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A Review of the Cognitive Outcomes of Bilingualism

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ABSTRACT
Research on the cognitive outcomes of bilingualism has shown mixed results in the literature. It is reviewed in this article that early studies have suggested that bilingualism is deleterious to speakers' cognitive ability, whereas more recent works have indicated that bilingualism is beneficial to speakers' ability in metalinguistic awareness, problem solving and, most importantly, attentional control.

Keywords: *Bilingualism, Cognitive Outcomes, Metalinguistic Awareness, Problem Solving, Attentional Control.*

1. INTRODUCTION

Research into bilingualism has a long history in linguistics. For many years, the literature has paid particular attention to the cognitive outcomes associated with bilingualism. However, conclusions on the nature and extent of these cognitive outcomes have appeared rather inconsistent within the literature. Therefore, this paper aims to offer a systematic review of this issue to gain a clear understanding of the cognitive outcomes of bilingualism. To make the research target more specific and try to make a distinction between bilinguals and late second language learners, in this paper, bilinguals are defined as bilingual as early bilingual [1] who acquires two languages simultaneously [2] before age 6.

2. EARLY STUDIES

Early studies suggests that bilingualism is deleterious to learners according to the results of intelligence tests and school achievements. Saer [3] compared Welsh-English bilinguals with monolingual on the Stanford-Binet Scale of intelligence and concluded that bilingual children obtained significantly lower scores than monolingual children. Note that one major problem of his research method is the two groups of children are not only different in their language usage but more significantly in their socioeconomic status: he used middle-class monolingual children to compare working-class bilingual children. Thus, it is highly possible that the claimed difference in IQ test may result from the different socioeconomic backgrounds. In addition, he also translated the original IQ test to Welsh to ensure Welsh-speaking children can equally understand the questions as English-speaking ones. But it is not guaranteed that the translated version could generate precise results just as the English version. In this case, the data collected from these two versions may be not comparable.

Similarly, Manuel [4] conducted a study on the academic performance of bilingual and monolingual children. He compared the reading and arithmetic abilities of Spanish-speaking and English-speaking children who were both instructed in English in schools. The results show that the Spanish-speaking/bilingual children lagged behind English-speaking/monolingual ones in both tasks. But, just as Saer [3], the major problem of Manuel [4] is that these two groups of children are not equal in their socioeconomic status.

Despite of the flawed methodology, such kind of conclusions on both verbal and non-verbal IQ tests as well as school outcomes were popular for decades.

3. MODERN STUDIES

In an influential paper, Peal and Lambert [5] firstly summarized the shared methodological defects in earlier studies and provided a new approach in bilingualism. They noted that previous studies are commonly not properly controlled on the difference between bilinguals and monolinguals in their: socioeconomic status, language proficiency, language of assessment, gender and age. These differences may have confounded the disadvantages of bilinguals in IQ tests and school

achievement evaluations in early studies. By carefully controlling these extraneous factors, Peal and Lambert compared 10-year-old French-English bilingual and English monolingual children on both verbal and non-verbal intelligence test. Contrary to previous findings, they found bilingual children outperform monolinguals in both aspects.

Since Peal and Lambert [5], more and more research has started to report positive consequences of bilingualism in various aspects. Instead of focusing on general intelligence performance as in early studies, researchers have gradually moved their attention to more detailed aspects in mental development. The following of this section summarizes these studies from three aspects: metalinguistic awareness, problem solving and attentional control.

3.1. Metalinguistic Awareness

The word 'metalinguistic' was originally developed from the concept of 'metacognition' which, in essence, means 'knowing about knowing'. In specific, metalinguistic awareness refers to the explicit awareness of linguistic forms and rules as well as the relationship between forms and meanings. It was the major research question in bilingualism in 1970's. Such research hypothesized that being exposed to two languages may facilitate bilinguals' development of metalinguistic awareness. For example, knowing two different words in two languages for the same concept (e.g., 'apple' in English and 'pomme' in French) may enable bilingual children have a better understanding of the symbolic and arbitrary feature of languages. Similarly, bilinguals may have more explicit awareness of syntactic rules in different languages (e.g., 'Adjective + Noun' in English and 'Noun + Adjective' in French).

The very first study in this topic is Feldman and Shen [6]. In this study, five-year-old Spanish-English bilinguals and English monolinguals were tested for their understanding of object constancy, the arbitrary nature of words, and their ability to switch labels in sentences. The results show that bilinguals are better than monolinguals in their ability to switch familiar labels in the context of sentences. Ianco-Worrall [7] studied Afrikaans-English bilinguals and monolinguals concluding that bilinguals show an earlier separation of word sound and meaning. Ben-Zeev [8] tested Hebrew-English bilinguals and monolinguals in their strategies in learning the two languages. He suggested bilingual children tend to conduct a more analytical processing not only in verbal tasks but also in non-verbal ones. Similar studies are conducted by Cummins [9], [10] and Bialystok [11]–[13].

