วารสารภาษาและภาษาศาสตร์ ปีที่ 42 ฉบับที่ 1 (มกราคม - มิถุนายน 2567)
JOURNAL OF LANGUAGE AND LINGUISTICS 42, 1 (JANUARY - JUNE 2024)

Research on the Effect of Overlearning Theory on the Long-term Memory of Chinese Nouns with Different Semantic Transparency among Thai University Students*

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Received 19 June 2023; revised 21 July 2023; accepted 1 September 2023

Abstract

Vocabulary teaching is an essential component of teaching Chinese in Thailand. For Thai university students, teachers should pay attention to their long-term vocabulary retention after class and their learning in class. The effect of long-term vocabulary memorization has a significant effect on the students who need to take the new HSK Test. Based on the ethical review of research ethics involving humans by the Kasetsart University Research Ethics Committee, this paper investigates the effect of "overlearning theory" on the long-term memory of Chinese nouns with high semantic transparency and low semantic transparency by Using qualitative, quantitative, and experimental methods, and found that the "over-learning theory" did have a positive effect on Thai college students' long-term memory of Chinese noun words within 3-9 weeks. Over-learning did improve students' long-term memory of Chinese noun words to a certain extent, but it should be noted that there is a difference between words with high and low semantic transparency. The effect of "overlearning theory" on the long-term memory of nouns with high semantic transparency is slightly greater than that of words with low semantic transparency.

Keywords: Overlearning theory, Chinese nouns, Semantic Transparency, Long-term memory

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* This article is part of a thesis entitled "A Research on the Effects of "Overlearning Theory" on the Long-Term Memory of Chinese Vocabulary and its "Optimal Degree" among Thai University Students" for the degree of Doctoral of Philosophy (Eastern Languages), Department of Eastern Languages, Faculty of Humanities, Kasetsart University. Dr. Nathakarn Thaveewatanaseth is the principal advisor and Asst. Prof. Dr. Warisa Asavaratana is the co-advisor.

1. Introduction

"Overlearning theory" was proposed by the famous German psychologist Ebbinghaus, who derived it from his research on the rule of forgetting, the primary meaning of which is to continue to memorize something after an entirely correct reproduction. Of course, the "continue" here is not endless, but is reflected by a "degree" (Peng Sixiang & Qin Rong, 2012). The famous British scholar Harry Maddox pointed out in his essential academic work "The Learning Strategy" that when the practice of learning material does not achieve 100% correct recall, we call it "underlearning." And when you continue to learn after the material has been learned with 100 percent correct recall, that is "overlearning." He also cites: "You can learn twenty English words in ten minutes, and then if you continue to concentrate on them and review them as you did before, you are over-learning the material. If you learn five minutes more, you are overlearning 50%; if you learn ten minutes more, you are over-learning 100%." Feng Zhiping and Xu Xiaoyan (1996) have conducted numerous experimental studies of the overlearning process, showing that the "optimal degree" of overlearning is a 50% increase from the "base degree." This is because knowledge and skills that have been overlearned to this degree can be incorporated into one's knowledge structure and used efficiently (Chen Hongxiu, 2004).

In addition, the semantic transparency of words also affects the efficiency of vocabulary learning and, subsequently, vocabulary memory. Semantic transparency refers to the degree to which the meaning of the whole word of a synthetic word can be inferred from the meaning of the constituent semantics and is operationally defined as the semantic relevance of the constituent semantics to the whole word. There are degree differences in the semantic transparency of words, which can be

roughly classified into four gradations: completely transparent, relatively transparent, relatively obscure, and completely obscure. In this study, the authors classify Chinese noun words into two categories according to this definition: those with high semantic transparency include those completely transparent and relatively transparent, and those with low semantic transparency include those completely obscure and relatively obscure.

