

Bilingualism's Influence on Cognitive Development

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ABSTRACT

This paper explores the influence of bilingualism on cognitive development, focusing on its effects on executive functions, language processing, and auditory processing. The study examines different classifications of bilingualism and their implications for cognitive performance. Findings suggest that bilingual individuals often exhibit enhanced executive functions, such as improved attention, problem-solving, and multitasking abilities. Additionally, bilingualism may contribute to delayed onset of age-related cognitive decline. However, some challenges, including language interference and processing delays, are noted. The paper concludes by highlighting the cognitive advantages and potential limitations of bilingualism, providing insights into its role in shaping cognitive processes across the lifespan.

Keywords: Bilingualism, Cognitive Development, Executive Functions, Language Processing, Auditory Processing, Cognitive Aging.

INTRODUCTION

Today, the majority of people worldwide speak more than one language. This not only helps with communication across cultures but also enhances cognitive skills. Studies suggest that bilingual individuals often excel in maintaining focus and switching between tasks due to their proficiency in managing multiple languages simultaneously. Additionally, bilingualism benefits individuals across their lifespan: from infants as young as seven months, who can more easily adapt to new environments, to older adults, who may experience a slower rate of cognitive decline. (Bialystok, 2009)

Language plays a crucial role in our lives, as it is a tool for expressing thoughts and emotions. It is an instrumental tool for connecting with others and exchanging knowledge. Speaking more than one language is necessary for a large segment of the world's population to get by in daily life. A 2006 European Commission survey revealed that 56 per cent of participants could communicate in a language different from their mother tongue. In some countries, multilingualism is even more prevalent; for example, 99 per cent of people in Luxembourg and 95 per cent in Latvia are proficient in multiple languages. (European Commission Special Eurobarometer, 2006) Despite the common perception of the United States as a predominantly monolingual country, data from 2007 shows that one-fifth of individuals aged five and older speak a language other than English at home. This represents a significant rise of 140 per cent since 1980. (United States Census Bureau, 2012) Many Americans frequently use languages other than English, not only at home but also at work and in school. This multilingual trend isn't limited to the United States and Europe. The Associated Press has reported that about two-thirds of children globally are raised speaking more than one language. (Associated Press, 2001) In recent years, advancements in technology have enabled scientists to explore more

thoroughly how bilingualism affects and modifies cognitive and neurological functions in the brain.

Bilingualism

The concept of bilingualism might seem straightforward in the beginning. According to Webster's Dictionary, being bilingual means using two languages with fluency and control, which is typical of a native speaker, and bilingualism refers to the regular oral use of two languages. Commonly, people equate being bilingual with speaking two languages flawlessly. This perspective agrees with Leonard Bloomfield's definition of bilingualism in 1935, describing it as having native-like proficiency in two languages. John Macnamara proposed a broader definition of "perfect bilinguals" in 1967. He argued that everyone who exhibit a basic degree of proficiency in any one of the four language skills—speaking, listening, reading, or writing—in a language other than their mother tongue can be classified as bilingual. (Harmer & Blanc 2000)

Classification of Bilingualism

Hull and Vaid (2006) proposed a multiple-criteria classification system for bilingualism. They define "Bilinguals" as individuals who are proficient in at least two languages, with the ability to read, write, and speak in each. Second come "Early Bilinguals" who acquire two languages before becoming six years old, treating both languages as their first language or L1. On the other hand, people who started learning a second language after turning six are known as "Late Bilinguals". "Proficient Bilinguals," who maintain strong linguistic ability and score above 85% on standardized language proficiency tests, are also included in this classification. Finally, individuals who score below the proficiency criterion on these tests, showing less competence in their languages, are referred to as "Non-proficient Bilinguals".

Other researchers like Paap and Sawi (2015) provided another classification. They divided bilingualism into three types: harmonized bilingualism, double bilingualism, and delayed bilingualism. Both harmonized and double bilingualism are forms of early bilingualism that develop during childhood. In contrast, delayed bilingualism occurs when someone learns a second language after the age of 12.

Harmonized bilingualism occurs when a child is raised with two simultaneous language systems. This is common in households where each parent communicates with the child in their own native language, enabling the child to develop two separate linguistic systems they can navigate with ease. Another scenario is when a child who has already learned their native language is adopted by parents who speak another language, creating a different linguistic environment for the child.

Delayed bilingualism, the third type, involves learning a new language after childhood. Although it's generally more challenging due to the closure of the critical period for language learning, sufficient exposure and practice can still allow an individual to reach a high level of proficiency later in life.

The last type is called delayed bilingualism, which refers to learning the language after the childhood phase is passed, which makes it very challenging to miss the critical period. However,

with abundant practice and exposure to the language, the person can still reach a great deal of proficiency in his life at later stages.

