

The Correlation of Field Cognitive Style and Working Memory Capacity with English Reading Strategy of Second Language Learners

Haiyan Tong¹ & Chao Wang¹

¹ Zhiyuan School of Liberal Arts, Beijing Institute of Petrochemical Technology, Beijing, China

Correspondence: Chao Wang, Zhiyuan School of Liberal Arts, Beijing Institute of Petrochemical Technology, Beijing, No.19, Qingyuan North Road, Daxing District, Beijing, P.R. China. E-mail: wangchao@bipt.edu.cn

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Abstract

Understanding written text is crucial in language acquisition, and the cognitive style and working memory capacity of an individual play crucial roles in determining their level of reading comprehension. Individual differences may result in different reading strategies being employed during the reading process. Research has demonstrated that cognitive style and working memory capacity can impact language learning outcomes like vocabulary acquisition, grammar comprehension, and speaking fluency. However, there is a lack of research on how these cognitive factors relate to the reading strategies utilized by English as a second Language learners.

The purpose of this study is to explore the relationship between Field-Independent and Field-Dependent (FI/FD) cognitive styles and working memory capacity in relation to the utilization of English reading strategies among freshmen engineering majors at BIPT. Data is gathered utilizing the theoretical model of FI/FD cognitive styles, working memory capacity and English reading strategies. The collected data includes results from the Cognitive Style Figure Test (CSFT), Reading Span Test, and a questionnaire on English reading strategies, which are then analyzed using SPSS 22.0. The findings from the thorough analysis show that there exists a notable relationship between working memory capacity and the utilization of reading strategies in relation to FI/FD cognitive styles. Students exhibiting an FI cognitive style tend to favor the implementation of cognitive and metacognitive strategies, whereas those with an FD style are inclined towards employing social/affective strategies. Additionally, disparities in the use of reading strategies are observed between students with high and low working memory capacity. Students with high working memory capacity demonstrate a higher tendency to employ cognitive strategies, metacognitive strategies, and social/emotional strategies when compared to those with low memory capacity.

Keywords: field cognitive style, working memory capacity, English reading strategies

1. Introduction

1.1 Background of the Study

The process of learning a second language involves various cognitive abilities and strategies. Two important cognitive factors that have been extensively studied are field cognitive style and working memory capacity. Field cognitive style pertains to an individual's favored approach in perceiving and handling information. It can be categorized as field-dependent or field-independent. Field-dependent individuals show a tendency to rely on external cues and context, while field-independent individuals rely on internal cues and separate details from the context. Working memory capacity, on the other hand, refers to the ability to hold and manipulate information temporarily in mind.

The field of second language acquisition has recognized the significance of these cognitive factors in understanding individual differences in second language learning.

1.2 Significance of the Study

The cognitive factors have been acknowledged by the field of second language acquisition as crucial in comprehending the variances among individuals in their acquisition of a second language. Previous research has shown that field cognitive style and working memory capacity can have an impact on various aspects of language learning, such as vocabulary acquisition, grammar comprehension, and speaking fluency. However, limited research has been conducted on the relationship between these cognitive factors and reading strategies in

individuals learning English as a second language (ESL).

Understanding the correlation between field cognitive style, working memory capacity, and reading strategy in ESL learners holds both practical and theoretical implications. The present study is designed to inform language teachers and researchers about the individual differences that may affect learners' reading comprehension. By identifying learners' cognitive styles and working memory capacities, educators can tailor their instructional strategies and interventions to better meet their learners' needs. These knowledge can promote more effective teaching methods. Furthermore, it can delve into the cognitive process of second language reading and explore how field cognitive styles and working memory capacity interact with the selection and use of reading strategies, which helps to enrich theories and models of second language reading studies, contributing to the overall understanding of how learners comprehend written text in a second language.

Additionally, by considering these cognitive factors, language tests can be designed to measure not only linguistic competence but also cognitive abilities related to reading. This can lead to the development of more valid and reliable language assessments, which in turn can have implications for educational policymaking, placement decisions, and program evaluation.

Therefore, the objective of this research is to investigate the connection between field cognitive style and working memory capacity in relation to the utilization of English reading strategies. The study will focus on freshmen who are pursuing science and engineering at BIPT, drawing upon theories related to field cognitive style, working memory capacity, and English reading strategies. The following questions will be focused on:

- (1) What is the correlation between learners' FI/FD cognitive style and their choice and use of English reading strategies?
- (2) What is the correlation between learners' working memory capacity and their choice and use of English reading strategies?
- (3) Which factor has a greater impact on learners' choice and use of English reading strategies: their FI/FD cognitive style or their working memory capacity?

1.3 Overview of the Thesis

This study consists of the following five main chapters:

Chapter 1 is the Introduction. Firstly, a brief overview of the research background of the paper was provided. Next, the research objectives and writing significance of the paper were elucidated. Finally, the overall structure and main content of the paper were introduced in detail.

Chapter 2 is the Literature Review. This chapter delves into the conceptual definitions of cognitive styles related to field independence/field dependence, working memory capacity, and strategies employed in English reading. Additionally, this section presents prior studies investigating the correlation between Field cognitive style and working memory capacity, as well as English Reading strategy.

Chapter 3 is the Research Design. The research questions were formulated to address the current state of the research as stated in the literature review and detailed the object of the research, the research instrument, the research methodology and the specific steps of the operationalization.

Chapter 4 is the Results and Discussions. In this chapter, the collected data was analyzed to obtain the specific usage of cognitive style, working memory capacity, and reading strategies among current college students. Furthermore, the correlation between cognitive style and working memory capacity with English reading strategies was analyzed.

Chapter 5 is Conclusion. It consists of findings, implications and limitations.

2. Literature Review

2.1 Definition

Aiming to explore and synthesize relevant studies that investigate the relationship between field cognitive style, working memory capacity, and English reading strategy, it is necessary to specify some key definitions in a clear and exact way.