In Thailand, the vast majority of university students who study Chinese take the New HSK Test after they have reached a certain level of Chinese language learning because, on the one hand, they want to check what level of Chinese language ability they have reached. On the other hand, if they pass the New HSK Level 5 Test, they can apply for a scholarship from the Chinese government to pursue further studies in China. However, while preparing for the new HSK Test, many students consider vocabulary memorization a serious obstacle in the process. After compiling and counting the 1300 words in the new HSK syllabus level 5, the authors found that there are eleven categories of vocabulary, including nouns, verbs, adjectives, pronouns, quantifiers, adverbs, conjunctions, prepositions, auxiliaries, exclamations, pictograms, of which nouns alone account for about 40%. Therefore, this paper combines the theory of "overlearning" with "long-term memory" of Chinese noun vocabulary in order to control the semantic transparency of vocabulary to help Thai university students improve their long-term memory of Chinese vocabulary.

Regarding "overlearning," most scholars in China hold a supportive attitude. In the article "On the Value, Basis Degree, and Principles of Overlearning," scholars believe that most of the knowledge or skills acquired through "overlearning" will be transformed into specific abilities, and "overlearning" helps students develop and discover their creative and unique abilities.

However, “overlearning” should be timely and moderate (Cheng Shaotang & Sun Fang, 1989, p. 24). Most of the research in this field is still at the theoretical level; although a few scholars have conducted some empirical studies on “overlearning,” there are still many problems (Feng Zhiping & Xu Xiaoyan, 1996, p. 26). In the article “Research on the Effect of Over-Learning on Long-Term Memory,” scholars only introduced the study of overlearning and memory forgetting in China. However, the study had no theoretical model, and the relevant variables needed to be better controlled in the experimental study (Li Yanping, 2012.) In the article “An Investigation of Chinese vocabulary memory of international students based on the overlearning principle,” the scholars did not exclude the interference of memorizing multiple groups of words simultaneously (Liu Juanjuan & Li Guiqiong, 2016, p. 116). In “A study on the effect of overlearning on high school students’ English vocabulary,” the interference of variables related to vocabulary memory, such as “semantic transparency of words” and “vocabulary recurrence rate” on long-term memory, is not excluded. Only a part of the degree of overlearning and the time interval were analyzed (Gao Qi, 2018). This also indicates that there is still much space to explore “overlearning” empirically.

In China, research on “vocabulary memory” is divided into two camps: Chinese vocabulary memory and English vocabulary memory. The main focus of the research on Chinese vocabulary memory is to explore the teaching of Chinese vocabulary through vocabulary memory. For example, in the article “The Cognitive-Motivational Model of Second Language Vocabulary Teaching,” the scholars studied vocabulary memory directly based on psychological theories (He Qingqiang, 2008). In the article “An Experimental Study on the Effectiveness of “Associative Memory” on the

Memory of Chinese Vocabulary among University Students: The Example of Tajikistan State Language Institute and National University," the scholar takes the processing level theory of cognitive psychology and the cognitive teaching method as the theoretical sources and combines them with the experience of teaching practice. However, it is worth mentioning that in his experimental study the number of subjects was only 28, so any conclusions about the final data still need to be verified (Xu Qian, 2017).

In addition to Chinese vocabulary memory, current research on English vocabulary memory also focuses on memory strategies. One study found that approximately 75% of students memorized English vocabulary by repeatedly reciting words (Peng Sixiang & Qin Rong, 2012). This suggests that in actual vocabulary learning, most learners apply the principle of "overlearning" to memorize vocabulary, but most students are unaware of the principle of this approach. According to "overlearning" theory, repetition is one of the typical characteristics of "overlearning," and "overlearning" cannot be equated with "rote memorization." "Overlearning" emphasizes the high intensity of learning rather than memorization without understanding. However, these studies are a good reminder that we must pay attention to the form and "degree" of "overlearning" to prevent students from being negatively affected by the lack of theoretical mastery.

2. Objectives of the Research

1) To study the effects of "overlearning" on the long-term memory of Thai university students' Chinese noun vocabulary.