3.2. Problem Solving

Research also indicates evidence that bilinguals have enhanced ability in problem solving, reasoning and creative thinking. Bain [14] is the first study to claim cognitive advantages in problem solving of bilinguals. He examined 11-year-old French-English bilinguals and monolinguals in their ability to solve problems based on logical operations and sense emotional expressions from portraits. In both tasks, bilinguals are well-performed than monolinguals. A slightly different result is reported by Cummins and Gulutsan [15]. They found that bilinguals outperform monolinguals only on verbal ability, reasoning and originality but not on memory.

In 1970's, a considerable amount of positive evidence of bilingualism was reported both in metalinguistic awareness and problem solving. However, under more controlled research methods, noticeable negative evidence was reported from time to time [16]. To better understand this contradiction, Cummins [9] hypothesized that the positive consequences of bilingualism could be observed only after a child obtain a certain level in L2.

Following this hypothesis, Diaz [17], [18] examined two groups of Spanish-English bilingual children with varying degrees of English proficiency. However, he found a strong relation between the degree of bilingualism and the benefits in cognitive abilities even when the English proficiency of the bilingual children is low. Thus, he revised Cummins's hypothesis and suggested that the degree of bilingualism could only predict the cognitive benefits before certain level of L2 has been achieved. This implies that it is the efforts to acquire another language rather than the language proficiency itself that would lead to those claimed cognitive advantages.

3.3. Attentional Control

To understand the motivation and mechanism behind the observed positive cognitive effects of bilingualism, in more recent studies, researchers have gradually focused on bilingual's ability on attentional control. Bialystok and Majumder [19] examined the performance in problem solving of balanced French-English bilinguals, partial Bengali-English bilinguals, and English monolinguals through a series of tests, including the Peabody Picture Vocabulary Test-Revised, the Grammaticality Judgment Task, the Block Design Task, the Water level Task, and the Noelting Juice Task. The results indicate that bilinguals outperform monolinguals only in those tasks that require more ability in control. Similar conclusions were suggested in many other follow-up research [19]–[24].

A dominant explanation of such phenomenon comes from the evidence that in the mind of bilinguals both

languages remain activated during the processing of either language. Thus, after years and years' practicing of handling two languages at the same time since childhood, bilinguals are more capable of controlling their attention to tell the difference between two linguistic systems and selectively attend to the information of their target languages, which, as a result, benefits other tasks that required highly controlled attention.

In line with the above findings, there are studies claiming that, by managing two languages in a lifelong time, bilingualism may be helpful to offset some age-related cognitive decline [25], [26].

4. CONLUSION

The relationship between cognitive outcomes and bilingualism has received a lot of attention in the past eighty years. With negative, positive and even mixed effects being reported, what is the overall cognitive outcomes of bilingualism? Is it detrimental or beneficial to be a bilingual?

In order to gain a clear answer to the above question, Adesope et al. [27] analysed 63 studies in bilingualism and its cognitive outcomes and got a positive result in the overall weighted mean effect size, indicating general moderate beneficial outcomes of bilingualism. Moreover, among all the benefits, bilinguals' advantage in attentional control reached the largest effect size, showing strong evidence of such phenomenon.

With all the above findings, bilingualism and its cognitive outcomes are generally considered to be positively associated now. The explanation for this lies in that being able to simultaneously process two languages (focus on one target language and inhibit another) allows bilinguals to develop skills that can be extended to other domains. These skills enable bilingual speakers to be more aware of the abstract features of language and their learning process. They also enhance speakers' capability in control their attention and distribute their attentional recourses. After years and years of such practice, bilinguals are believed to be more flexible in their brain compared with other monolinguals at the same age. Thus, their onset age of dementia is usually later than monolinguals.

However, the underlying threat for the validity of this conclusion mainly comes from the highly heterogeneous experiment reports. Admittedly, considering the various backgrounds of actual bilingual speakers (language types, age, language used as school instructions, etc.), such studies for bilingualism are inevitably to be heterogeneous in a way. It seems that the only way to confirm the conclusion is to conduct similar research repeatedly to get a more generalized consensus. Another thing remains unclear is, even if bilingualism has these benefits, it is still not clear about what is the practical utility of such ability in specific context. For example, to what extent bilingual children could make the best use of these specialty to achieve a better mental and academic development? Furthermore, is it necessary to set up special curriculum or assessment for bilingual children? Further investigations on bilingualism in educational context is needed to clarify such issues.

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