Cognitive Consequences of Bilingualism

Earlier views often regarded bilingualism as a potential cause of developmental issues or delays in children. However, recent research across various fields, such as education, psycholinguistics, psychology, speech and hearing sciences, and neuroscience, presents a more positive perspective. Studies by researchers like Ricciardelli (1992) and Torrance et al. (1970) indicate that bilingualism can have beneficial effects. It has been found that bilingual children's cognitive systems show remarkable variances from those of monolinguals. Studies have also revealed that exposure to two languages from an early age can impact critical neurological and cognitive development, influencing how these systems process and store information. (Yoshida, 2008)

Language Co-activation

Studies have shown that bilingual people have both of their languages switched on, even when they're only speaking one. When we hear a word, it doesn't hit our ears all at once; instead, it unfolds sound by sound. As soon as we start to hear a word, our brain gets busy guessing what it might be, activating similar words we know. For example, if you hear "can," your brain might also think of "candy" or "candle" pretty early on. For those who are bilingual, this guessing game pulls in words from both languages, not just the one they're currently using.

Some of the strongest evidence that both languages are active in the minds of bilinguals comes from watching where their eyes go. We tend to look at things that we are thinking about, talking about, or hearing. For instance, if a bilingual person who speaks both Russian and English is asked to pick up a "marker" from a group of items, they might find themselves looking at a stamp. This happens because the Russian word for "stamp," "marka," sounds similar to the English word "marker."

This phenomenon shows that when bilinguals hear something, their brains might link it to similar-sounding words from either of their languages. Additionally, this activation of both languages happens automatically, meaning that bilinguals often think of words from both languages, even if the words don't sound alike. (Marian & Spivey 2003)

Executive Functions

Research consistently highlights the potential advantages of bilingualism on executive functions, which include self-control and the ability to manage conflicting information. Executive functions are critical situations where individuals must repress their habitual or spontaneous reactions, such as remaining seated despite wanting to stand up, resisting the temptation to take candy when told not to, or choosing a new approach for doing a certain task instead of the familiar one. (Beaver & Wright, 2007)

Most research on how bilingualism affects executive functions and other skills has focused on children. Kids growing up in multilingual environments often have to pay attention to the abstract nature of language. Because they learn multiple names for the same thing, they understand the differences between words and meanings and realize that object names are somewhat arbitrary. (Ibrahim et al., 2013)

Moreover, Bilingual children often show improved executive control, a feature that suggests bilingualism may enhance cognitive functions associated with self-control (Yoshida, 2008). The constant need to switch between languages and suppress words from one language while speaking another may act as a behaviour that strengthens the neural pathways responsible for self-control.

However, after reviewing the existing literature, one can figure out mixed findings regarding the extent of the abovementioned benefits. While some studies emphasize that bilinguals outperform monolinguals in tasks requiring conflict resolution, distraction management, and multitasking, other research findings revealed no significant distinctions between both groups. There are even situations where monolinguals showed better performance (Paap et al., 2014). Due to this discrepancy, researchers have suggested that the benefits of bilingualism might be dependent on certain factors, including the specific types of bilingual experiences. It might also be limited to particular components of Executive Functions.

Inhibitory and Attention Control

Bilingual people often perform better in tasks that require administering conflicting information. Take, for example, the Stroop Task, where participants need to name the colour of a written word. What makes this task challenging is the fact the printed word contradicts the colour of it. (such as the word "red" written in blue). The cognitive system is forced by this mismatch to ignore the unimportant word and focus on the colour. In general, bilinguals are better at this ability as inhibitory control- than monolinguals. Furthermore, bilinguals are excellent multitaskers. For example, they may quickly move from organizing objects by colour to organizing them by shape. They are able to handle these switches more quickly than monolinguals, showing greater cognitive flexibility in adapting strategies spontaneously. (Marian& Shook, 2021). Additionally, research has proven that bilingual individuals often have superior attention control compared to monolinguals. This advantage is resulting from the bilinguals' need to continuously manage and choose between two languages in daily conversations. Researchers suggest that the ability of bilinguals to keep and selectively concentrate on different languages mentally may enhance their overall control of attention. This skill is beneficial for bilingual individuals as it helps them avoid interference from one language when they are using the other. (Ali, 2023)

Auditory Processing in Bilinguals

The benefits of being bilingual reach into deeper brain areas commonly associated with processing sensory information. When listening to a basic speech sound like "da" without any background noise, both monolingual and bilingual teenagers show similar brain stem reactions. However, in noisy environments, bilinguals display a stronger neural response, showing they encode the sound more effectively, particularly its fundamental frequency, which influences pitch perception. This means that bilinguals have increased activity in their brain stem when hearing sounds, suggesting they're better at focusing on important auditory information in noisy settings. (Krizman et al, 2012)

Learning Advantages

Being bilingual can lead to practical benefits. The enhanced cognitive and sensory skills developed from managing two languages may allow bilinguals to process information from their surroundings more effectively, improving their learning capabilities. This increased

attention to detail might also explain why bilingual people generally learn a third language more easily than monolinguals learn a second one. (Kaushanskaya & Marian, 2009) The language-learning advantage among bilinguals could be due to their ability to focus on new language details while filtering out interference from the languages they already speak. (Bartolotti & Marian, 2012). This skill enables bilinguals to retrieve newly learned words more effortlessly, resulting in greater vocabulary expansion compared to monolinguals, who might not be as good at filtering out distracting information.

