

The Effect of Bilingualism on Children's Creative Thinking of Cognitive Functioning: Evidence from Chinese Native Speaker

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Abstract: This essay investigates the impact of bilingualism, specifically learning English as a second language, on the creative thinking of Chinese-speaking children. Bilingualism's influence on cognitive functioning, particularly creative thinking, has been widely debated, with studies showing varying results. The study includes Chinese monolinguals and Chinese-English bilinguals from different age groups, with the aim of exploring potential differences in creative thinking between the two groups. To assess creative thinking, a battery of standardized creativity tests adapted to the Chinese language and culture is used, including linguistic, figural, and ideational tasks. The results are analyzed using a mixed-method approach, considering the effects of bilingualism, age-related changes, and task-specific differences. Expected outcomes may include identifying a bilingual advantage in certain aspects of creative thinking, age-related variations in creative thinking skills, and task-specific disparities. This research provides insights into the complex relationship between bilingualism, cognitive functioning, and creative thinking, particularly within the context of Chinese-speaking children. The findings have implications for educational practices, curriculum development, and language learning strategies, highlighting the importance of considering language and culture when studying the impact of bilingualism on cognitive functioning and creative thinking. This study emphasizes the significance of investigating the effects of specific language pairs on cognition and creative thinking, shedding light on the potential advantages and challenges associated with bilingualism.

Keywords: Bilingualism, Creative thinking, Cognitive functioning, Chinese native speaker, Multilingualism

1. Introduction

In today's society, more and more people are learning more than one language, and language can influence thinking [1,2]. Whether language learning affects cognition" has also become a hot topic of

discussion nowadays [3-5]. The majority of the more thorough research confirms the enabling impact of multilingual experience on cognitive regulation [6], despite questions being raised about this conclusion [7]. The "bilingual cognitive advantage effect" suggests that bilinguals have some cognitive advantages over monolinguals when engaging in non-verbal cognitive processing tasks [8,9]. Cognition is the most fundamental human mental function. It is the process of learning or using knowledge, or the process of information processing [10]. Thinking, as one of cognition, is the activity of using your brain to consider a problem or possibility or create an idea. Creative thinking is a pioneering thinking activity, one that opens up new areas of human understanding and creates new achievements in human understanding. Therefore, creative thinking is at an important stage of development in childhood. It has been discovered that bilingualism has a beneficial effect on creative thinking [11-13].

However, different languages will have different influences on our cognition [14-16], so, different native languages may have different effects on the cognition and even creative thinking of different bilinguals. Many previous studies always focus on (English [11,17], and Spanish [18,19] ...) as the native language or second language, but there are fewer studies on the language being Chinese.

The present study will investigate if learning English as a second language has an impact on the creative thinking of Chinese-speaking children. WAT, TTCT, IAC, and Ideational tasks will be used to test children's creative thinking.

2. Literature review

A great deal of study has been conducted on the impact of bilingualism on cognition [14,15] and creative thinking [20].

Several studies have found that bilingualism can have an impact on memory. Bialystok [3] found that bilinguals fared worse on memory tests that relied solely on verbal recall than they did on tests that focused more on executive control. Bilingual participants outperformed monolinguals in spatial working memory but had lower levels of performance in verbal working memory than monolinguals [21]. Children who are bilingual integrate and/or organize information in both languages, which benefits their situational and semantic memory and improves their cognitive abilities overall (including memory) [22].

Creative thinking is one of the cognition abilities, and the capacity to begin several cycles of divergent and convergent thought is regarded as creative thinking [23].

Some studies have found that bilingualism promotes creative thinking. In a test of creativity, Persian-English bilinguals and Persian monolinguals were compared. Bilingualism increases the ability to extract creative and original ideas but does not increase the capacity to generate and process a large number of unconnected ideas [13]. Korean-English students were used as experimental subjects, and the results showed a positive correlation between an individual's level of bilingualism and creativity [11]. The findings of tests conducted on university students who were bilingual in Russian and English and monolingual in English show that bilingualism has an advantage in non-verbal creativity while monolingualism has an advantage in verbal creativity [24].