2.1.1 Field Cognitive Style

The introduction of Cognitive Style as a concept was initially credited to Allport in the field of psychology. Since then, numerous scholars both domestically and internationally have engaged in extensive and profound deliberations regarding this subject matter. Cognitive style refers to a relatively enduring and consistent manner

in which individuals organize and process information during cognitive processes, including differences in individual cognitive processes such as sensation, perception, thinking, and memory (Zhu, 1991).

Although there are many classifications of cognitive styles, field independence and field dependence have also been widely applied in academic research related to language teaching. In this paper, cognitive style is analyzed in depth based on examples of field independence (FI) and field dependence (FD). Witkin (1971) believed that individuals with FI are good at analyzing and thinking about problems. Their perception remains unaffected by external factors while problem-solving, demonstrating independence. Conversely, those with FD rely heavily on their surroundings as a point of reference for perception and tend to be influenced by the immediate environment during problem-solving. Zeng Xiaoyou (2008) found that Field dependent learners are good at discovering clues to solve problems, but if the problem is complex and disturbed, Field dependent learners are prone to emotional fluctuations, making it difficult to detect and correct errors.

Above all, both field independence and field dependence possess their own set of strengths and weaknesses, which should be analyzed according to different situations.

2.1.2 Working Memory Capacity

Working memory is a cognitive mechanism that enables an individual to think and retain information about other tasks while multitasking simultaneously. A working memory capacity system is considered to be a finite capacity storage system capable of storing and processing information, to run concurrently (Baddeley & Hitch, 1974). Individuals possess the capacity to temporarily retain and process information in their minds through working memory, enabling them to engage in concurrent mental activities (Berch & Mazzocco, 2007). As stated by Linck, WM is a cognitive mechanism that assumes the role of managing, overseeing, and preserving information while encountering disruptive elements (2014).

With limited capacity, working memory is closely related to complex human cognition, such as reading comprehension and language production. Baddeley and Hitch proposed a WM model in 1974. As shown in Figure 1, the central executive's role is to control information and coordinate cognitive processes. It consists of three parts: Visuospatial sketchpad, episodic buffer and phonological loop. The function of Visuospatial sketchpad is to manage visual and spatial information. It can process information about the things we see with our eyes and the location of space. Phonological loop can store phonological information. When someone repeats the number, it can store a long string of numbers. It also can convert text into speech for us to learn. The episodic buffer is responsible for storing and integrating different types of information, which include visual and spatial and phonological information.

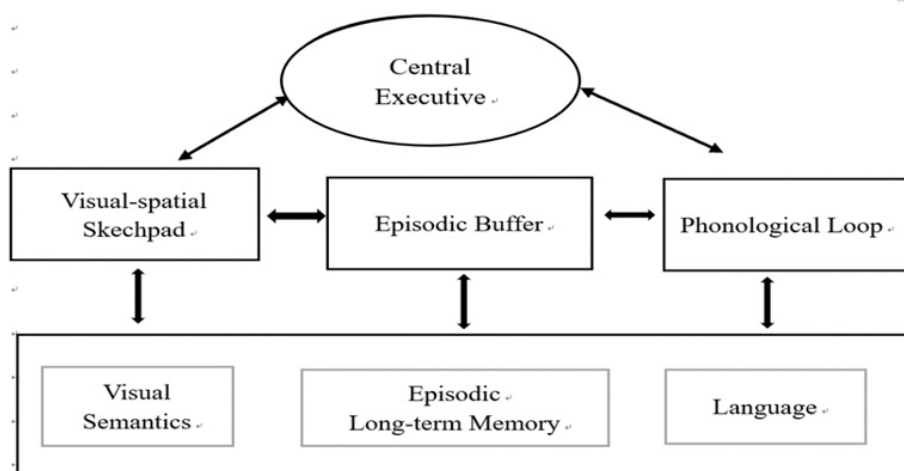


Figure 1. Multi-component model of working memory

In this study, working memory capacity is a memory system with limited storage capacity that can temporarily retain and process information simultaneously. In fact, many scholars have proposed methods for measuring working memory capacity (Zhu, 2000). The measurement method of this study is to use a memory span test, which first requires presenting a series of English sentences. The task for the participants is to ascertain if the Chinese meaning of the sentence aligns with its corresponding English meaning, which is the processing task; Then recall the last word of each sentence, which is equivalent to a memory task.

2.1.3 English Reading Strategy

Various scholars hold varying perspectives on the notion of reading strategies. The utilization of reading strategies involves active engagement between learners and the materials, resulting in a dynamic process (Block, 1986). Wallace (1992) thought that reading strategies are flexible, and students will change it according to the purpose of reading and the type of material. According to Routman, the purpose of students using reading strategies is to improve our problem-solving speed and accuracy. The improvement of students' reading skills in English is greatly impacted by the effective utilization of strategies during the process of reading. (Wang, 2021).

As for the classification of reading strategies, Oxford's (1990) classification of reading strategies has received widespread attention from many scholars. He categorized reading strategies into cognitive, metacognitive and affective strategies. O'Malley & Chamot's classification of reading strategies is derived from Oxford's framework. According to O'Malley & Chamot (2001), the three dimensions of reading strategies are metacognitive, cognitive, and social/affective strategies. Compared with the classification standards of other scholars, O'Malley & Chamot's classification standards are more suitable for the main content of this study. Therefore, this study classifies reading strategies from three dimensions: metacognitive strategies, cognitive strategies, and social/affective strategies.

Therefore, it is evident that reading strategies serve as efficient techniques employed by learners to swiftly address reading challenges. Reading strategies have great influence on students' English learning. Teachers should encourage students to use English strategies in class. The application of reading strategies can benefit students throughout their lives.

