pyramid". Studies have shown that visual chunking can extend memory retention time to more than 60 seconds [7]. Li Xixi found that when learners use the "substitution" strategy (replacing abstract concepts with specific images), memory retrieval speed increases by 22%, and this strategy shows a significant leap during 3-4 months of learning, which is a critical period for training [8].

4.2. Collaborative Training of Working Memory

Given that interpreting requires the simultaneous execution of multiple cognitive tasks, isolated memory training is insufficient. The following section explores interactive training methodologies designed to enhance the cognitive processing power of working memory, focusing on parallel execution, real-time information updating, and attention preservation under external friction.

4.2.1. Shadowing Technique

Learners repeat the source language with a lag of 1-2 seconds, gradually extending to 5 seconds, to train the parallel processing ability of "listening-memory-repetition". Zhang Wei (2008) found that this method can reduce the information omission rate in simultaneous interpreting by 25%. Combined with the rater training mechanism proposed by Huang Min and Wang Binhua (2024), "double rater calibration" can be introduced in training to ensure the objectivity of repetition quality assessment.

4.2.2. N-back Task Training

Improve working memory updating ability by judging whether the current information is consistent with the nth previous item (e.g., "whether the heard word is the same as the one 3 items before"). Dong et al. (2018) confirmed that 20-minute n-back training, 3 times a week, can increase reaction speed in interpreting by 15%. This training should be arranged during the critical learning period (3-7 months) to form a synergistic effect with the development of strategic competence.

4.2.3. Anti-Interference Training

Conduct listening and memory exercises in noisy environments (such as cafes and multi-person conversation backgrounds) to enhance attention focus. Studies have shown that learners who undergo 10 weeks of anti-interference training have a 30% improvement in memory accuracy in complex scenarios (Han Xiao et al., 2021). Sheng Dandan (2024) pointed out that only 7.3% of existing textbooks include practical environment training, and it is recommended to develop a "multimodal interference corpus" to fill this gap.

4.3. Linked Training of Chunks and Long-Term Memory

Efficient real-time retrieval in short-term memory heavily depends on the systemic support of long-term cognitive storage. This section examines training methods designed to bridge the gap between active processing and long-term memory, emphasizing the lexical capitalization of professional domains, logical cohesive networks, and the proactive activation of thematic schemata.

4.3.1. Thematic Chunk Accumulation

Organize high-frequency chunks by field (such as diplomacy and medical care). For example, diplomatic phrases like "mutual respect" and "win-win cooperation" can be strengthened through contextual recitation and substitution exercises (such as replacing "cooperation" with "collaboration, partnership") to enhance memory retrieval. Business chunk textbooks account for 15.1%, but legal, medical and other fields account for less than 1%, so it is necessary to strengthen the construction of chunk textbooks in segmented fields [3].

4.3.2. Strengthening Logical Connectives

Focus on memorizing connectives such as "causal (therefore),转折 (however), progressive (furthermore)" to build discourse logical frameworks. Experiments have shown that mastering 30 high-frequency connectives can improve discourse memory efficiency by 50% [5]. The frequency of learners using the "syntactic restructuring" strategy is positively correlated with the memory proficiency of logical connectives ($r=0.43$, $p<0.01$) [8].

4.3.3. Activation of Pre-Interpreting Background Knowledge

For specific tasks, check relevant field knowledge in advance (such as conference themes and participants' positions) to activate schemas in long-term memory. For example, understanding the concept of "carbon neutrality" in advance can help quickly grasp relevant terms and arguments. Zhang Wei and Liu Yubo confirmed that subjects with sufficient pre-interpreting knowledge preparation improved their logical memory test scores by 18%, and this effect is more significant in the Chinese-English direction [2].

4.4. Psychological Regulation Strategies

Cognitive capacity in interpreting is fundamentally intertwined with the interpreter's affective and psychological states. To ensure the stability and reliability of memory retrieval, this section outlines specific psychological adjustment techniques aimed at mitigating cognitive interference caused by anxiety, affective stress, and mental fatigue.

4.4.1. Attention Control Training

Improve anti-interference ability through "mindfulness meditation" (10 minutes of daily focus on breathing). Studies have shown that after 8 weeks, the number of attention distractions in interpreting can be reduced by 40% [10]. Zhang Wei and Liu Yubo found that this training can reduce the negative impact of language anxiety on interpreting memory (β decreased from -0.24 to -0.11) [2].

4.4.2. Stress Simulation Training

Set time-limited tasks (such as memorizing and translating 300-character texts within 1 minute) to simulate practical pressure. Gradually extend text length and shorten time to enhance psychological adaptability [12]. Huang Min and Wang Binhua suggested introducing "real-time rater feedback" in training, with reference to CATTI scoring standards for memory retrieval training under pressure [13].