2) To investigate the effects of "overlearning" on vocabulary based on different degrees of semantic transparency with respect to the long-term memory of Thai university students' Chinese noun vocabulary.

3. Research hypotheses

The research is about the effect of Overlearning Theory on Thai university students' long-term memory of noun vocabulary with different semantic transparency in Chinese. In the experimental section of the study, we tested the following two hypotheses:

3.1 Overlearning has a positive effect on Thai university students' long-term memory of Chinese noun vocabulary, and the application of overlearning theory to Thai university students' memorization of Chinese noun vocabulary will help them form long-term memories.

3.2 Overlearning has a positive effect on Thai university students' long-term memory of Chinese noun vocabulary for words with high semantic transparency and words with low semantic transparency, but it has a greater effect on words with high semantic transparency than on words with low semantic transparency.

4. Research Methodology

4.1 Population and Participants

The target population of this study is Thai university students. The 100 participants were selected using purposive sampling from a cohort of Chinese majors at Silpakorn University, Thailand. All participants had passed the Chinese New HSK Level 4 Test and were interested in taking the New HSK Level 5 Test.

As for the Chinese noun vocabulary applied in the study, the author used stratified and random sampling to select six nouns from the new HSK Level 5 vocabulary syllabus that all participants had not seen before. These include three items with high semantic transparency and three items with low semantic transparency.

As for the principles of participant selection, they are as follows:

4.1.1 Inclusion criteria for subjects

Preparation period:

1) Thai nationality.

2) Current student of Silpakorn University-Sanamchandra Palace Campus majoring in Chinese language.

3) Students who voluntarily filled out the researcher's questionnaire.

Experimental session:

1) Thai nationality.

2) Current student of Silpakorn University-Sanamchandra Palace Campus majoring in Chinese language.

3) Students who have completed the questionnaire during the preparation period.

4) Students who have passed the New HSK Level 4 test, but have not yet passed the New HSK Level 5 test or above.

5) Students who are intending to take the new HSK Level 5 test.

6) Students who volunteered to participate in the researcher's study.

4.1.2 Exclusion criteria for subjects

1) Absent during data collection.

2) Not cooperating when providing information.

3) Not able to follow up on the results completely.

4) Not completing the activity.

4.1.3 Withdrawal criteria for subjects

Volunteers decide to withdraw from the research during both the preparation period and the experimental period.

4.2 Research instruments

The main research instruments used in this study were three questionnaires and a test paper.

Questionnaire: A total of three questionnaires were used in this study. The first questionnaire (Questionnaire 1) was used to elicit information about the students' performance on the Chinese New HSK test and to collect background information about the students. The second questionnaire (Questionnaire 2) was used to investigate the students' intention to take the New HSK Level 5 test, and the problems and difficulties they encountered during the preparation process. This questionnaire was also designed to find out about the students' current vocabulary memorization. The third questionnaire (Questionnaire 3) was used to determine words that the participants had already seen or could translate correctly from the 129 nouns sampled from the new HSK Level 5 vocabulary syllabus in order to create the study word lists.

Test paper: After selecting the target vocabulary with stratified sampling and simple random sampling, a test paper was constructed based on the learning materials of the target vocabulary and the new HSK Level 4 test paper and vocabulary syllabus. This included two questions on translating words and four questions on completing sentences, worth one point each, for a total of six points.

In order to ensure the validity and quality of the experiment, in the preparation period, three experts were recruited, including one associate professor (PhD), one assistant professor (PhD) and one lecturer (PhD). They were invited to evaluate the structure, content and overall validity of the questionnaires and test paper using a 4-point rating scale. The ratings and opinions of the experts were combined and it was generally considered

that a rating mean greater than 3.50 and a standard deviation less than 1.00 indicated good validity of the questionnaire. The final results showed that the mean of rating of Questionnaire 1 was 4.00 with a standard deviation of 0.00; the mean of Questionnaire 2 was 3.67 with a standard deviation of 0.57; the mean of Questionnaire 3 was 3.67 with a standard deviation of 0.57; the mean of test paper was 3.67 with a standard deviation of 0.57; all of which indicated that the above research instruments had good validity.