2.2 Review of Studies

In order to explore the relationship between FI/FD cognitive style and working memory capacity with reading performance, a large amount of research has been conducted at home and abroad. However, there has been limited investigation into the correlation between FI/FD cognitive style and working memory capacity in relation to strategies employed.

2.2.1 Previous Research on the Correlation between Field Cognitive Style and English Reading Strategy

Limited studies have been conducted by international researchers exploring the correlation between cognitive style and reading strategies in English. According to Oxford's (1990) perspective, there exists a significant connection between the FI/FD cognitive style and various reading strategies, particularly metacognitive and affective strategies. Similarly, Cohe's (1998) investigation revealed a connection between field cognitive style and the adoption of specific English reading strategies. During reading, independent learners are not affected by external factors when choosing reading strategies, and choose suitable reading strategies according to their own needs. However, field dependent learners rely more on external motivation.

In China, Numerous scholars have conducted research on the correlation between field cognitive style and reading strategies. According to a study by Song Guangwen et al. (2001), students' reading performance varies based on their cognitive styles. Students with field independent styles tend to achieve higher reading scores compared to those with field dependent styles. The disparities in learning outcomes are more pronounced in prose literature than explanatory texts, although they may not be readily apparent. Li Ying et al. (2008) conducted a study examining the relationship between field cognitive styles, reading strategies, and English reading proficiency among Chinese university students. The research findings suggest that there is no direct correlation observed between various reading strategies, reading performance, and field cognitive styles. However, the utilization of reading strategies significantly influences reading performance, particularly in terms of emotional strategies. Wangwei (2015) states that students with FI cognitive style demonstrate proficiency in employing cognitive and metacognitive strategies, while there is no noticeable difference in the use of social affective strategies between students with FI and FD cognitive styles.

To summarize, a connection can be observed between cognitive styles in different fields and the strategies employed during reading. However, most scholars have not conducted in-depth quantitative analysis. Therefore, this study will use questionnaires and Group Embedded Figure Test for in-depth analysis.

2.2.2 Previous Research on the Correlation between Working Memory Capacity and English Reading Strategy

At home and abroad, it is not very frequent to find research on the correlation between working memory capacity and English reading strategies. Chun (2004) found that additional search effort was required from students exhibiting lower levels of working memory capacity when these 13 German senior students were reading words from stories, because they have to find other methods to compensate for their lack of working memory ability. According to Carruthers (2015), the efficiency of processing and storing reading information simultaneously was

influenced by the capacity of working memory. Karlsson et al. (2019) indicate that individual differences in WM ability deeply influence the processing and understanding of long and difficult sentences. Ren Hulin and Jin Pengsun (2010) believe that working memory plays a certain role in the reaction time of compound sentences in high school Chinese English learners, but has little effect on the processing results of compound sentences. Ma Zheng and Wang Tongshun (2011) explored the relationship between working memory on Chinese reading and native language learning ability. 94 high school students were tested. The conclusion is that there is little correlation between working memory with Chinese reading and native language learning ability.

In recent years, there have been few studies on the impact of working memory capacity on reading strategies. Most scholars have focused on the impact of working memory capacity on English reading performance. In this study, based on previous research, I will conduct an in-depth quantitative analysis of the relationship between working memory capacity and reading strategies, exploring whether there is a connection between the two variables.

3. Research Design

3.1 Research Questions

On the ground of the theory of field cognitive style, working memory capacity and English reading strategy, this study aims to explore the correlation between field cognitive style, working memory capacity, and the application of English reading strategies. The research questions are as stated below:

- (1) What is the correlation between learners' FI/FD cognitive style and their choice and use of English reading strategies?
- (2) What is the correlation between learners' working memory capacity and their choice and use of English reading strategies?
- (3) Which factor has a greater impact on learners' choice and use of English reading strategies: their FI/FD cognitive style or their working memory capacity?

3.2 Participants

Taking the freshmen majoring in engineering in BIPT as the subjects, with a total of 110 students. The number of valid questionnaires was 94. The research subjects selected had an upper-middle level of English proficiency and had at least 6 years of English learning experience. Therefore, they had good reading comprehension skills and their cognitive styles and ways of thinking had become stable, as well as accumulating certain learning strategies.

3.3 Instruments

Three instruments were used to collect data, including Questionnaire, Cognitive Style Figure Test and Working Memory Test (a Reading Span Test).

3.3.1 Questionnaire

This questionnaire is mainly aimed at measuring how students use English reading comprehension strategies. The questionnaire content is mainly based on three dimensions of O'Malley & Chamot (2001): metacognitive strategies, cognitive strategies, and social/effective strategies. The survey consists of a grand total of 24 questions, all in the form of multiple-choice, of which cognitive strategies include a total of 11 questions, metacognitive strategies include 9 questions, and social/effective strategies include 4 questions.

3.3.2 Cognitive Style Figure Test

Witkin (1977) believed that the detection of students' field cognitive styles can be achieved through the utilization of the Cognitive Style Figure Test (CSFT), and this achievement has also been confirmed by scholars at home and abroad. Therefore, most scholars both domestically and internationally use CSFT to detect the types of cognitive styles in student fields. This research employed a modified version developed by a psychology professor from Beijing Normal University, which has become one of the most widely used measurement tools by Chinese scholars.

