



# How Does Bilingualism Affect Cognition in Children?

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**Abstract**

Preceding Peal and Lambert's (1962) [1] study, psychological research concerning bilingualism and its effect on cognition came to the common conclusion that bilingualism causes a decrease in linguistic capabilities and intelligence [2,3]. Cognition is a term that can be defined as the process of knowing, reasoning and remembering. Peal and Lambert's (1962) [1] study challenged this common belief. They found that bilingual children did in fact have greater cognitive capabilities; specifically if they were balanced bilinguals- meaning that they were equally versed in both of their acquired languages rather than knowing one greater than the other. In addition, socioeconomic statuses were not considered in research prior to Peal and Lambert (1962) [1]; the majority of the monolingual subjects came from well-educated families with high income while the bilinguals belonged to immigrants and farmers [4]. Peal and Lambert (1962) [1] found that bilingual subjects were superior to their monolingual peers in terms of intelligence. There is some criticism on their research as it seems the researchers specifically chose bilinguals whom had a high academic standing.

Upon analyzing a plethora of peer edited psychological research, it was found through empirical data that bilingual children are superior in four distinct cognitive domains such as having cross-language interactivity [5], inhibitory advantages [6], metalinguistic awareness [7] and cognitive flexibility [8]. In addition, greater amounts of positive effects were observed in bilinguals who knew languages that had greater dissimilarities.

In this investigation, it was concluded that bilingualism affects cognition positively in children; leading to advantages in cognitive abilities when compared to their monolingual counterpart. In order to witness these effects, however, one has to be a balanced bilingual who is of equal socioeconomic status as his monolingual counterparts.



## Introduction

As times have progressed, a new era of multiculturalism has risen and with it has come the ability (or requirement) to learn more than one language; or in other words, to become a bilingual. With this new trend, controversy has developed as to how this affects performance in terms of cognitive abilities. The purpose of this essay is to deduce: **How bilingualism affects cognition in children.** This topic is worthy of investigation due to increasing globalization and multiculturalism. Now more than ever, children have the opportunity to learn multiple languages and it is critical to be aware of how these new acquisitions will affect cognition. Cognition is a term that can be defined as the process of knowing, reasoning and remembering.

Many researchers have set out to solve this contentious mystery. For years, it was believed that being bilingual meant that one was at a disadvantage when compared to their monolingual peers [9]. However, more recent research suggest the opposite, concluding that children who are presented with more than one language are prone to better organization [7] and exclusion skills-meaning they are better able to notice the important information and disregard the unimportant [10]. This filtering of information leads to a more efficient use of cognitive resources. Another factor that significantly affects one's cognitive abilities is the method in which one learns their second language, and additionally, when they acquire it [1]. It is important to bring more transparency to this discussion as the occurrence of knowing more than one language has become much more prevalent in recent years. Alongside the obvious benefits of knowing two one language, the psychological effects that take place also need to be considered.

### History of bilingual research

In the early and mid-nineteenth century, there was a notion between researchers and public alike that bilingual children were not equivalent in terms of cognitive abilities when compared to monolinguals. Harsh statements such as the one by stated that bilingualism was a "social plague" and that it was "a hardship devoid of apparent advantage" as cited by Hakuta & Diaz (1985) [9]. The research conducted in their era concluded that "bilingualism acted as a handicap that affected a person for their life in terms of cognitive development and intellectual advancement" [3]. It is imperative to note that these earlier studies had significant limitations. For example, whether or not the bilingual was actually fluent in his second language was not a criterion in sample collections. In some extreme cases, the extent of one's bilingualism was measured by the area in which they lived in, surnames, and how foreign their parents were. An additional weakness was that the social and economic, or socioeconomic statuses of the subjects was not accounted or adjusted for, as observed by McCarthy (1930) [4]. Socioeconomic status is a level of an individual or family's economic and social position according to their education, occupation and income. A greater socioeconomic status equates to a greater availability of educational resources, which generally increases intellect. She found that the majority of the bilingual children present in these early studies were those of immigrant laborers while the monolinguals belonged to higher classes where parents had academic and professional occupations.