4.3 Data Collection

The authors identified 512 nouns in the 1300-word list from the HSK syllabus level 5, which were then classified according to the semantic transparency of the words. As a result, there were 228 words with high semantic transparency in the noun category and 284 words with low semantic transparency in the noun category.

Stratified random sampling was then used in proportional sampling, which resulted in 58 words selected from the noun category with high semantic transparency and 71 words selected from the noun category with low semantic transparency, yielding a total of 129 words. Questionnaire 3 was then constructed based on the five-level VKS vocabulary scale. The purpose of the questionnaire was to let the participants judge each of the 129 words selected and to ensure the reliability and validity of the word list that would be used in the experiment; any word the participants could translate was removed to ensure that the target words were new words that were unknown to the research participants.

Immediately afterward, the author applied for an ethical review of research involving humans to the Kasetsart University Research Ethics Committee (Bangkhen Campus) in Thailand. After the application was approved

on March 10, 2023, the author began to recruit participants. After screening through Questionnaire 1 and Questionnaire 2, the authors selected 100 students who had passed the new HSK Level 4 test but had not yet passed the Level 5 test as the research participants. To ensure that the target words used in the experiment were words that none of the participating students knew, based on the Rule of Thumb, the sample size of the experimental study could not be less than 30, so the author first randomly selected 34 of the 100 subjects to judge the words. After that, the word judgments were mainly carried out using Questionnaire 3. In addition, to ensure that the target words were not known to all the participants and were seen for the first time, the students who completed the questionnaire during this period did not participate in the subsequent experiment. Therefore, the number of participants in the follow-up experiment was finally set at 66.

After analyzing the collected questionnaires, the author found that 63 of the 129 words had been seen by participants and could be translated correctly: 14 had been seen and the meaning could be guessed; 18 had been seen but their meaning was unknown; and 34 had not been seen. Finally, 34 words out of 129 were determined to be completely unknown by all participants. The authors selected six target words for the experiment using stratified random sampling (proportional), three words each with high and low semantic transparency, namely: 事先 (shì xiān; prior), 背景 (bèi jǐng; background), 台阶 (tái jiē; step), 待遇(dài yù; treatment), 嘉宾(jiā bīng; guest), and 缘故 (yuán gù; reason).

To study the effect of “overlearning” on the long-term memory of Chinese noun vocabulary among Thai university students, the experiment was conducted for a period of approximately two months, during which

quantitative data were collected through one pre-test and three post-tests. The experimental procedure is as follows:

The first step was to invite the participants to a Zoom classroom, where they received the target vocabulary learning materials. The first author then explained the target vocabulary one by one and after the students thoroughly listened to understand the target vocabulary, set aside time for everyone to memorize the vocabulary. At the beginning of the memorization process, everyone was instructed to turn on the timer, wait until everyone felt they had completely remembered the words, and then write down the time they spent memorizing. The first author then provided the target vocabulary test using Google Forms and asked participants to answer the test on the spot, with a time limit of 10 minutes. Only those students who got a perfect score were perfect participants in the test, and those who did not get a perfect score would be asked to leave the Zoom classroom first.

We then calculated the mean and plural values of the vocabulary memorization time for all students to ensure that the participants' memory levels were similar. The students whose memory time was too long or short compared to the mean and plural values were excluded. We found that most of the students could finish memorizing the target vocabulary within 5 minutes. After completion, the remaining participants were formed two large groups: Group A and Group B. Group A was the experiment's control group, with 33 students, and Group B was the experimental group, with 33 students.