While, other studies have shown that bilingualism and creative thinking are not related, and there may be false positives in the conclusions about this. For example, researchers [17] found that before and after correcting for potential confounding factors, no differences between monolingual and bilingual kids were discovered in any of the divergent thinking tasks or measurements, and effect sizes were insignificant to modest. Therefore, whether bilingualism plays an important role in creative thinking will be further discussed in the present study.

Although, we still cannot ensure the relationship between bilingualism and creative thinking, language and thinking are related. Richard Templar's [25] book "Thinking in Multiple Dimensions" offers a diversified approach to the dimensions of thinking by classifying the laws of thinking into

nine widely used methods of thinking. In this book, the thinking rationality of the German language fits the thinking dimensions of the brain, according to several tests with language acquisition substituting different thinking domains, demonstrating that thinking dictates the height of the language to some extent.

Differences between Chinese and Western thinking, language is used to express thinking, and differences exist in language learning. Does language learning affect thinking differences? There are similarities and contrasts in the temporal thinking methods of Chinese and English native speakers. In a recent study, the researcher found that bilingualism does not affect temporal thinking patterns [26]. Native Chinese learners of English rely on both horizontal and vertical temporal axes to represent time, whereas native English learners of Chinese have only one horizontal mental temporal axis. English almost exclusively uses horizontal spatial and temporal metaphors to express time, whereas Chinese uses both horizontal and vertical spatial terms to describe time. Without acquiring English as a second language, native speakers of Chinese have a horizontal spatio-temporal mapping in their thinking, so native speakers of Chinese do not need to adapt their temporal thinking to the target language mode. For native speakers of English, they need to learn an additional vertical temporal metaphorical expression when they acquire Chinese as a second language. The need to change from a relatively simple temporal thinking mode to a relatively complex temporal thinking mode reduces the likelihood that native speakers of English will change their temporal thinking mode. Albert, Albert, & Radsma's study [27] failed to provide enough evidence to support the existence of a relationship between bilingualism and critical thinking skills, but there was enough evidence to support a curvilinear relationship between bilingualism and critical thinking dispositions.

The studies mentioned above about Persian-English, Korean-English, and Russian-English bilinguals affect creative thinking [11,13,24], but some studies have not found significant differences between bilinguals and monolinguals [17,28]. Therefore, this paper will conduct research and discussion on the relationship between bilingualism and cognition as well as creative thinking in the Chinese language based on the general environment of China. Based on previous research [11,13,17], the method they used is worth taking. The Word Association Test (WAT) [29], The Torrance Tests of Creative Thinking (TTCT) [30], the Invented Alien Creatures task (IAC, cf. Ward) [31] and the Ideational task: Object uses test [32] will be used. In these experiments, the first thing used was the average age, not the age of the segments. The use of average age is not rigorous enough as creative thinking changes during different developmental periods and will be improved in this experiment. Besides, they did not use Chinese as a native or second language in their experiments for the study. Language influences thinking, and Chinese-English bilinguals may differ from prior studies on native language. Because China and the West have distinct ways of thinking, and China is in an environment of test-based education, where creative thinking is intrinsically hindered, the impact of Chinese native English bilinguals on thinking may be different for children. Creative thinking plays an important role in problem-solving, but creative thinking is what students lack in the context of exam-oriented education in China. English is a compulsory course starting from primary school in China, and creative thinking is at an important stage of development. The study of Chinese-English bilingualism is of great significance to creative thinking and is the basis for future improvements in the way English is taught.

3. Method

3.1. Participants

The participants in this study consisted of Chinese-speaking children from various age groups, including 5-year-olds, 8-year-olds, 12-year-olds, and 16-year-olds, residing in diverse regions of China. Two distinct participant groups were involved:

3.1.1. Chinese Monolinguals

Number: A total of 200 Chinese monolingual children were recruited. The distribution across age groups was as follows: 5-year-olds (n=50), 8-year-olds (n=50), 12-year-olds (n=50), and 16-year-olds (n=50).

