

Explore the Difference Between Bilingual and Monolingual Children

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ABSTRACT

The aim of this study is to explore whether bilingual children have better working memory skills and cognitive ability than monolingual children. By summarizing previous studies, Chinese-monolingual and Chinese-English bilingual children aged 48-54 months from two kindergartens, whose parents are of lower socioeconomic status and do not speak English, would be selected. The results of previous studies indicate that bilingual children are better at processing information and suppressing cognitive interference than monolingual children, which supports our hypothesis. However, differences in schooling levels and errors in the assessment of children's family economic status in the study still need to be controlled for more carefully. In addition, further implications of this study and the advantages and disadvantages of bilingual education are also discussed.

Keywords: *bilingualism, cognitive ability, working memory*

1. INTRODUCTION

According to the previous research on children's language education, it is not difficult to find that children's language ability is closely related to memory. Based on this, I hope to further explore whether bilingual children and monolingual children have different working memory abilities and the gap in their cognitive abilities.

The comparative study of bilingual children and monolingual children began as early as 2013. The study compared the gap between the two children in working memory and their performance in tasks requiring different working memory levels and many papers on the same subject have been extended downward. These findings are both mutually confirmed and contradictory. The reason for this may be related to the research materials used by different researchers, so, to avoid this situation, we control the SES background to make the experiment more precise. Also, the common of these studies show that bilingual children have better memory ability. To prove this argument, we choose the Chinese-monolingual and Chinese-English bilingual children aged 48-54 months from two kindergartens, whose parents are of lower socioeconomic status and do not speak English to experiment.

We discovered certain research gaps in the papers we chose for reference, which will fix in the trials to ensure the correctness of the study outcomes. For example, one of the articles mentioned that bilingual children may learn two languages in different environments, resulting in unequal profitability of bilingual children in the two languages and a large gap in the proportion of exposure to the two languages [1].

For example, in the Netherlands, children usually speak Turkish, a minority language, at home. At school and outside, they often come into contact with Dutch, which is used by everyone. This makes the learning environment of Turkish and Dutch often scattered, so most children learning these two languages are sequential bilinguals, rather than bilingual simultaneously or in between [1]. The difference between sequential bilinguals and parallel bilinguals is that parallel bilinguals are those who learn two languages concurrently in the same environment and the other learn in a different environment [2].

2. LITERATURE REVIEW

This study focuses on the differences between bilingual and monolingual children and their relationship with each other and the outside world. In addition, it will also make a series of analyses and discussions on the controversial proposition of "bilingual advantage".

Bilingualism has been associated with the enhancement of multiple executive functions, including cognitive flexibility, efficiency, task switching, and conflict resolution. This is believed to be the result of lifelong experience managing multiple languages that compete for selection. Resolution of this competition requires higher-order executive control processes that may extend to enhance generalized executive function.

2.1. The Definition of Variable

To ensure the accuracy of the experiment, this study will control the variables. The independent variables will be defined as monolingual and bilingual children. Some researchers define bilingualism as that both languages can be as proficient as their mother tongue; Some believe that bilingualism is the practice of using two languages alternately. And, others think that bilingualism refers to the activity of completing meaningful discourse in two languages. Researchers have different views on the definition of bilingualism. In general terms, the focus of their debate is the proficiency of language use. This study refers to many views and defines bilingualism as an individual who often receives two language inputs in the most active communication development period from birth to adolescence.

The dependent variables were working memory, cognitive ability, and non-cognitive ability. Cognitive ability includes but is not limited to reading ability, cognitive processing ability, and time cognitive management ability, which will be the concentrated of this article.

2.1.1. Working Memory

Working memory (WM) refers to the temporary storage of information and its joint operation with other more complex tasks. In other words, human memory will launch its ability to save information when encountering other messy information. On the other hand, working memory also is a psychological process that allows limited information to be temporarily accessible in the process of cognitive processing [3]. At once, it is also the core of various cognitive abilities, especially those involving the ability to deal with interference, conflict, or distraction. To some extent, it can also predict children's basic cognition and academic achievement. This has led to early literacy and arithmetic skills and subsequent language and mathematics scores that depend largely on WM.

The WM of bilinguals has been proved by many scientists that be greater than that of monolinguals. For instance, the gap between bilingual children and monolingual children in working memory from two studies conducted by Morales, Calvo, and Bialystok in 2013: the performance of monolingual children and bilingual children in tasks requiring different levels of

working memory was compared. It was found that bilingual children had greater advantages in more difficult conditions and inconsistent experiments. In the two studies, Peabody Picture Vocabulary Test (PPVT-III), Kaufman Brief Intelligence Test (K-BIT), and frogs matrices task were conducted respectively [4].

Moreover, a meta-analysis of the estimated overall effect size in 2017 found that bilinguals were generally better than monolinguals in working memory of tasks [5]. These findings are both mutually confirmed and contradictory.