CSFT is a paper pen test (Huang, 2023). The experiment asked participants to quickly draw simple shapes embedded in a complex structure within a set amount of time. If the number of correct simple shapes found by the subject is greater, the score will be higher, indicating that their field independent cognitive style is more obvious. Conversely, the score decreases as the number of patterns identified decreases, indicating that the field-dependent style was evident. As shown in Figure 2, participants need to quickly find a simple shape with the same direction and size as "x" in the "complex shape", and highlight it with a pencil in the figure:

This test consists of three parts. The first part includes 9 complex shapes. The first part is not intended for testing, but to help students become familiar with simple shapes. This part is not included in the total score. The second and third parts are test, each with 9 shapes. This section is included in the total score. The specific scoring criteria for each shapes were set by Meng Qingmao (1998). In the 10 shapes in the second part, the first and second shapes each have a score of 0.5 points, the third and fourth shapes each have a score of 1 point, and the fifth to tenth shapes each have a score of 1.5 points. The scoring criteria for the third part are the same as those for the second part, resulting in a total score of 24 points. This study will refer to the classification criteria uniformly used in the studies of Zhao Min (2006), to distinguish between FI and FD types, that is, scores greater than or equal to 12 are FI, and scores less than 12 are FD.

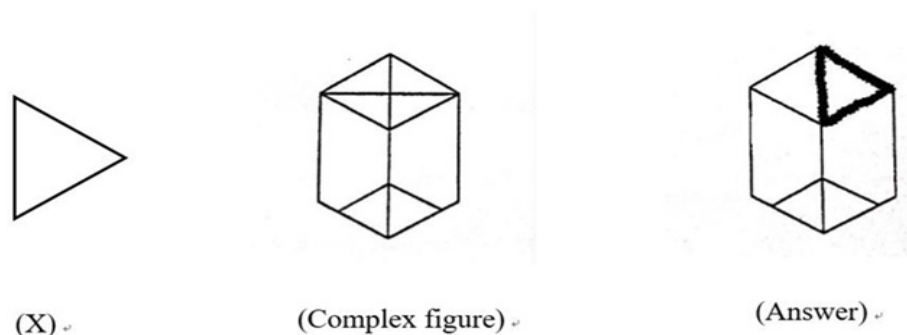


Figure 2. Example of Cognitive Style Figure Test

3.3.3 Reading Span Test

The Reading Span Test utilized in my research was a revised version of the test developed by Daneman and Carpenter, as well as an adapted edition based on Wang's 2019 study. The reliability coefficient for the Reading Span Test was determined to be 0.912, while its validity coefficient stood at 0.845. This test consists of a total of 42 unrelated sentences, ranging from 4 to 11 words in length, with distinct ending words for each sentence. To ensure a more precise measurement of participants' working memory capacity, they were given instructions to recall the ending words presented within the specified time after each group of sentences, and also to assess if the Chinese meaning corresponded with the English meaning for each sentence. The test is categorized into four tiers: two-sentence, three-sentence, four-sentence, and five-sentence levels; each tier consisting of three sets. The two-sentence level encompasses a total of six sentences, while the three-sentence level entails nine sentences. As for the four and five sentence levels, they comprise twelve and fifteen sentences respectively. The test is presented by PowerPoint. Initially, the participants are presented with a computer screen displaying sentences in pairs. Subsequently, they are asked to assess whether the Chinese meaning of each sentence matches its English meaning by marking either a tick or cross on paper within a given time frame for each set of sentences. Following this evaluation task, participants are then instructed to recall and write down the final words of these two sentences on paper within specific time constraints. The time required to complete the full task process for each level sentence is as follows: eight seconds for two-sentence levels; eleven seconds for three-sentence levels; fourteen seconds for four- sentence levels; and seventeen seconds for five- sentence levels. In terms of scoring criteria, the maximum achievable score is 84 points.

As for the scoring criteria, the total score is 84 points.

- (1) 1 point will be awarded for judging whether the English meaning matches the Chinese meaning;
- (2) Accurately writing in order the end words of 42 sentences earns 1 point;

3.4 Data Collection and Analysis

For the collection of choice and use of English reading strategies, it opts for a professional data collection questionnaire survey platform called Wenjuanxing. Prior to distributing the survey, it is essential to provide participants with a clear explanation regarding the purpose and significance of the study in order to ensure their sincere responses. Additionally, after sharing the survey questionnaire, it is important to offer participants detailed instructions on how to complete it accurately. The meanings of the five options A, B, C, D, and E after each question in the questionnaire are different: A represents never, B represents occasionally, C represents sometimes, D represents often, and E represents always. And The questionnaire is emphasized that there is no

right or wrong choice among the options, and participants only need to make choices based on their actual situation. By explaining the precautions, the validity of the questionnaire survey results can be effectively improved. 30 minutes were allowed to complete the reading strategy questionnaire. 93 valid questionnaires were collected from this reading strategy survey.

For the collection of Cognitive Style Figure Test data, it is a paper-and-pencil test. This test is divided into five steps. Firstly, distribute sample test papers and guide participants to fill in personal information such as name and student ID on the sample test papers, but do not inform participants that this test paper is a sample test paper. Secondly, guide the participants to find simple shapes in the complex shapes of the sample test paper according to the instructions of the questions. Third, check if all participants fully understand the requirements of the question. Then, distribute formal test papers, and also require participants to fill in their names and student numbers on the test papers. Finally, participants are required to complete the second part of the CSFT within 2 minutes, and are reminded not to turn pages until further instructions are received. After 2 minutes, participants were asked to stop answering the second part of CSFT and turn pages uniformly, and complete the third part of the CSFT within 9 minutes. The purpose of the first three steps is to enable participants to fully understand the requirements and methods of the test, in order to ensure that they can answer smoothly in the formal test. The operation of the experiment of the fifth step can ensure that each participant has consistent time during the first and second parts of the test, and the reliability and validity of the experiment can be guaranteed through time control. After the experiment, 93 CSFT papers were collected. Under the supervision of the author, all papers are valid and can be used for further research and analysis.