After that, the time for overlearning was assigned according to the group. Group A served as the control group for this experiment; that is, the non-overlearning group. Therefore, they did not need to continue studying

after answering the questions, so they could exit the Zoom classroom and were asked not to review the study material for the next nine weeks. Group B served as the experimental group; that is, the over-learning group, and this group was required to overlearn the previous material for an additional 50% of the time. This meant that they needed to study and memorize the vocabulary for a further 2.5 minutes. After completion, the study material was retrieved, and it was emphasized that all participants should not review it outside of class.

After learning the target vocabulary, three post-tests were administered after one week, three weeks, and nine weeks. One week later, the experimental and control groups were asked to complete the first post-test of vocabulary recall; three weeks later, the second post-test; and nine weeks later, the third post-test. The test paper used for each test was identical in content to the test paper distributed when learning the target vocabulary, but the order of the questions would be changed, and the time of each test was the same as the time of the pre-test.

4.4 Data analysis

This study used SPSS Statistics version 26.0 to analyze the experimental data. For the first question of the research: what is the effect of "overlearning" on long-term memory of Chinese noun vocabulary among Thai university students, we used an independent sample t-test to analyze the data. For the second research question: what is the effect of "overlearning" on vocabulary with different levels of semantic transparency on long-term memory of Thai university students' Chinese noun vocabulary, a one-way ANOVA was used to analyze the data.

5. Results and Discussions

5.1 Results

In response to the first research objective, the author first conducted an independent samples t-test on the test scores of the first post-test (i.e., the test scores after one week) based on the previous grouping of the experimental and control groups. The results showed that in the first post-test, there was a significant difference between the scores of students in the experimental and control groups (t = 10.695, p < .05): the scores of students in the experimental group were higher than the scores of students in the control group (*MD* = 1.15). The mean score of the experimental group was 6.00, and the control group's mean score was 4.85, with a difference of 1.15 points between them.

Table 1

Results of the first post-test for the experimental and control groups

Group	*n*	*M*	*SD*	*t*	*p*
Experimental	33	6.00	.000	10.695	.000
Control	33	4.85	.619		

Table 1 reveals a significant difference (p < .05) between the mean scores of students in the experimental group and the control group on the Chinese vocabulary memory test after one week. The mean score of the experimental group was 6.00, with a standard deviation of 0.000. The control group's mean score was 4.85 with a standard deviation of 0.619, and the mean score of the experimental group was significantly higher than that of the control group (*MD* = 1.15). This finding indicates that

after one week, the vocabulary memory of the group who overlearned (experimental group) was significantly higher than that of the control group (non-overlearning students), and the scores of the over-learning students were significantly more concentrated compared to the scores of the non-over-learning students.

We then conducted an independent samples t-test on the test scores of the second post-test (i.e., the test scores after three weeks). The test results showed that there was still a significant difference between the experimental group and the control group in the second post-test (t = 9.412, $p < .05$): the experimental group scored significantly higher than the control group (MD = 1.21), with the mean score of the experimental group being 5.18 and the mean score of the control group being 3.97, a difference of 1.21 points.

Table 2

Results of the second post-test for the experimental and control groups

Group	*n*	*M*	*SD*	*t*	*p*
Experimental	33	5.18	.528	9.412	.000
Control	33	3.97	.637		

Table 2 shows a significant difference ($p < .05$) between the mean scores of students in the experimental and control groups on the Chinese vocabulary memory test after three weeks. The mean score of the experimental group was 5.18, with a standard deviation of 0.528. On the other hand, the control group's mean score was 3.97 with a standard deviation of 0.637, and the mean score of the experimental group was significantly higher than

that of the control group (*MD* = 1.21). This indicates that after three weeks, the vocabulary memory of the overlearning students (experimental group) remained significantly higher than that of the non-overlearning students (control group). The difference between the two groups increased slightly from the difference in the first post-test results. However, the dispersion of the scores of the students in the over-learning group compared to those from the non-overlearning group changed from significantly higher than that shown in the first post-test to slightly higher. However, the test scores of both experimental and control groups, as shown by the second post-test, showed that the vocabulary memory of students in both groups decreased after three weeks compared to one week later.

