

The Effects of Diglossia on Cognitive Ability: Taking Cantonese-Mandarin Speakers as an Example

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ABSTRACT

There are many dialects in China. With the popularization of Mandarin, it is common to see more and more people in China can speak both Mandarin and other dialects. The linguistic relativity hypothesis holds that language affects cognitive processes. Through literature review, this article analyzes the effects of diglossia on lower-order cognition (including immediate memory, identification, and classification) and higher-order cognition (including autobiographical memory, implicit memory, language, reasoning, and decision making) in the case of Cantonese-Mandarin diglossia speakers. The results showed that Cantonese-Mandarin diglossia speakers have an advantage over Mandarin monolingual speakers in the above-mentioned cognitive abilities, except language cognition. However, there is still a gap in the effects of diglossia on other cognitive processes as well as on the scientific mechanism behind and future research may continue to explore to fill the gap.

Keywords: *Diglossia, Cognition, Mandarin, Cantonese.*

1. INTRODUCTION

China is a multinational and multilingual country with ten major Chinese dialects including Jin language, Wu language, Cantonese, etc [1]. Dialects are different from each other in terms of pronunciation, intonation, semantic, and grammar. Among the ten major Chinese dialects, Cantonese has a unique position. This is because Cantonese is widely spoken not only in the southeastern and southwestern coastal provinces of China as well as in Hong Kong and Macao but also in the Chinese communities of Southeast Asia, Australia, North America, and the United Kingdom [2]. Given that, to facilitate communication among people speaking different dialects, Mandarin was officially promoted in China in 1956. After more than 60 years, at present, it is common to see more and more people in China can speak both Mandarin and dialects.

There is no general agreement yet on the relationship between Mandarin and dialects in linguistics. One view holds that they are bilingual, while the other holds that they are diglossia. Cheshire considers diglossia as two variants of the same language, or the coexistence of both dialects within the same language group [3]. In addition,

some researchers hold that bilingualism refers to two languages that have large differences in both spoken and written language; bilingualism refers to two languages that maintain essentially the same written language despite some differences in spoken language [4]. It can be seen that, compared to bilingualism, diglossia emphasizes the commonality between two languages. Within the Chinese community, although dialects and Mandarin are different in pronunciations, both use Chinese characters as written language, and their grammar is almost the same. Therefore, people who speak both Cantonese and Mandarin are considered as diglossia speakers in this article.

Language can shape people's thinking and cognitive abilities. The linguistic relativity hypothesis suggests that different phonological intonation, different lexical semantics, and different grammatical structures among languages affect the cognitive processes of speakers [5]. This hypothesis is often used to explain the effect of bilingualism on cognitive abilities. So does the mastery of both Mandarin and dialects, as opposed to bilingualism, also affects the cognition of diglossia? American researchers divided the cognitive processes into lower-order cognition and higher-order cognition [6].

This article summarizes previous empirical literature to analyze the effects of diglossia on the lower-order and higher-order cognition in the case of Cantonese-Mandarin speakers and concludes with two practical implications accordingly. Finally, based on the existing research, two suggestions are made for future research.

2. EFFECTS OF DIGLOSSIA ON LOWER-ORDER COGNITION

Lower-order cognition is a relatively early cognitive process, including perception, attention, immediate memory, identification, and classification. Previous empirical research showed that Cantonese-Mandarin diglossia speakers have an advantage in immediate memory, identification, and classification over mandarin monolingual speakers.