Demographics: Gender distribution was balanced across age groups among Chinese monolingual participants. Participants were carefully selected from various regions of China to ensure a representative sample. Background information, including family socio-economic status and educational background, was collected through a background questionnaire.

3.1.2. Chinese-English Bilinguals

Number: The study encompassed a total of 200 Chinese-English bilingual children. The distribution across age groups was as follows: 5-year-olds (n=50), 8-year-olds (n=50), 12-year-olds (n=50), and 16-year-olds (n=50).

Demographics: Gender distribution was well-balanced across age groups among Chinese-English bilingual participants. Participants were selected from diverse regions of China, encompassing both urban and rural settings, to represent the diversity of bilingual experiences in the country. Relevant background information, such as the languages spoken at home and exposure to English, was gathered to establish a comprehensive understanding of their language environment.

Language Proficiency: To gauge the English proficiency of bilingual participants, several measures were employed [specify the measures used]. Based on the results of these measures, participants will be categorized into two groups: 'High Proficiency' (those who use English daily) and 'Low Proficiency' (those who use English less frequently). Additionally, the age at which bilingual participants commenced learning English was recorded to investigate potential developmental differences in language acquisition.

3.2. Design

A mixed-method design was employed, with the primary factor being the participants' language group (Chinese monolinguals vs. Chinese-English bilinguals) and various divergent thinking measures as within-subject factors.

3.3. Materials

To assess the creative thinking abilities of the participants, a battery of standardized and culturally adapted creativity tests was administered [33]. These tests included linguistic, figural, and ideational tasks, which have been previously validated in the context of the Chinese language and culture. The specific creativity tests used in this study were as follows:

3.4. Procedure

Data collection was conducted in a controlled and standardized manner to ensure the reliability and validity of the results. The procedure involved the following key steps:

Before participation, informed consent was obtained from both the children and their parents or legal guardians. The consent forms explained the nature of the study, its objectives, potential risks, and benefits, and participants' rights. Each participant completed the battery of creativity tests, which were administered by trained researchers fluent in both Mandarin Chinese and English. The tests were conducted in a quiet and distraction-free environment, typically within the participants' school settings or community centers. Furthermore, for the bilingual participants, an additional language proficiency assessment was administered to determine their English language skills accurately. This

assessment included tasks related to reading, listening, speaking, and writing in English, with age-appropriate content for each age group.

3.4.1. Linguistic Task: Word Meanings Test

The Word Meanings Test was adapted to the Chinese language and culture from previous linguistic creativity assessments [34,35]. Children were presented with words that have multiple meanings in Chinese and were asked to provide as many different uses or meanings for each word within a specified time limit. The test aimed to evaluate participants' linguistic creativity by assessing fluency, flexibility, and originality in word usage.

3.4.2. Figural Task: Circles Test

The Circles Test, inspired by the Torrance Test of Creative Thinking [36], was adapted to align with Chinese cultural norms. Participants were provided with a set of line drawings of circles and instructed to create as many unique and creative drawings as possible within a time constraint. This task assessed figural creativity, including fluency, flexibility, and originality in figural representations.

3.4.3. Ideational Task: Object Uses Test

The Object Uses Test was designed to measure participants' ideational creativity by asking them to generate various uses for common objects. This test involved presenting participants with images of everyday objects (e.g., a blanket or a brick) and instructing them to brainstorm as many alternative uses as possible within a defined time frame. It assessed ideational fluency, flexibility, and originality in generating novel ideas for object utilization.

3.5. Data Analysis

Statistical analyses will be conducted to compare the creative thinking performance of Chinese monolinguals and Chinese-English bilinguals across different age groups. The analysis will involve examining the effect of bilingualism on creative thinking using appropriate statistical tests (e.g., ANOVA) while controlling for potential confounding factors such as age and gender.

To begin, descriptive statistics will be used to provide an overview of the participant's demographic information and their performance on the creativity tests. This will include calculating means, standard deviations, and frequency distributions for each of the creativity tests (linguistic, figural, and ideational). These statistics will help in characterizing the sample and identifying any initial patterns or trends.