Finally, we conducted an independent samples t-test on the test scores of the third posttest (i.e., the test scores after nine weeks). The test results showed that there was still a significant difference between the scores of students in the experimental group and the control group ($t = 4.899$, $p < .05$): the scores of students in the experimental group were significantly higher than those in the control group (*MD* = 1.00). The mean score of the experimental group was 3.82, and the control group's mean score was 2.82, with a difference of 1.00 points between them.

Table 3

Results of the third post-test for the experimental and control groups

Group	*n*	*M*	*SD*	*t*	*p*
Experimental	33	3.82	.808	4.899	.000
Control	33	2.82	.950		

Table 3 reveals a significant difference ($p < .05$) between the mean scores of students in the experimental group and the control group on the Chinese vocabulary memory test after nine weeks, where the mean score of the experimental group was 3.82 with a standard deviation of 0.808. On the other hand, the control group's mean score was 2.82 with a standard deviation of 0.950, and the mean score of the experimental group was significantly higher than that of the control group (*MD* = 1.00). This indicates that after nine weeks, the vocabulary memory of the overlearning students (experimental group) was still higher than that of the non-overlearning students (control group). However, the difference between the two groups was slightly less than in the results of the second post-test. The vocabulary memory of both groups decreased significantly after nine weeks compared to three weeks in both experimental and control groups, and the degree of dispersion increased in both groups.

In response to the second research objective, we conducted a one-way ANOVA on words with high semantic transparency, and the results showed a significant difference in the scores of words with high semantic transparency among the experimental group in the three post-tests ($F = 35.351$, $p < .05$).

Table 4

Three post-test results of words with high semantic transparency in the experimental group

Time	*n*	*M*	*SD*	*F*	*p*
After 1 week	33	3.00	.000	35.351	.000
After 3 weeks	33	2.55	.711		
After 9 weeks	33	1.91	.579		

As shown in Table 4, the "overlearning" had a significant effect on the memory of words with high semantic transparency (F = 35.351, p < .05). Repeated comparisons showed that students in the experimental group scored slightly higher in week one than in week three (MD = 0.45) and slightly higher in week three than in week nine (MD = 0.64). In general, the student's long-term memory retention of the words with high semantic transparency was good due to the influence of "overlearning."

An additional one-way ANOVA was conducted on the words with low semantic transparency, and the results showed a significant difference in scores across the three post-tests for the experimental group (F = 58.963, p < .05).

Table 5

Three post-test results of words with low semantic transparency in the experimental group

Time	***n***	***M***	***SD***	***F***	***p***
After 1 week	33	3.00	.000	58.963	.000
Time	***n***	***M***	***SD***	***F***	***p***
After 3 weeks	33	2.30	.728		
After 9 weeks	33	1.39	.747		

As shown in Table 5, the "overlearning" also had a significant effect on the memory of words with low semantic transparency (F = 58.963, p < .05). In addition, repeated comparisons showed that students in the experimental group scored slightly higher in week one than in week three (MD = 0.70) and slightly higher in week three than in week nine (MD = 0.91).

Combining Table 4 and Table 5, the *F* value in Table 5 is significantly higher than in Table 4, and a higher *F* value means a more significant difference between groups. Therefore, in the three post-tests, the experimental group's long-term memory retention fluctuations for words with high semantic transparency were relatively smaller than those of long-term memory retention for words with low semantic transparency. This shows that the "overlearning" has a slightly greater impact on words with high semantic transparency in the long-term memory of Chinese noun vocabulary among Thai university students.

5.2 Discussions

Through a series of studies, the authors found out the effects of overlearning on Thai university students' long-term memory for Chinese nouns and the effects of the Overlearning Theory on Thai university students' long-term memory for nouns with high semantic transparency and nouns with low semantic transparency. Based on the comparison with previous studies, the two hypotheses proposed in this paper are discussed.