2.1. Effect of diglossia on immediate memory

Immediate memory is a lower-order cognitive process, which fully participates in other cognitive activities such as sensation, perception, and thinking. In recent years, the research on the effects of Cantonese-Mandarin diglossia on the memory of speakers has been enlightened in many aspects. One is the language-dependent effects—a theory that memories become more accessible when the languages of retrieval and encoding matched than when they mismatched which provides a new way for relevant scholars to explore the characteristics of the bilingual language model. Furthermore, this idea has been used for reference by diglossia researchers to carry out relevant empirical studies. Zhang and Zhang set up a set of experiments in Cantonese-Mandarin speakers memory test [7], the experimenters by changing the auditory words made research regarding the effects of the language expression and voice on recognition and recall. Then this article explores whether the memory language-dependent effect is more significant in Cantonese presentation words. The results have shown that Cantonese-Mandarin bilinguals recall Cantonese words faster and more efficiently, but recall Mandarin slower. This proves that phonological or linguistic expression is a momentous factor affecting the memory language-dependent effect in immediate memory. On the other hand, auditory encoding and visual encoding are components of immediate memory, and auditory encoding plays a major role. As different phonetic stimuli, Mandarin and Cantonese presented different auditory encoding in memory. It can be assumed that Cantonese and Mandarin will have different effects on memory if they are presented in different ways (visual encoding and auditory encoding) in immediate memory. Could this hypothesis be one of the directions of future research?

The processing level theory proposed by Craik and Lockhart is that stimuli acting on human beings need to

undergo a series of analyses at different levels, and it can be seen from the cognitive process that processing level is one of the factors affecting memory [8]. Zhang and Zhang explored whether the Cantonese-Mandarin memory language-dependent effect was influenced by the processing level theory [9]. The subjects learned Korean words in the environment of Mandarin and Cantonese by intentional or unintentional learning (immediate memory process). The variables of the two groups of experiments were Mandarin and Cantonese as well as processing level (intentional learning and unintentional learning). The results showed that the memory language-dependent effect exists in both intentional and unintentional learning, and intentional learning. Participants perform better in the Cantonese test environment with a shorter time and lower error rate, which proves the processing level is associated with memory language-dependent effects. Concretely speaking, the language-dependent effects on immediate memory were more obvious when participants were learning a language in different language environments by improving their processing level. It is the feasible direction and goal of diglossia research to perfect the above findings to form a relatively complete theoretical system and apply it to education and teaching research.

2.2. Effect of diglossia on identification and classification

Identification and classification is a lower-order cognition, which is vital but easily ignored. The study found that Cantonese-Mandarin diglossia children were better at identification and classification than Mandarin monolingual children.

Chen and Ouyang investigated the identification and classification ability of 32 Mandarin monolingual children and 32 Cantonese-Mandarin diglossia children. The multidimensional change card classification task was used to assess the accuracy of color and pattern recognition [10]. The experimental results show that the identification and classification accuracy of Cantonese-Mandarin diglossia children is higher. Moreover, the cognitive flexibility of the diglossia children was greater when it came to rule changes, such as classifying the same card by color first and pattern later.

Research has shown that the experience of switching or suppressing between two dialects improves the performance of diglossia children in the card sorting task. For Cantonese-Mandarin children, Cantonese is their mother tongue and Mandarin is their second language. Both of them are acquired early (before the age of 3) and are used with similar frequency, so the two languages need to be switched or suppressed frequently according to the language environment and the target audience. Through long-term practice, the diglossia children's brains store the experience of language switching which also influences the cognition of identification and

classification. Therefore, when subjects complete the multidimensional change card classification task, they can correctly classify the cards according to an established rule, and when the rule changes, they can quickly adapt to the change and respond to it.

3. EFFECTS OF DIGLOSSIA ON HIGHER-ORDER COGNITION

Higher-order cognition is a relatively late cognitive process, including long-term memory, autobiographical memory, implicit memory, language, reasoning, and decision-making, problem-solving, etc. Previous empirical studies found that Cantonese-Mandarin diglossia speakers have an advantage in autobiographical memory, reasoning, and decision cognition over Mandarin monolingual speakers except in language cognition.

3.1. Effect of diglossia on autobiographical memories and implicit memory

Autobiographical memory and implicit memory are advanced cognitive processes. Research on Cantonese-Mandarin speakers' memory has found a feasible way from the empirical studies of bilinguals and started with the language-dependent effects. The first study is concerned with Bugelski for Spanish-English bilinguals (native language is Spanish) memory test [11], Research has shown that the memory of subjects exist obvious time characteristic, when using Spanish as a clue, more subjects to recall events occur in Spanish language environment which belongs to early memory. Schraulf also conducted a memory experiment on elderly bilinguals who came from Spain and settled in the UK and found that there was a significant correlation between memory recall and the encoding language of memory at that time [12].