For the collection of working memory capacity data, it is also a paper-and-pencil test. The test consisted of four levels, comprising a total of 42 sentences. Initially, the researcher dedicated 2 minutes to explaining the rules and operational details. Subsequently, participants engaged in three practice sets which lasted approximately 2 minutes. Following this preparation phase, the actual test commenced. During the first level, participants were presented with two English sentences along with their corresponding Chinese meanings on a PowerPoint slide. Within an 8-second timeframe, individuals had to determine whether each sentence was correct or incorrect before proceeding to the next sentence in that set. Furthermore, participants were instructed to recollect the final word of these two sentences before finalizing their assessment. Once all judgments for a particular set were made, participants moved on to recalling information from that set. At the two-sentence level, each set contained two sentences; whereas at the three-sentence level there were three sentences per set. This process continued similarly for subsequent levels. The completed time for this section averaged around 8 minutes and an additional 2 minutes were allocated for distributing and collecting test papers. Overall, this entire procedure took approximately 14 minutes to complete. Participants who achieved scores above average were categorized as having high working memory capacity while those below average constituted the group with low working memory capacity.

The Cognitive Style Figure Test and Reading Span Test data were imported into SPSS 22.0 for analysis. The English reading strategy data, obtained from 'Wenjuanxing', were also transferred to SPSS 22.0 for further processing. This study utilized SPSS statistical software version 22.0 to analyze the data collected.

4. Results and Discussion

4.1 Results

4.1.1 Descriptive Statistics on the Results of FI/FD Cognitive Style

The Cognitive Style Figure Test (CSFT) is divided into criteria by scoring, with higher scores representing more distinctive features of field-independence (FI) and lower scores representing more distinctive features of field-dependence (FD). Therefore, this study ranked scores of 93 subjects in descending order, and then distinguished between FI and FD based on the classification used in. Scores greater than or equal to 12 were classified as FI, while scores less than 12 were classified as FD. Scores are ranked in ascending order, the number of students with scores greater than or equal to 12 indicates that there are 59 students who belong to the FI, while the remaining 34 students belong to the FD.

The table 1 below shows that among the 95 students who participated in the test, the highest score was 24 points, while the lowest score was only 3.5 points. Among the 95 participants, there are 59 FI students, accounting for 63% of the total, with an average score of 16.846 points; There are 34 FD students, accounting for 36% of the total number, with an average score of 8.909. This result indicates that there are two cognitive styles among college students: FI and FD, with FI being the most common.

Table 1. Descriptive Statistics on the results of FI/FD Cognitive Style

	N	Minimum	Maximum	Mean	The standard deviation
Filed Cognitive style scores	93	3.5	24	13.945	4.8556
Field independent	59	12	24	16.847	3.2086
Field dependent	34	3.5	11.5	8.909	2.5378
N (listwise)	93				

4.1.2 Descriptive Statistics of Working Memory Capacity

The table 2 below shows the descriptive statistics of working memory capacity of university students. The total score is 84 points and from the table 2 it can be indicated that the highest score of the students is 83 points and the lowest score is 9 points. The mean score is 76.68 points. The standard deviation is 9.053. Therefore, it is revealed that there is a big difference between the highest and lowest scores.

Table 2. Descriptive Statistics of Working Memory Capacity

	N	Minimum	Maximum	Mean	The standard deviation
working memory capacity	93	9	83	76.68	9.053
N (listwise)	93				

The frequency statistics of working memory capacity of college students are shown in the table 3 below. The number of people who get 80 points is the largest, a total of 14 people, accounting for 15%. Following by the number of people who get 81 and 82 points is 13.

Table 3. The Frequency Statistics of Working Memory Capacity

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	9	1.1	1.1	1.1
	42	1.1	1.1	2.2
	65	1.1	1.1	3.2
	66	1.1	1.1	4.3
	68	2.2	2.2	6.5
	69	2.2	2.2	8.6
	70	1.1	1.1	9.7
	71	4.3	4.3	14.0
	72	3.2	3.2	17.2
	73	2.2	2.2	19.4
	74	3.2	3.2	22.6
	75	2.2	2.2	24.7
	76	5.4	5.4	30.1
	77	4.3	4.3	34.4
	78	11.8	11.8	46.2
	79	7.5	7.5	53.8
	80	14	15.1	68.8
	81	13	14.0	82.8
	82	13	14.0	96.8
	83	3	3.2	100.0
Total	93	100.0	100.0	

Students with above-average scores are identified as having high memory capacity, while students with low memory capacity are identified as having below average scores. The average score was 76.68. Therefore, as Table 4, the number of people with high memory capacity is 65, accounting for 69.89%; The number of students with low memory capacity is 28, accounting for 30.11%. It indicates that the number of students with high memory capacity is more than the number of students with low memory capacity.

Table 4. Descriptive Statistics of High Working Memory Capacity and Low Working Memory Capacity

		Frequency	Percent	Valid Percent	Cumulative Percent
High Memory Capacity	Working	65	69.89	69.89	69.89
Low Memory Capacity	Working	28	30.11	30.11	100
Total		93	100	100	

4.1.3 Descriptive Statistics of English Reading Strategies

After completing the questionnaire, we utilized SPSS 22.0 statistical software to test the reliability of the reading strategies questionnaire. The results, displayed in table 5, indicated a high level of reliability with a score of 0.934. This suggests that the data collected from the questionnaire is suitable for further analysis and utilization.