Moreover, the advantages of bilingualism seem to manifest early on. Studies have found that bilingualism can positively impact attention and conflict management skills in infants as young as seven months. For instance, in one experiment, babies from both monolingual and bilingual households were conditioned to expect a puppet to appear on one side of a screen when a tinkling sound was played. Midway through the experiment, the puppet started appearing on the opposite side.

To receive a reward, the infants had to adapt to this new rule; only the bilingual infants managed to successfully make this adjustment. (Kovacs & Mehler, 2009) This indicates that even in very young children, being exposed to multiple languages can provide benefits that extend beyond linguistic skills.

Bilingualism and Age-related Cognitive Symptoms

So many studies have revealed that being bilingual has advantages for the brain and cognition throughout the ageing phase. One significant benefit of bilingualism that helps delay the inevitable deterioration of cognitive function is maintaining what is referred to as "cognitive reserve". Craick et al., 2010, cited in (Marian Shook, 2021). Cognitive reserve is the ability to effectively use brain networks to maintain or enhance brain function as we age.

Being bilingual may assist in maintaining this reserve by attracting different brain networks to replace the ones that are lost as we age and by keeping cognitive mechanisms sharp. Compared to older monolingual individuals, older bilinguals have better memory and executive control, which can have positive effects on their actual health. (Schroeder & Marian, 2012, cited in Marian Shook, 2021).

Research also confirms that age-related cognitive decline and dementia can be prevented by having cognitive reserve, which aids in postponing the onset of dementia by around 4-5 years, according to recent epidemiological studies. (Perani et al., 2016)

Negative Consequences

One primary consistent area where bilingual children tend to lag behind is in receptive vocabulary. Studies have repeatedly shown that bilingual children usually score lower than their monolingual peers in understanding vocabulary in each of their languages.

This finding has been observed in numerous studies comparing monolingual and bilingual children, particularly during the preschool years and sometimes in the early years of schooling. (Bialystok, 2001) The exact same result has been proven by other researchers who stated that bilingual individuals have less number of vocabulary words in their both languages compared to monolinguals.

To assert the abovementioned results, researchers collected the scores from the standardized Peabody Picture Vocabulary Test for 971 children aged between 5 and 9 years; almost half of them were bilingual. These children had taken part in several studies conducted in the researchers' lab over many years. The findings revealed that the average standard score for monolingual children was 105, while bilingual children had an average score of 95. (Bialystok, 2009)

The reason why bilinguals have difficulties with lexical access remains unclear. One perspective attempting to justify this issue attributes it to the fact that bilinguals utilize both of their languages less frequently than monolinguals, which results in weaker links between the necessary connections needed for quick and smooth delivery of the speech. (Michael & Gollan, 2005).

Factors Influencing the Impact of Bilingualism

Many studies are looking at aspects of being bilingual, including language usage, language competency, and the age at which one first learned the second language—all of which may be related to better executive functioning. While some studies find that early versus late acquisition of a second language is a determinant of improved executive control, others suggest that usage and proficiency of a second language—rather than the age of acquisition per se—contributes to improved executive control (e.g., inhibition, switching, and monitoring processes). Higher usage and competence levels have been linked to more frequent language switching, which has been linked to better executive control and better practice effects. (Secer, 2016)

CONCLUSION

To conclude, the whole world is heading to either be bilingual or multilingual, which leaves us with no option but to be as competitive as the world we are living in. Being bilingual not only helps people live a better life or have a better or a high-ranking job but also affects them as individuals; that is, bilingualism helps develop their cognitive skills. This paper aims to discuss the main cognitive advantages of bilingualism. These benefits start showing early in a bilingual's childhood and extend to older ages.

Most studies drew a positive relationship between bilingualism and having better executive functions, such as inhibitory control. This results from the ability of bilinguals to suppress the vocabulary of a specific language while speaking the other. Bilinguals also are proven to have more focus and attention control, and the Stroop task has demonstrated this advantage they acquire. An interesting finding was related to ageing, as bilingualism served as an anti-ageing defence mechanism against the natural cognitive symptoms that co-exist in old people, such as Alzheimer's or Dementia. People who are bilingual showed symptoms at later stages than their monolingual counterparts.

However, some challenges mentioned in the literature were encountered by bilingual individuals. Among these challenges was the difficulty of bilingual individuals in understanding lexical items in both of their languages and one view explained the reason for that as a result of using both languages less frequently than monolinguals. In a nutshell, the cognitive benefits of bilingualism outweigh its drawbacks, and future research in the field might unveil more cognitive and linguistic advantages of bilingualism.

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