

## **STM Span for Various Types of Auditory and Listening Comprehension**

### **DUREE DE LA MEMOIRE A COURT TERME ( MCT) POUR DE DIVERS TYPES DE COMPREHENSION AUDITIVE**

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**Abstract:** This paper tests short-term memory (STM) span for various types of auditory input which seem to be related to LC. The result is that memory for sentences in isolation or chosen from running discourse is the best predictor of listening success.

**Key words:** listening comprehension; STM for sentences in context; STM for isolated sentences; STM for random words; STM for random digits

**Résumé:** Cet article vérifie la durée de la mémoire à court terme (MCT) pour de divers types d'entrées auditives qui semble être liée à compétence linguistique. Le résultat montre que la mémoire des phrases isolées ou choisies dans un discours en cours est le meilleur prédicteur du succès auditif.

**Mots-clés :** compréhension auditive; mémoire à court terme pour des phrases dans un contexte; mémoire à court terme pour des phrases isolées; mémoire à court terme pour des mots aléatoires; mémoire à court terme pour des chiffres aléatoires

The purpose of this passage is to test short-term memory (STM) span for various types of auditory input which seemed to be related to LC and to decide how much each type contributed to variance in LC scores. This passage will give a detailed account of the study, involving the specific research questions for the study, the variables to be examined, the subjects, the instruments, the methods and the procedures for LC test.

## **1. VARIABLES**

Five variables in total were involved in this experimental study. The independent variables of the present

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study were STM for sentences in context, STM for isolated sentences, STM for random words, STM for random digits. The dependent variable of the study was listening comprehension. The controlling variables involved background knowledge, delivery rates, pauses, accent, white noise, vocabulary, syntactic complexity and relative length.

## **2. SUBJECTS**

The subjects were 40 second-year non-English majors from Qingdao University. All of the subjects were native speakers of Chinese. Their age ranged from 19 to 22. These subjects had studied English as a foreign language for at least 6 years at high school. Ten of them had passed the College English Test for Band 4 (CET-4) during their second year in Qingdao University.

## **3. INSTRUMENTS**

### **3.1 Measures of short-term memory**

The STM test consisted of 4 subtests. Each successive subtest was constructed to remove one recognizable component of STM from the previous task. The four subtests were all paper-and-pencil tests requiring the subjects to write down the test items verbatim after listening to them. These subtests were administered in a language laboratory, where the subjects heard the materials through headsets.

#### **3.1.1 Measure of STM for sentences in context**

The first subtest, defined as the probe subtest, was devised to contain all the components of memory normally employed in paying attention to spoken language. It asked the subjects to listen to a short story in English which was interrupted at intervals a total of ten times. After each interruption, the subjects heard a probe-word hint (which was the first content word in the sentence last heard) and were required to write down the words that followed it in the story. Therefore, just as in normal listening, the subjects were concentrating on the content of the narrative rather than on its linguistic form. The subjects knew that they would be required to recall and write down something but did not know how long it would be or when they would be required to begin to recall and write it down. Memory tasks of this type are said to tap running memory.

#### **3.1.2 Measure of STM for isolated sentences**

The second subtest, the sentence subtest, got rid of the element of context from the test. For each of the 40 items, the subjects heard a sentence similar in length, syntactic complexity and vocabulary to a sentence in the probe subtest and were asked to write them down exactly as they had heard them. Like the probe subtest, the sentence subtest demanded the subjects to write down real sentences. However, under this condition, the testees knew that they would be asked to write down each sentence they had heard; they could, therefore, focus attention on its lexical and syntactic component without being distracted by its semantic content. As a result of this, the sentence subtest was a straightforward test of memory; it did not simulate natural listening.

#### **3.1.3 Measure of STM for random words**

The third subtest, the random word subtest, eliminated the element of syntax from the test by asking the subjects to listen to and write down strings of content words ranged in random order. The 25 strings ranged from four to eight words in length and consisted of the content words that had appeared in the two previous subtests. While the input in this task remained linguistic, the subjects were taken away the

extrinsic ordering of words offered by syntax.

### 3.1.4 Measure of STM for random digits

The fourth subtest removed the element of lexical meaning from the test and was designed to test a component of STM that might be called symbolic. This subtest asked the subjects to listen to and write down 25 strings of random digits ranging in length from four to eight items. When a digit is heard in isolation, its meaning, which is clear and explicit, should not result in semantic interference for the listener who is attempting to recall a string of random digits. However, a content word in isolation can have any one of a number of meanings. When he hears a word, the listener might extract several meanings from LTM, therefore affecting the efficiency of short-term recall. Besides, interference caused by idiosyncratic associations with a word may also influence performance. Such idiosyncratic associations are not usually related to the names of digits. Therefore, it will not influence their short-term recall. As a result of this, it can be acknowledged that random digit tasks tap an aspect of STM little different from memory for random word tasks. The random digit test can be regarded as testing semi-lexical memory, whereas the random word test evaluates lexical memory.