Table 5. Reliability Statistics

Cronbach's Alpha	N of Items
.934	24

This questionnaire on reading strategies comprises a total of 24 questions, of which 11 questions are related to cognitive strategies, namely, questions 1, 2, 3, 4, 5, 6, 8, 9, 10, 12, and 13; 9 questions are related to metacognitive strategies, namely, questions 11, 14, 15, 16, 17, 18, 19, 20, and 23; and 4 questions are related to social/affective strategies, which are questions 7, 21, 22, and 24. As shown in the table 6 below, the score of cognitive strategy has a maximum value of 5 points, a minimum value of 1 point, the mean value is 3.1774 points, and the standard deviation is 0.90; the score of metacognitive strategy has a maximum value of 5 points, a minimum value of 1 point, the mean value is 3.3226 points, and the standard deviation is 0.99; and the score of social/affective strategy has a maximum value of 5 points, a minimum value of 2 points, the mean value is 3.0591 points, and the standard deviation is 0.65. Oxford argued that mean score of 4.5-5.0 indicate that subjects use the strategy all the time, 3.5-4.4 points indicate that they often use the strategy, 2.5-3.4 points indicate that they use the strategy occasionally, 1.5-2.4 points indicate that they use the strategy less often, and 1.0-1.4 indicate that they never use the strategy. The mean scores for cognitive, metacognitive, and social/affective strategies are 3.1774, 3.3226, and 3.0591, respectively. Thus, it indicates that the subjects occasionally use cognitive, metacognitive, and social/affective strategies in the reading process. In conclusion, the experimental data indicates that the subjects have some awareness of using reading strategy during the reading process.

Table 6. Description Statistics of Reading Strategies

	N	Minimum	Maximum	Mean	Std. Deviation
cognitive strategies	93	1.00	5.00	3.1774	.90483
metacognitive strategies	93	1.00	5.00	3.3226	.99084
social/affective strategies.	93	2.00	5.00	3.0591	.65046
Valid N (listwise)	93				

4.2 Discussion

4.2.1 Differences between the FI and FD Learners in the Use of the Three Dimensions of Reading Strategies

As shown in Table 7 below, the scores of cognitive strategies of FI and FD learners are 3.58 and 2.49, respectively; the metacognitive strategy's scores of field independents and field dependents are 3.77 and 2.54

respectively; and the social/affective strategy’s scores of FI and FD learners are 2.11 and 2.9 respectively. Therefore, FI learners compared to FD learners used cognitive strategy more. And FI learners used cognitive more and metacognitive strategies while FD learners used social/affective strategy more. The main reason is that FD learners tend to make judgments about things by referring to objective things outside of their own bodies, and they are easily influenced and interfered by the people around them. For example, after completing the English reading comprehension questions, they tend to ask others how they did.

Table 7. Group statistics for field-independent and field-dependent groups on reading strategies

	cognitive strategies	metacognitive strategies	social/affective strategies
FI	3.58	3.77	2.11
FD	2.49	2.54	2.9

In order to conduct a more in-depth examination into the potential variation between the groups categorized as field-independent and field-dependent in the use of the three dimensions of reading strategies, the Independent Samples T-test is used in this study. In the Table 8 below, Levene’s test indicates that the probability of significance (Sig.) for the variables of cognitive strategies, metacognitive strategies, and social/affective strategies are 0.046, 0.290, and 0.172 respectively, which are all greater than 0.05, indicating that the variances of the field-independent and field-dependent groups on the four variables are equal. In the Sig. (two-sided) test, the probability of significance for cognitive strategies, metacognitive strategies and social/affective strategies are 0.00, 0.00, 0.00 respectively, which are less than 0.05, while the probability of significance for the variable of social/affective strategies reaches 0.322, which is obviously greater than 0.05. These findings suggest notable differences in the overall utilization of English reading strategies among college students with diverse cognitive styles. Specifically, there were noteworthy disparities observed in the application of both cognitive strategies ($p=0.00<0.05$) and metacognitive strategies ($p=0.00<0.05$) between the FI and FD groups. Field-independent students use cognitive and metacognitive strategies more frequently than field-dependent students. However, there was no notable variation observed in the utilization of social/affective strategies among college students with varying cognitive styles ($p=0.322>0.05$)

Table 8. Differences between field-independent and field-dependent groups on three dimensions of reading strategy

		Sig.	Sig. (2-tailed)	95% Confidence Interval of the Difference	
				Lower	Upper
cognitive strategies	Equal variances assumed	0.046	0.00	.77506	1.40689
	Equal variances not assumed		0.00	.74218	1.43977
metacognitive strategies	Equal variances assumed	0.290	0.00	.88607	1.56806
	Equal variances not assumed		0.00	.86762	1.58652
social/affective strategies.	Equal variances assumed	0.172	0.322	-.13863	.41779
	Equal variances not assumed		0.347	-.15531	.43447

4.2.2 Correlation between FI/FD Cognitive Style and English Reading Strategies

To investigate the potential relationship between field cognitive styles and reading strategies, this study initially performs correlation analysis on both variables, and then conduct correlation analysis between FI, FD and the three dimensions of reading strategies.

According to table 9, the Sig.(2-tailed) value for the relationship between field cognitive style and English reading strategies is .000, suggesting a noteworthy connection between the pair of factors. The correlation coefficient R is .751, which suggests a strong positive correlation. In other words, college students who score higher on the Cognitive Style Figure Test are more likely to use English reading strategies frequently.

Table 9. Correlation between Cognitive Styles and Overall English Reading Strategies

field cognitive style	
English reading strategy	
Pearson correlation	.751**
Sig.(2-tailed)	.000
N	93

** . Correlation is significant at the 0.00 level(2-tailed).

The following table are demonstrated the correlations between field-independent learners and field-dependent learners with the three dimensions of reading strategies. According to Yao (2007), there are four levels of correlation coefficient (R), when R is greater than 0.8 it is said to be highly correlated; R is moderate correlation when it is 0.5-0.8; R is low correlation when it is between 0.3-0.5; and when R is less than 0.3 it means there is no correlation at all. As shown in Table 10 below, the P-values of correlation coefficient between cognitive and metacognitive strategies for the field-independent learners are $0.000 < 0.01$ and $0.021 < 0.05$, which indicates that there is statistical significance in the relationship between field independence and cognitive strategies. R-values are 0.776 ($0.5 < R < 0.8$) and 0.301 ($0.3 < R < 0.5$) respectively, indicating a moderate connection between FI Cognitive Style and the utilization of Cognitive Strategies, while revealing a low correlation between FI Cognitive Style and the employment of Metacognitive Strategies. From their R-values, it can be obtained that the Cognitive Strategies and Metacognitive Strategies show a positive correlation with the Field Independent Cognitive Style. In other words, college students with higher FI Cognitive Style scores tend to use metacognitive strategies and cognitive strategies more frequently. However, the correlation coefficient for FI Cognitive Style in Social/Affective strategies is 0.712 ($P > 0.05$), indicating no statistical significance. Therefore, there is no significant difference in the utilization of Social-affective Strategies among learners with FI, and they may choose strategies based on their personal preferences.