Based on the experience of bilingual research, Ji-Jia and Qian-Qiu explored whether Cantonese-Mandarin speakers exist the memory language-dependent effects by triggering the autobiographical memory mechanism of the subjects, during which the subjects performed autobiographical recall in different language environments. The results showed that individuals reflected their dependence on the linguistic environment during recall, and when the recalled episodic language matched with the expressive language at the time of the event, subjects obtained more similar memories, thus proving that the language-dependent effects existed in the autobiographical memory of Cantonese-Mandarin speakers [7].

Research on memory characterization of Cantonese-Mandarin speakers has also made some achievements, which are based on the hypothesis of word association model, concept mediation model, and revised hierarchical model [13]. Ma, Wei, and Zhang refer to the

bilingual researchers' cross-language long-term repeated priming experiment to explore whether the Cantonese-Mandarin speakers' memory representation model is consistent with that of bilinguals [14]. The results show that the concept mediation model applies to Cantonese-Mandarin speakers. Hence, the applicability of the revised hierarchical model needs further study. The similarity and difference of the memory representation models between bilinguals and diglossia speakers is a problem that researchers need to solve in the future.

3.2. Effect of diglossia on language

Language cognition covers a broad range, including phonology, vocabulary, grammar, reading, parsing, etc [15]. The existing studies on Cantonese-Mandarin diglossia mainly focused on phonology and it was found that Cantonese-Mandarin diglossia had worse verbal fluency performance and was less competent in Mandarin phonological processing compared to Mandarin monolinguals.

Verbal fluency refers to the degree of fluency with which individuals convey information in spoken language [16]. Phonemic fluency and semantic fluency are the two main indicators of verbal fluency. To investigate the phonemic fluency and semantic fluency of Mandarin monolinguals and Cantonese-Mandarin diglossia, some researchers conducted an experiment where both Mandarin monolingual speakers and Cantonese-Mandarin diglossia speakers were asked to say words beginning with a certain letter (e.g., D) or to say words/expressions of a certain category (e.g., animal) within a time limit [17]. The results showed that the phonemic fluency and semantic fluency of Cantonese-Mandarin diglossia were worse than that of Mandarin monolinguals. One of the reasons that led to the results may be the pronunciation confusion in Cantonese.

In addition to the verbal fluency test, some researchers conducted 2 sets of experiments to examine the Mandarin phonological processing ability of Cantonese-Mandarin diglossia college students and Mandarin monolingual college students, respectively [18]. Experiment 1 tested Mandarin consonant, rhyme, and tone awareness, and Experiment 2 tested naming speed for numbers, letters, colors, and shapes. The results of Experiment 1 showed that diglossia college students scored lower in rhyme than monolingual college students, and the differences in the vowel and tone awareness scores were smaller. The results of Experiment 2 showed that diglossia college students were significantly faster than monolingual college students in naming numbers, letters, and colors, and the difference in naming shapes was smaller. This indicated that the Mandarin phonological processing ability of diglossia college students was significantly lower than that of monolingual college students, mainly in Mandarin rhyme awareness and fast naming speed.

It is observed that both of the above two tests of language ability focused on Mandarin phonology, and the test objectives were rather one-sided. Therefore, it was not sufficient to conclude that Cantonese-Mandarin diglossia was inferior in language cognition. Future research should focus more on other language cognition of Cantonese-Mandarin diglossia such as vocabulary, grammar, reading, and parsing.

3.3. Effect of diglossia on reasoning and decision-making

Reasoning and decision-making is a more advanced cognitive process that involves complex interactions among several cognitive processes such as attention, memory, language, etc [6]. A study found that Cantonese-Mandarin speakers may have stronger implicit reasoning abilities.