5. Application Scenarios of Training Strategies

5.1. Application in Consecutive Interpreting

Consecutive interpreting allows interpreters to translate during speech intervals, and the core demand of short-term memory is "paragraph-level information retention". It is recommended to adopt the "logical stratification + note-taking assistance" strategy:

Split long sentences according to "subject-verb-object" when listening, and record key information with symbols (such as "↑" for increase);

Focus on "arguments + examples" when memorizing, for example, remembering "new energy vehicle sales rise due to policy subsidies and technological progress" as "sales ↑ ← subsidies + technology";

Reorganize chunks quickly before output to ensure logical coherence. Combining this strategy with "hierarchical transfer" during 5-7 months of learning can improve information completeness by 30%.

5.2. Application in Simultaneous Interpreting

Simultaneous interpreting requires "listening and translating at the same time", and short-term memory needs to balance "real-time processing" and "information temporary storage". Recommended strategies:

Adopt "predictive memory" to predict subsequent content according to context (e.g., preparing the translation of "second" when hearing "first");

Use the "phonological loop" to temporarily store 2-3 words while 启动 (initiating) target language conversion. For example, outputting "气候变化" while memorizing "climate change";

Improve information updating speed through n-back training to reduce lag error. Sheng Dandan pointed out that existing simultaneous interpreting textbooks account for only 2.1% and supporting memory training modules need to be developed [3].

5.3. Differentiated Applications in Professional Fields

The execution of short-term memory strategies must adapt dynamically to the unique information structures of different communicative domains. This section analyzes how the aforementioned training models are tailored and implemented across distinct professional settings, each presenting specialized cognitive demands and lexical landscapes.

5.3.1. Business Interpreting

Focus on number chunking and term association, for example, remembering "net profit margin 15.6%" as "net profit 15.6%";

Accumulate negotiation set phrases (such as "Our proposal.../Considering...") to reduce real-time organization pressure. The predictive validity of logical memory tests in business scenarios (R^2=0.27) is higher than in general scenarios (R^2=0.14) [2].

5.3.2. Medical Interpreting

Strengthen memory of procedural information, chunking according to "symptoms → diagnosis → prescription";

Establish medical term-colloquial expression correspondences (such as myocardial infarction-heart attack) to avoid semantic confusion. Medical interpreting textbooks should add "memory training in emergency scenarios" to simulate information retention under high pressure.

5.3.3. Conference Interpreting

Activate field knowledge schemas in advance (e.g., "artificial intelligence" covers "algorithms, data, ethics");

Use chunks to quickly organize target language, for example, translating "下面我从三个方面展开" as "Now I will elaborate on three aspects". The appropriate use of the "addition" strategy in conference scenarios can reduce memory load by 25%, but redundant information interference should be avoided.

6. Conclusion and Prospects

As the core procedure of information processing during interpreting, overall memory capacity relies on systematic mnemonic training strategies and scenario-oriented practical application. Drawing on core tenets of cognitive psychology, this study constructs a three-level training framework consisting of foundational chunking drills, coordinated cognitive training, and schema-connected chunk consolidation. The framework targets three core cognitive objectives: lifting upper memory capacity limits via logical information integration, boosting cross-cognitive coordination through multi-task training tasks, and lowering real-time information processing load by accumulating domain-specific lexical chunks.

Current interpreting textbooks exhibit notable shortcomings in the systematic design of memory training curricula (Sheng, 2024). Building on these identified gaps, future pedagogical advancement should progress along three interconnected dimensions. First, a tiered "basic–advanced–applied" training continuum should be constructed to align with distinct learning stages—with particular attention to the 3–7 month critical developmental window identified in longitudinal research—ensuring that training intensity calibrates to learners' evolving cognitive trajectories. Second, multilingual memory training modules warrant development to accommodate the expanding demand for language service talent under the Belt and Road Initiative, extending chunking-based pedagogical frameworks beyond dominant language pairs to under-served linguistic combinations. Third, a standardized memory competence assessment framework integrated with CATTI scoring criteria should be established (Huang Min & Wang Binhua, 2024), thereby bridging the longstanding disconnection between classroom instruction and industry certification benchmarks. Taken together, these efforts would shift interpreting pedagogy from fragmented skill drills toward a theoretically coherent, empirically validated model of memory capacity development that serves both learners and the broader translation and interpreting profession.

Future research can explore the neural mechanisms of short-term memory combined with brain science technologies (such as fMRI), or develop AI-assisted training systems (such as real-time chunk prompts) to provide technical support for personalized training. For learners, it is necessary to select targeted strategies according to their own weaknesses and adjust dynamically in practice, ultimately forming a stable and efficient memory mode to lay a solid foundation for high-quality interpreting practice.

Acknowledgments

This work was financially supported by Key Project of the Center for Chinese Culture Translation and Research, Provincial Philosophy and Social Science Key Research Base (grant number: ZY26B17), Higher Education Teaching Reform Project at China West Normal University (grant number: CWNUJG2024023), Key Project of Shu Dao Research Institute (grant number: SDYJB240205), Key Project of Nanchong Federation of Social Sciences (grant number: NC26A043).

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