For the FD Cognitive Style, Cognitive Strategies' P-value is 0.003 ($p < 0.05$), which reaches statistical significance. Its R-value is 0.501 ($0.5 < R < 0.8$), which indicates that the correlation between FD Cognitive Style and Cognitive Strategies is moderate. A positive correlation ($R > 0$) suggests that as the cognitive style scores of students with FD Cognitive Styles increase, so does their frequency of using Cognitive Strategies. However, the correlation coefficient P-values of Metacognitive Strategies and Social/Affective Strategies is 0.291 ($P > 0.05$) and 0.270 ($P > 0.05$) respectively, which obviously don't reach statistical significance. Thus, there is no significant difference in the utilization of Metacognitive Strategies as well as the utilization of Social/Affective Strategies among FD learners. Maybe this is because the choice of these two strategies does not have a specific effect on field-dependent learners, who may prefer to choose them on their own terms.

Table 10. Correlation between field-independent/field-dependent and reading strategies

	cognitive strategies		metacognitive strategies		social/affective strategies.	
	FI	FD	FI	FD	FI	FD
Pearson correlation	.776**	.501**	.301*	.187	.049	.195
Sig.(2-tailed)	.000	.003	.021	.291	.712	.270

4.2.3 Differences between the High WMC and Low WMC Learners in the Use of the Three Dimensions of Reading Strategies

As shown in the table 11 below, the cognitive strategy's scores of High WMC students and Low WMC students are 3.2385 and 3.0357, respectively; The metacognitive strategy's scores of High WMC students and Low WMC students are 3.3615 and 3.2321, respectively; The social/affective strategy's scores of High WMC students and Low WMC students are 3.1846 and 2.7679, respectively. The experimental data illustrates two issues: Firstly, compared to Low WMC students, Students with high working memory capacity (WMC) exhibit a greater inclination towards employing cognitive strategies, metacognitive strategies, as well as social/emotional strategies. Additionally, when considering the three reading strategies examined in this study, both high and low WMC individuals demonstrate a preference for utilizing metacognitive strategies while intermittently resorting to cognitive strategies and less use of social/affective strategies.

Table 11. Group statistics for High WMC and Low WMC on reading strategies

	WMC	N	Mean	Std. Deviation	Std. Error Mean
cognitive strategies	High WMC	65	3.2385	.88877	.11024
	Low WMC	28	3.0357	.94211	.17804
metacognitive strategies	High WMC	65	3.3615	.98626	.12233
	Low WMC	28	3.2321	1.01363	.19156
social/affective strategies	High WMC	65	3.1846	.64692	.08024
	Low WMC	28	2.7679	.56898	.10753

4.2.4 Correlation between Working Memory Capacity and English Reading Strategy

According to the data presented in table 12, it is evident that the correlation coefficient P values for cognitive strategies, metacognitive strategies, and social/affective strategies are 0.010 ($P < 0.05$), 0.524 ($P > 0.05$), and 0.000 ($P < 0.05$) respectively. Therefore, we can conclude that there is a significant correlation between working memory capacity (WMC) and cognitive strategies as well as social/affective strategies; however, no correlation exists between WMC and metacognitive strategies. The R values of cognitive strategies and social/effective strategies are 0.266 ($R > 0$) and 0.357 ($R > 0$), respectively. Therefore, it can be concluded that working memory capacity is positively correlated with cognitive strategies and social/effective strategies. In other words, the higher the score of working memory capacity, the more times people use cognitive strategies, social/effective strategies. However, the use of metacognitive strategies did not show any correlation with WMC, indicating that there was no notable difference in the utilization of metacognitive strategies between individuals with high WMC and those with low WMC.

Table 12. Correlation between WMC and reading strategies

		WMC	cognitive strategies	metacognitive strategies	social/affective strategies
WMC	Pearson Correlation	1	.266*	.067	.357**
	Sig. (2-tailed)		.010	.524	.000
	N	93	93	93	93
cognitive strategies	Pearson Correlation	.266*	1	.475**	.102
	Sig. (2-tailed)	.010		.000	.331
	N	93	93	93	93
metacognitive strategies	Pearson Correlation	.067	.475**	1	.194
	Sig. (2-tailed)	.524	.000		.063
	N	93	93	93	93
social/affective strategies	Pearson Correlation	.357**	.102	.194	1
	Sig. (2-tailed)	.000	.331	.063	
	N	93	93	93	93

4.2.5 Analysis of the Influence of FI/FD Cognitive Style and WMC on the Choices of Reading Strategy

The previous section has analyzed the Correlation between FI/FD cognitive style and English reading strategy, as well as the Correlation between working memory capacity and English reading strategy. This section will analyze which one of FI/FD cognitive style and WMC has a greater impact on the choice of reading strategies.