1) Discussion of the Effect of Overlearning Theory on Thai University Students' Long-Term Memory of Chinese Nouns

The first research hypothesis proposed in this paper was that "overlearning" would have a positive effect on Thai university students' long-term memory of Chinese noun vocabulary, and the application of "overlearning theory" in Thai university students' memorization of Chinese noun vocabulary would help students form long-term memory of those vocabulary items. Summarizing the results of this paper and those of previous studies, the following discussion is made: The results of this paper show that "overlearning" can significantly improve the long-term memory of Chinese noun vocabulary over a period. This is consistent with the

results of a multivariate analysis conducted by Driskell et al. (1992) on the relationships among "baseline degree of overlearning," "extended time" and "overlearning task." That is, the overlearning effect exists regardless of the type of "overlearning task" that students perform. (Driskell et al., 1992) In other words, if a moderate degree of overlearning is carried out, the retention of the learned material must be higher than that of the participants who did not carry out overlearning, no matter what the circumstances are. This demonstrates that the first research hypothesis proposed in this paper is confirmed.

2) Discussion of the Effects of Overlearning Theory on the Long-Term Memory of Thai University Students' Chinese Nouns with High and Low Semantic Transparency

The second hypothesis of this paper is that "overlearning theory" has a positive effect on both nouns with high semantic transparency and nouns with low semantic transparency on long-term memory, but the effect on nouns with high semantic transparency is greater than that on nouns with low semantic transparency. Firstly, we found through a cross-sectional comparison that the students' scores on nouns with high semantic transparency and nouns with low semantic transparency in the three posttests showed a decreasing trend, and the rate of decrease gradually slowed down, whether it was the first posttest, the second posttest, or the third posttest. This is consistent with Ebbinghaus's memory forgetting curve, that is, the speed of forgetting slows gradually. Secondly, through a longitudinal comparison, we found that the gap between the first posttest, the second posttest, and the third posttest of the words with high semantic transparency was significantly smaller than the gap between the first posttest, the second posttest, and the third posttest of the words with low semantic

transparency. This finding shows that under the influence of "overlearning," the fluctuation of long-term memory retention of words with high semantic transparency is obviously smaller than that of words with low semantic transparency, which indicates that the second hypothesis proposed in this paper was confirmed.

5.3 Conclusions

The experimental study has indicated that "overlearning" positively affected Thai university students' long-term memory of Chinese nouns within a certain period, and that over-learning did improve students' long-term memory of Chinese nouns to a certain extent. However, it should be noted that there are also differences between words with high and low semantic transparency. Therefore, the "overlearning" effect on the long-term memory of nouns with high semantic transparency is slightly greater than words with low semantic transparency.

Students who want to take the new HSK Level 5 can use the "overlearning" method to memorize vocabulary and knowledge points during the preparation process if they take the test in a short period to achieve better long-term vocabulary memorization.

In the future teaching of Chinese to Thai university students, the authors believe that besides teaching students basic Chinese language knowledge, teachers can also help students understand and accept new learning methods, such as the "overlearning" method mentioned in this study. However, they should also pay attention on how to use it as well as the limitations of the new learning methods.

5.4 Recommendations

The "degree" of overlearning has been mentioned in previous studies of "overlearning," and the three "degrees" of 30%, 50%, and 100%

are often mentioned. However, in this study, we selected 50%, which most scholars consider to be the "most appropriate" degree based on the results of previous studies. Inevitably, in Thai students' Chinese vocabulary memory, nouns are not the only category of words to-be-learned, so there is plenty of space for extending work in this area.

Although there are still a few shortcomings in this study, the results obtained are of some reference value for Thai university students' long-term memory of Chinese vocabulary and they also provide some ideas for subsequent studies in this field.

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