The primary analyses will include a series of inferential statistical tests to assess the impact of bilingualism on creative thinking. A two-way ANOVA will be employed, with language group (Chinese monolinguals vs. Chinese-English bilinguals) and age group (5-year-olds, 8-year-olds, 12-year-olds, and 16-year-olds) as independent variables. The dependent variables will be the scores obtained on the linguistic, figural, and ideational creativity tests individually. This approach allows us to explore potential variations in creative thinking across different dimensions and provides a comprehensive understanding of the influence of bilingualism.

Post-hoc tests, such as Tukey's Honestly Significant Difference (HSD), may be conducted to further explore significant interactions detected in the ANOVA. These post-hoc tests will help identify specific age groups or language proficiency levels where significant differences in creative thinking exist. By analyzing each creativity test separately, we can gain insights into the nuances of how bilingualism affects different aspects of creative thinking.

This comprehensive approach to data analysis ensures a thorough examination of the impact of bilingualism on creative thinking while considering potential variations across age groups and creativity dimensions.

4. Expected Results

Based on the research hypothesis and the existing literature, several expected results can be anticipated in this study. It is important to note that these are speculative expectations and the actual results may vary:

4.1. Bilingual Advantage

One of the primary expectations is that Chinese-English bilinguals, across different age groups, will demonstrate a potential advantage in certain aspects of creative thinking compared to their monolingual counterparts. Previous research has suggested that bilingualism can enhance cognitive flexibility and problem-solving skills, which are essential components of creative thinking. Therefore, it is possible that bilingual participants may exhibit higher scores on the creativity measures, particularly in tasks involving linguistic and ideational creativity.

4.2. Age Effects

Another expected finding may pertain to age-related changes in creative thinking. It is hypothesized that older children, such as 12-year-olds and 16-year-olds, may exhibit more advanced creative thinking skills compared to younger participants. This trend could be attributed to the cumulative cognitive development and exposure to different linguistic and cognitive experiences as children grow older. However, the precise nature and extent of age-related changes in creative thinking will be explored through statistical analysis.

4.3. Task-Specific Differences

It is possible that Chinese monolinguals and bilinguals may exhibit differential performance on various creativity tasks. For example, bilinguals may excel in tasks that require divergent thinking or generating novel ideas due to their experience with multiple languages, whereas monolinguals might perform equally well or better on tasks that involve more structured and convergent thinking. These task-specific differences will be examined to shed light on the nuances of creative thinking across language groups and age levels.

5. Conclusion

In conclusion, this essay has explored the impact of bilingualism on the creative thinking and cognitive functioning of Chinese-speaking children. The study aimed to address the gap in research regarding the effects of learning English as a second language on the creative thinking abilities of Chinese-speaking children. The literature review provided insights into the complex relationship between bilingualism and cognition, highlighting the potential advantages and challenges associated with bilingualism. It also emphasized the need to consider the specific effects of different languages on cognitive functioning. The research design involved a diverse sample of Chinese-speaking children across various age groups, including both Chinese monolinguals and Chinese-English bilinguals. A mixed-method approach was employed, utilizing culturally adapted creativity tests to assess different aspects of creative thinking. Statistical analyses were used to explore the impact of bilingualism on creative thinking while accounting for age-related differences and task-specific variations. The expected results of this study include the potential identification of a bilingual

advantage in certain aspects of creative thinking, age-related changes in creative thinking skills, and task-specific differences between monolinguals and bilinguals. These findings will contribute to our understanding of how bilingualism influences cognitive functioning, particularly creative thinking, in the context of Chinese-speaking children. Focusing on the impact of different language pairs on cognitive functioning and creative thinking can provide nuanced insights. Research can explore whether learning specific languages, such as English as a second language, has distinct effects compared to other language combinations.

Overall, this research holds implications for educational practices and language learning strategies, particularly in a Chinese educational environment that places a strong emphasis on test-based education. By shedding light on the relationship between bilingualism and creative thinking, this study may inform future improvements in the way English is taught and integrated into the curriculum for Chinese-speaking students. It underscores the importance of considering language and culture when studying the impact of bilingualism on cognitive functioning and creative thinking.

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