As shown in the table 13 below, the correlation coefficients p-values of the FI/FD cognitive style with cognitive strategies, metacognitive strategies, and social/affective strategies are 0.000 ($p < 0.05$), 0.000 ($p < 0.05$), and 0.175 ($p > 0.05$), respectively, so there exists a notable relationship between cognitive strategies and metacognitive strategies with FI/FD cognitive style; however, no significant correlation can be observed with social/affective strategies. The R-values of cognitive strategies, metacognitive strategies are 0.782 ($R > 0$), 0.600 ($R > 0$) respectively, so the cognitive style of FI/FD is found to have a strong positive correlation with both cognitive strategies and metacognitive strategies. P-value of WMC with cognitive strategies, metacognitive strategies, and social/affective strategies are 0.010 ($P < 0.05$), 0.524 ($P > 0.05$), 0.000 ($P < 0.05$), so it can be

concluded that the working memory capacity (WMC) exhibits a significant connection with cognitive strategies and social/affective strategies, while no correlation is observed between WMC and metacognitive strategies. The R values for cognitive strategies and social/affective strategies are 0.266 ($R > 0$) and 0.357 ($R > 0$), respectively. Consequently, it can be inferred that there exists a positive correlation between WMC and both cognitive strategies as well as social/affective strategies. Since $0.782 > 0.600 > 0.357 > 0.266$, that is to say, the R-value of the cognitive strategies of FI/FD cognitive style is the largest, so the FI/FD cognitive style has more influence on the choice of learners' English reading strategies.

Table 13. Correlation between FI/FD Cognitive Style or WMC and Reading Strategies

		FI/FD cognitive style	WMC	cognitive strategies	metacognitive strategies	social/affective strategies
FI/FD cognitive style	Pearson Correlation	1	.307**	.782**	.600**	.142
	Sig. (2-tailed)		.003	.000	.000	.175
	N	93	93	93	93	93
WMC	Pearson Correlation	.307**	1	.266*	.067	.357**
	Sig. (2-tailed)	.003		.010	.524	.000
	N	93	93	93	93	93
cognitive strategies	Pearson Correlation	.782**	.266*	1	.475**	.102
	Sig. (2-tailed)	.000	.010		.000	.331
	N	93	93	93	93	93
metacognitive strategies	Pearson Correlation	.600**	.067	.475**	1	.194
	Sig. (2-tailed)	.000	.524	.000		.063
	N	93	93	93	93	93
social/affective strategies	Pearson Correlation	.142	.357**	.102	.194	1
	Sig. (2-tailed)	.175	.000	.331	.063	
	N	93	93	93	93	93

5. Conclusion

5.1 Major Findings

For individuals learning a new language, it is essential to recognize and comprehend their cognitive style in order to optimize their learning results. Being aware of their preferred way of thinking and learning can guide them towards academic success. Reading is considered a complex cognitive activity that tests language proficiency. This research investigates the cognitive preferences of freshmen pursuing a degree in engineering and explores the correlation between FI/FD cognitive styles and working memory capacities relate to reading strategies. The findings are as follows.

First, the study examines how learners' FI/FD cognitive style influences their selection and utilization of English reading strategies. The findings indicate that FI learners exhibit a higher frequency in employing cognitive strategies compared to FD learners. Moreover, FI learners show a higher preference for cognitive and metacognitive strategies, while FD learners lean towards utilizing social/affective strategies. The correlation analysis demonstrates a moderate connection between FI Cognitive Style and Cognitive Strategies, as well as a minimal correlation with Metacognitive Strategies. Moreover, there is a strong positive connection between FI Cognitive Style and both Cognitive Strategies as well as Metacognitive Strategies. On the contrary, FD cognitive style displays a moderate positive correlation with cognitive strategies and no correlation with metacognitive strategies or social/affective strategies.

Second, the study explores the connection between learners' working memory capacity and their English reading strategy usage. The findings indicate that students with High WMC are more likely to utilize cognitive strategies, metacognitive strategies, and social/affective strategies compared to Low WMC students. However, both High WMC and Low WMC students show a preference for metacognitive strategies, occasional use of cognitive strategies, and limited utilization of social/affective strategies. Working memory capacity exhibits a positive correlation with cognitive strategies and social/affective strategies, while there is no significant correlation with metacognitive strategies.

Finally, the research examines which factor, FI/FD cognitive style or working memory capacity, has a greater influence on learners' English reading strategy selection and usage. The results suggest that learners' FI/FD cognitive style has a stronger impact on their choice of English reading strategies. This is because FI learners are more inclined to employ a wider range of cognitive and metacognitive strategies compared to FD learners, indicating that FI Cognitive Style plays a crucial role in determining the strategies used in reading comprehension.

5.2 Implications

This study utilized the CSFT, Reading Span Test and survey research to find that college students currently exhibit more consistent thought patterns. The influence of their thinking habits leads to a distinction between field-independent (FI) and field-dependent (FD) cognitive styles, which in turn affects their choice of reading strategies. Students exhibit varying levels of preference for specific reading strategies based on their individual cognitive styles. Additionally, working memory capacity plays a role in students' selection and application of reading strategies, which significantly impacts their reading proficiency. Both FI/FD cognitive styles and working memory capacity have a significant impact on the selection and utilization of reading strategies. Therefore, educators must consider both factors in the teaching process to ensure students' development.

5.3 Limitations

The purpose of this research is to explore the relationship between the cognitive style and work memory capacity with the reading strategies among college students, specifically freshmen. Nevertheless, the author's restricted proficiency, limited study duration, and incomplete comprehension of the research background may have impacted the findings, there are shortcomings in the study.

On the one hand, the sample size in this study was small, consisting of only 93 valid samples who were all freshmen from Beijing Institute of Petrochemical Technology. This limited scope of participants may have impacted the accuracy of the research results. Additionally, the cognitive style measurement tool, CSFT, while widely used in China, may not fully capture the cognitive styles of students, leading to potential errors in the measurement results.

On the other hand, the author's lack of teaching practice experience may have hindered a more in-depth analysis of the data. The author need to improve their knowledge and experience in order to utilize a variety of research methods to address more relevant teaching practice questions. This will likely result in more comprehensive and insightful research outcomes.

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