### 3.1.5 Principle

We should make an explanation that the probe was always the first content word (and any determiner before it) in a sentence of the basic form NP1+BE+V-ing+NP2. These sentences differed in placement (NP1 or NP2) and type (adjective, prepositional phrase or relative clause) of noun phrase modification. Relative length was decided by calculating the number of words in the sentence, the number of syllables, and the (approximate) number of morphemes and dividing the sum of these numbers by three. The content words employed in the probe and sentence subtests were taken from the list of content words employed in the random word test. The numbers at the end of the sentences show the relative length of each sentence; the first number reveals the number of words, the second, the number of syllables, and the third, the number of morphemes.

The sentences in 1) of subtest 2 will be equivalent to the first sentence of subtest 1 in length, syntactic complexity and vocabulary, the sentences in 2), equivalent to the second, the sentences in 3), the third, and so on and so forth.

Relative Length of sentences ①,②,③,④ in 1) of subtest 2 must be equal to the one of sentence 1) in subtest 1. Morpheme number in the table is the exact number. If the relative length of sentences ①,②, ③,④ in 1) of subtest 2 by dividing the sum of morpheme number, syllable number, word number by three is not the same as the one of sentence 1) in subtest 1, the morpheme number will become approximate number by adding 1 or subtracting 1 which is not marked in the table; relative length of the rest sentences may be deduced by analogy.

## 3.2 Measure of listening comprehension

The listening comprehension test was constructed to test the subjects' listening skill. There were altogether 5 parts. Part I, Part II, Part III and Part IV were multiple-choice questions, while Part V was a dictation test. In Part I, the subjects were asked to listen to ten short statements and choose the one which is closest in meaning to the statement. Part II contained 10 short conversations. Part III required the subjects to listen to one dialogue, then choose the best answer to each question for (A) and write "T" or "F" for (B). Part IV included 2 short passages. Part V was a spot dictation, a short passage, which contained ten blanks; it was read twice to the subjects. The listening material was a listening model test of College English Test for Band 3 which was designed by experienced professional teachers.

## **4. RESEARCH DESIGN**

As mentioned in the previous material, the present research included four independent variables and one dependent variable. One week before the 4 subtests were given, a pretest was administered to the subjects to test their listening proficiency. After the pretest, the research test involving measures of STM and measure of listening comprehension was administered to determine how much STM for various types of auditory input contributed to explaining the variance in LC scores. The subjects' scores in the pretest were compared and subjects were divided into different groups.

### **4.1 Pretest**

The listening material for the pretest was a listening model test from Public English Test System 3 (PETS-3). It contained 2 parts. They were all multiple-choice questions.

The pretest was a part of language proficiency test. Thus it was administered simultaneously by two teachers and the author herself in the language lab. Before the test began, the testers told the subjects in Chinese: "You are going to listen to the tape. The tape will be played once from the beginning to the end. Please listen to the tape and write down the answers on the answer sheet. The test will last 25 minutes." After the instruction, the testers handed out test papers to the subjects. When time was up, the testers required the subjects to stop at once and hand in their answer sheets.

According to the scores of the pretest, the 40 subjects were divided into 3 groups of high, medium and low listening proficiency levels. The high listening proficiency level, with scores from 80-90, contained 1 subject. Scores from 60 to 79 were considered the medium listening proficiency level, including 17 subjects. The low listening proficiency level consisted of 22 subjects, the scores ranging from 30 to 59.

### **4.2 Research test**

#### **4.2.1 Subtests of STM for sentences in context, isolated sentences, random words and random digits**

##### **4.2.1.1 STM test material**

To render the listening subtests as valid and reliable as possible, great pains were taken in preparing the test papers. All the listening materials were constructed by the author herself according to the above-mentioned principle and checked by a native speaker, an English teacher, to ensure that the materials were clearly and correctly written. The sentences in the probe subtest were similar to those in the sentence subtest in vocabulary, syntactic complexity and length.

The four subtests were carefully recorded on a tape by a native speaker of English in the recording room. The tape was checked for times to see to it that it was of good quality. Side A of the tape consisted of a warming-up passage, subtest 1, subtest 2 and subtest 3. Side B of the tape contained only subtest 4. The reason for recording the warming-up passage on the tape was to familiarize the subjects with the speaker's accent, intonation and rate of delivery.

##### **4.2.1.2 Experimental Procedure**

In order to avoid the interference of anxiety, fatigue and strong test effect, the subjects were tested in their normal classroom environment in the language laboratory by their regular instructor and the author herself simultaneously. Before the test began, the testers read the requirements in Chinese to the subjects as follows: "First, you are going to listen to one warming-up listening passage in order to familiarize yourself with the speaker's accent, the rate of delivery and intonation. After this, you will be given 4 subtest materials to listen to."

### ***The first subtest***

The speaker will read a short story in English which is interrupted at intervals a total of ten times. After each interruption, you will hear a word hint. You are required to write down the words that follow it in the story.

Note: Please don't begin to write until the foreign teacher finishes reading. You will be given 20 seconds to write down the test items verbatim after each interval.