The ability of individuals to explain and infer other people's behavior by attributing to their independent motivations, beliefs, expectations, emotions, and other mental states, is known as having a 'theory of mind'[19]. And explicit and implicit behaviors are usually observed respectively in the reasoning process to see the explicit and implicit reasoning abilities. Two sets of experiments were conducted to examine the reasoning performance of Mandarin monolinguals, Mandarin-English bilinguals, and Cantonese-Mandarin diglossia in the false-belief task by observing their verbal responses (explicit behavior) as well as first gaze point and gaze duration (implicit behavior) [20]. The results of Experiment 1 which was complex and required more cognitive resources showed that the three groups did not differ significantly in the explicit responses. In contrast, on the accuracy of the point of the first gaze, the diglossia performed best, and the monolinguals worst. The results of Experiment 2 which was relatively simple and required fewer cognitive resources showed that the three groups still did not differ significantly in the explicit responses, but the diglossia had the longest average gaze duration at the correct location, followed by the bilinguals and the monolinguals. This indicated that there was no significant difference among the three groups in their explicit reasoning behavior in the false-belief task, but diglossia and bilinguals shared stronger implicit reasoning abilities.

To further explore the reason why Cantonese-Mandarin diglossia had a slightly better performance than Mandarin-English bilinguals in implicit reasoning behaviors, the acquisition age as well as the usage frequency of the second language may be the answer. Cantonese-Mandarin diglossia are native speakers of Cantonese. They start learning Mandarin at about the preschool level and use both languages equally frequently in daily life. Mandarin-English bilinguals, whose mother tongue is Mandarin, begin learning English around the middle stage of elementary school, and they use English much less frequently than Mandarin

in their daily lives. Therefore, compared to Mandarin-English bilinguals, Cantonese-Mandarin diglossia acquires the second language at an earlier age and has higher proficiency in the second language. Over time, this experience promotes cognitive flexibility and inhibitory control of Cantonese-Mandarin diglossia, resulting in superior reasoning performance on false-belief tests.

4. DISCUSSION

4.1. Research significance for teaching and dialect protecting

The research on the psychological cognitive process of Cantonese-Mandarin speakers is undoubtedly of practical significance to the research on teaching method, teaching practice, and dialect research and protection. Firstly, it analyzes the cognitive system of Cantonese-Mandarin students and grasps its characteristics, which can help educators to cultivate students' abilities and advantages by teaching students by their aptitude. At the same time, more attention is paid to the cultivation of Mandarin ability. Secondly, based on the requirement of the unification of Chinese dialect protection and cultural inheritance, the research of Cantonese-Mandarin speakers' cognition is an effective way to explore the value of Cantonese. On the one hand, it guides Cantonese-Mandarin speakers to have a correct understanding of their dialects. On the other hand, it takes Cantonese as a research example to provide common exploration paths for cognitive research of other dialect speakers, to promote the attention and protection of more dialects.

4.2 Possible future directions of developments

Foreign research on diglossia psychology began in the 1980s and 1990s while such domestic research sprang up in the 21st century. At present, most of the research on diglossia refers to the experimental model of bilingualism and explores the effects of diglossia on cognitive ability, which provides diverse perspectives for future studies. However, there are still two issues that need to be further explored. First, the effects of diglossia cognition focuses more on higher-order cognition, especially language and memory, while there are few types of research on lower-order cognition, such as perception and attention. Second, there is a lack of research on the scientific mechanism behind, especially on cognitive neuroscience.

5. CONCLUSION

In addition to language, Cantonese-Mandarin diglossia speakers have stronger cognitive abilities in both lower-order cognition (including immediate memory, identification, and classification) and higher-

order cognition (including autobiographical memory, reasoning, and decision-making) than Mandarin monolingual speakers. In terms of language cognition, Cantonese-Mandarin speakers have a significant disadvantage. Because the test target of empirical research on language cognition focuses on Mandarin pronunciation. Other aspects of language cognition (such as vocabulary, grammar, and reading), and other languages (Cantonese or other third languages) have not been studied. Therefore, it did not conclude that Cantonese-Mandarin diglossia was inferior in language cognition.

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