2.1.2. Cognitive ability

Some research of bilingual and cognitive focus on the association between bilingual experience and language cognitive ability. Research shows that bilingual experience can promote children's metalanguage cognition.

2.1.2.1. Reading Ability

Many studies have shown that bilingual experience can promote the development of children's metalanguage cognition and reading skills. They are found to be better than monolingual children in the flexibility of lexical-semantic connection. Such as they show more exemplar association than monolingual children (that is, the associative words belong to the same category as the target words, such as dog and cat), indicating their advantages in the semantic association [6].

Some studies on adults are also applicable to bilingual children. It is found that bilingual people's metalanguage cognitive ability is significantly better than monolingual people. For example, Ransdell, Barbier, and NIIT asked college students to self-evaluate their reading ability, and then tested their actual reading comprehension ability [7]. The results showed that bilingual subjects' self-evaluation was more accurate than monolingual subjects (that is, their self-evaluation was more consistent with their actual ability).

Furthermore, Laurent and Martinot found that school-age children learning in a bilingual environment began to show the advantage of phonological awareness at the age of 9 (fourth grade of primary school), indicating that more than three years of bilingual experience can have a significant positive impact on children's language cognitive ability [8].

2.1.2.2. Cognitive Processing Ability

Language processing is the part of the cognitive ability which is a process of encoding, converting, storing, and extracting the input language information. Language processing can be divided into automatic processing and controlled processing, serial processing and parallel processing, modular processing, and interactive

processing. Many studies show that bilinguals have stronger language processing functions than monolinguals.

For monolinguals, the choice of target words only needs to be made between semantically related words in the same language. For bilinguals, the burden of the target word selection mechanism will be greatly increased. They need to select the target word from the semantically related words of the two languages [9]. Language processing also includes grammatical judgment, vocabulary acquisition age, and vocabulary semantics. Bilinguals and monolinguals show different behaviors and abilities in these aspects [10].

2.1.2.3. Time Management Ability

Different kinds of languages often have great differences in the expression of time, and there are obvious differences in the expression of time between Chinese and English.

Relevant experts and scholars have carried out a detailed discussion on this problem and set up two groups of comparative experiments to mainly investigate their respective periodic time reasoning abilities. Finally, through the research results obtained from the experiment, it can be summarized that for people who use one language, their reasoning about time is mainly processed according to numbers, while people who use two languages will add spatial imagination to determine the period based on numbers [10].

2.1.3. Non-cognitive ability

Similarly, bilingual learning also promotes nonverbal cognitive ability. Some studies have used the dimensional change card sorting task (DCCS) to study children's cognitive complexity. Through it, we found that bilingual children aged 4-5 years old have significantly higher DCCS test scores than monolingual children in the aspects of mother-tongue level and working memory level [11].

In this task, the researcher first presented the target cards with different colors and shapes (such as a red car and a blue flower) to the children, then presented a series of test cards (such as several blue cars and several red flowers) to the children, and asked the children to classify in one-dimension (colour); After several (such as 8) experiments, they were asked to classify them in another dimension (shape) for an equal number of times. The key dependent variable is whether children can classify correctly after the change of dimension, to test children's ability to use conjunction rules, that is, whether they can make flexible conversions between two sets of incompatible rules.

2.2. Advantages and Disadvantages of Bilingualism

Among many bilingual studies, an important direction in recent years is to explore the impact of Bilingual Experience on the cognitive process. From previous studies, the impact of bilingual (including multilingual) learning experience on cognition has two sides. On the one hand, the process of bilingual mastery may hurt some cognitive processes; on the other hand, bilingual experience has a positive impact on some important cognitive functions.

2.2.1. Bilingual Advantages

The study talked about the many disadvantages of bilingualism. However, bilingual experience also has a positive impact on cognition. The research on the executive function advantage of bilinguals mainly focuses on inhibition function, attention conversion, and the renewal and maintenance of working memory.

2.2.1.1. Promotion of Central Executive Function

Central executive function refers to the central part of the phonological loop and visual-spatial Sketchpad in working memory, which can synchronously store and process external input information. Its main functions include coordinating the operation of different tasks at the same time, changing operation strategies, suppressing information irrelevant to the current operation, maintaining information in long-term memory, and operating and processing information [12].

Specifically, in the test of "executive function" (a series of processes controlling thinking and behavior namely executive function), bilingual children perform better than children who only speak one language. It makes some complex cognitive tasks possible, such as problem-solving. Inhibition, inter-task conversion, and updating of working memory constitute the executive function.

On the other hand, the situation mentioned that one language system hinders the other, it forces the brain to solve internal conflicts and get exercise to enhance cognitive ability. Similar evidence from many such studies shows that the process of using bilingualism can enhance the so-called executive function of the brain - a command system that guides our attention process when we plan, solve problems and perform various other tasks that require more intelligence. These processes include ignoring distractions, focusing, shifting attention between two things at will, and remembering information.