### ***The second subtest***

You will listen to 40 isolated sentences. At the end of the each sentence, there will be an interruption. Please write down each sentence verbatim.

Note: Please don't begin to write until the foreign teacher finishes reading. You will be given 20 seconds to write down each sentence after each interval.

### ***The third subtest***

You will listen to 25 strings ranging from four to eight random words in length. After each interruption, you should write down exactly what you have heard.

Note: Please don't begin to write until the foreign teacher finishes reading. You will be given 20 seconds to write down each string after each interval.

### ***The fourth subtest***

You will listen to 25 strings ranging from four to eight random digits in length. After each interruption, you should also write down exactly what you have last heard.

Note: Please don't begin to write until the foreign teacher finishes reading. You will be given 20 seconds to write down each string after each interval.

The material for each subtest will be read only once. The test will last 60 minutes.

The testers emphasized again and again that in order to test the subjects' short-term memory, the subjects were forbidden to write while the foreign teacher was reading the test items. According to the instructions, the testers played the tape and the test started. When time was up, all the subjects were asked to stop and submit their test papers.

To ensure the serious cooperation of the subjects, we held back the experimental nature of the test until the end of test. We told the subjects that the tests would be part of their final examinations.

#### **4.2.1.3 Scoring**

The subjects' answers were rated according to the tapescripts. The total score for each subtest was 100. For errors of grammar and spelling, no point was deducted, provided that the comprehension was right in subtests 1 and 2, since they had nothing to do with retrieval failures. For subtest 1, consisting of 10 items, 10 points were given to each item. For subtest 2, consisting of 40 sentences, 2.5 points were given to each sentence. Responses for subtests 1 and 2 were evaluated on the number of correct idea units given. For subtest 3, consisting of 25 strings of words, 4 points were given to each string; for errors of spelling, no point was deducted. For subtest 4, consisting of 25 strings of digits, 4 points were given to each.

Since there was a subjective element in scoring subtests 1 and 2, the two subtests were scored independently by two raters to ensure that they would not influence each other. One was an experienced listening teacher who aided the author all the time during the research test and the other was the author herself. If there was any difference between the two, the mean score of the two raters was adopted. By employing the formula developed by Cronbach to calculate the reliability values for the subtest scores for the two raters, the coefficient alpha for subtest 1 was 0.9989; for subtest 2, the coefficient alpha was 0.9994. Therefore, the rating of subtests 1 and 2 was highly reliable.

#### 4.2.2 Test for listening comprehension

The test for listening comprehension, lasting 30 minutes, was administered in the language laboratory as part of a normal class. To ensure the validity and reliability of the test, a pilot test was administered to 5 students beforehand. And after the pilot test, a brief interview was performed to these students. And then, some changes were made to the test questions.

In scoring the listening comprehension test, two scores were given to each correct answer. The dictation was scored by using the exact word and equivalent word methods. And for the technical errors of spellings, no points were deducted.

#### 4.2.3 Post-test Questionnaire

After each test, the testers distributed the questionnaires to the testees. The requirements were read aloud to the testees in Chinese as follows: "This questionnaire is to investigate whether the content of the test is familiar to you or not. As you may notice, on it are some multiple-choice questions. Please read them carefully and tick the best answer."

The post-test questionnaire for the test involved multiple-choice questions constructed to investigate whether the subjects had done the pretest material and listening comprehension test or not. If someone ticked A (Yes), or B (most of them), he/she was thought to have done the material before, while if he/she ticked C (few of them) or D (Never), he/she was thought to have not done the material before. The post-test questionnaire indicated that no one chose A, B and C for the 2 tests—40 students ticked D, demonstrating that all the subjects were unfamiliar with the test.

## 5. CONCLUSION

The data present evidence that the independent variables measured by the sentence and probe subtests contributed most to an explanation of the variance in listening scores. The remaining two variables did not contribute as much. STM span for random digits, while correlating positively but weakly with language proficiency, is only marginally involved in language processing and is not a good indicator of overall language proficiency. These results also show that memory for sentences in isolation or chosen from running discourse is the best predictor of listening success in this battery. It is important to realize that both of these subtests contain memory for syntax. The scores on most of the subtests corroborated their hypothesized relationships with the listening comprehension scores.

## REFERENCES

- Anderson, A. & Lynch, T. (1988). *Listening*. Oxford: Oxford University Press.
- Anderson, J.R. (1995). *Cognitive Psychology and Its Implications* (4th Ed.). New York: Freeman.
- Carroll, David W. (2000). *Psychology of Language* (3rd Ed.). Foreign Language Teaching and Research Press.
- Clark, Herbert H. & Clark, Eve V. (1977). *Psychology and Language: An Introduction to Psycholinguistics*. New York: Harcourt Brace Jovanovich Inc.
- Krashen, S. D. (1981). *Second Language Acquisition and Second Language Learning*. Oxford: Pergamon.
- Richards, J. C. (1998). *Listening Comprehension: Approach, Design and Procedure. The Context of Language Teaching*. Cambridge: Cambridge University Press.