2.2.1.2. Inhibition Ability

Inhibition ability in this study mainly means the ability to suppress irrelevant information and deal with

conflicts. A series of studies show that on the basis of controlling language ability and short-term memory ability, bilingual children have significantly less reaction time than monolingual children, and show the ability to process conflict information faster and suppress interference information unrelated to the current task. In the study using reading materials as experimental materials, it is also found that bilinguals are more likely to detect and control language conflict information than monolinguals [13]. Until recently, researchers believed that the advantage of bilinguals mainly came from an inhibitory ability, which was enhanced in the process of suppressing a language system. It is said that such inhibition can help train the brain of bilingual people to ignore interference in other situations [14]. Nevertheless, this explanation is becoming more and more inadequate, because studies have shown that bilinguals perform better than those who use only one language even when they complete tasks that do not require inhibition.

2.2.1.3. Ability to Monitor the Environment

Another key difference between bilinguals and monolinguals may be more important: the former has a more prominent ability to monitor the environment. "Bilinguals need to switch languages frequently - you may use one language when talking to your father and another language when talking to your mother. This requires you to pay attention to the changes around you," said Yvette Costa, a researcher in Pompeii Fabra, Spain. Costa and colleagues conducted a study, Compare the performance of people who can speak German and Italian with those who can only speak Italian in the monitoring task. They found that bilingual subjects not only performed better but also had less activity in the part of the brain they monitored, indicating that they were better at this.

2.2.2. Bilingual Disadvantages

Considering the socio-economic status, cultural background, and individual factors, some studies still show that bilingual experience may lead to children's language development relatively slow. Studies have shown that although children can generally achieve oral proficiency in the less proficient languages in bilingual within two years, they are slower than monolingual children in reaching higher levels of language ability, such as academic language proficiency [6].

Bilingual children's lagging development in academic language may put them at a disadvantage in the standard language achievement test provided by the school [6]. In addition, bilinguals may not perform as well as monolinguals in terms of vocabulary. For example, research on children shows that bilingual children have a better understanding and understanding of a single language. The vocabulary on the expression test was

significantly smaller than that of the corresponding monolinguals [15].

Some researchers have also shown that if children contact the second language too early, it may lead to forced language learning and difficulty to achieve good results. Even if it works, there will be some obstacles in use.

Furthermore, for a long time, researchers, educators, and decision-makers believe that the second language is a kind of interference, which will affect children's academic and intellectual development from a cognitive perspective. Their view of interference has sufficient evidence that even if a bilingual person uses only one language, both language systems in his brain are active, resulting in the situation that one language system hinders the other.

3. LIMITATIONS AND FUTURE IMPLICATIONS

The research on the memory of bilingual and monolingual children developed as early as the end of the 20th century. So far, researchers have investigated the linguistic representation of bilinguals from many cognitive fields, investigated the impact of bilinguals on cognition, and analyzed the impact of bilingualism on children's psychology from the perspective of social psychology. While enriching the theory, they also provide a new perspective for investigating the relationship between language and cognition. These studies have guiding significance for future education: whether children should learn multiple languages from an early age and promote teaching. However, this study has several limitations that require future studies.

Firstly, the current study should deeply explore the impact of bilingual proficiency on cognitive ability. Language proficiency is "the ability to operate in an environment determined by specific cognitive and language requirements according to objective standards or social norms" [15]. Bilinguals often do not have the same proficiency in both languages. Bilinguals can also be divided into several types: 1. Late learners of the second language, who start learning the second language after the language critical period, and the first language is their daily language, so their proficiency in the second language is limited; 2 bilinguals who use bilingualism quite frequently master two languages since childhood. A few studies have shown that bilingual proficiency is related to the cognitive advantage that bilinguals may obtain.

Secondly, the field of psychological research on bilinguals and monolinguals needs to be expanded. Looking at the existing studies, we can find that researchers pay more attention to the comparison between "English" and researchers' mother tongue, and pay less attention to some speakers who use two minority

languages. These bilinguals have great differences in vocabulary, pronunciation, and even grammar, and may have more different discoveries.

In addition, we should further explore the impact of different bilinguals on cognitive ability, because different language types have different language characteristics. Because of its language structure and conceptual characteristics, a language can determine the way of thinking of its users [16]. For instance, in the study of different model language experiences, researchers found that oral sign bilinguals do not have the advantage of central executive function compared with monolinguals [17]. Therefore, they believe that the bilingual experience affecting the central executive ability is limited to bilinguals in the same mode (that is, the two languages they master are the same category in the activity mode, rather than different categories of languages, such as sign language and general language). These problems are worthy of further study.

4. CONCLUSION

In conclusion, the study can think that bilingual experience is closely related to cognitive ability, and the positive impact is greater than the negative impact. To be more specific, the ability to control two or more languages may have advantages in time cognition, executive function and language processing ability. Bialystok believes that bilingualism has a considerable impact on people, especially on the elderly and children. Many other scientists and studies have also shown the relationship between the advantages of bilingualism and some abilities.

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