In 1962, an important year for psychological research on bilingualism, Peal and Lambert (1962) [1] presented empirical data that displayed the progressive effect of bilingualism on the cognitive capacities of children. The researchers from McGill

University (Canada) compared the performance of ten-year-old children. The sample consisted of seventy-five monolinguals and eighty-six bilinguals who belonged to the same Montreal school system and were of equal socioeconomic status. The bilinguals who spoke both French/English and the monolinguals who spoke either one of the two languages were tested on an array of tasks in which their intelligence was assessed. It was found that the bilingual subjects were superior in terms of intelligence than their monolingual counterparts in all the tasks, which "[involved] concept formation and symbolic flexibility" [1]. The bilingual children were more malleable in their understanding and were able to bend and conform to different situations with greater success. These results were unlike anything that had been seen before as all previous research alluded to quite the opposite. What caused the results to differ? The researchers took extra precautions in their sample selections. They specifically chose "balanced bilinguals" [1]. A balanced bilingual can be defined as a person who is equally proficient in both his first language and second language. In contrast, they defined a pseudo-bilingual as a person "who knows one language much better than the other, and does not use his second language in communication" [1]. "The true bilingual is one who master both languages with paralleled proficiency at a young age" [1]. Peal and Lambert (1962) [1], set the stage for future researchers to explore this newfound idea. From the footwork that they had laid out, researchers later found that bilingualism resulted in superior performance in creativity and problem solving [5]. Despite utilizing balanced bilinguals and accounting for socioeconomic statuses, Peal and Lambert's (1962) [1] research had inherent limitations, as discussed by Hakuta and Diaz (1985) [9]. The bilinguals in the sample were older than the monolinguals thus giving them a greater amount of formal education, which could have affected the outcomes of the study. Furthermore, only bilinguals who scored a certain amount on the English Peabody Picture Vocabulary Test (a test used to assess a monolingual's intelligence) were selected as participants. Such factors may have contributed to confounding or extraneous variables that did not reflect the relationship under investigation. Moreover, Peal and Lambert (1962) [1] even admitted that their procedure and participant selection criteria might have skewed their results by favoring bilinguals over monolinguals.

Nonetheless, the distinction made by Peal and Lambert (1962) [1] between balanced bilinguals and pseudo-bilinguals had a substantial influence on future studies regarding bilingualism and cognition. "Their distinction has forced recent investigators to select their bilingual samples with much more care and measure the samples' actual knowledge of the two languages" [9].

### Balanced bilingual

As mentioned previously, the extent to which a child can benefit from bilingualism depends profoundly on whether or not they are equally well versed in both languages. One can be either an additive bilingual or a subtractive bilingual [11]. An additive bilingual is one who adds his second language on to his first whereas a subtractive bilingual is on who replaces his first language with his second in a gradual manner. Additive bilinguals are able to accumulate the skills they have acquired from their different languages while subtractive bilinguals employ one language more than the other, thus deteriorating the skills acquired from their second language.

### Episodic and semantic memory tasks and cross language interactivity

According to Tulving's (1972) [12] theory, episodic memory relates to events, places and time relative to experience. Semantic memory, on the other hand, relates to general knowledge and the meaning of words.

The research done by Kormi-Nouri (2008) [13] support the idea that bilingual children are better able to perform semantic and episodic memory tasks. They found that bilinguals had superior performance in numerous memory tasks. As discussed by Kormi-Nouri (2008) [13], it is widely accepted that cross language interactivity is the cause of the bilingual advantage. The cross language interactivity theory attempts to justify that bilingualism has affirmative effects on cognitive functions and processes, suggesting that cognitive development is enhanced when a person is in the midst of learning a second language and differentiating it from his first. An example of this would be in Peal and Lambert's (1962) [1] study where they claimed that bilingual children have increased mental flexibility since they know how to utilize different languages and cognitive functions. The cognitive capacity of a bilingual is directly related to the linguistic development in their childhood. This suggests that the highest gains in cognitive performance are evident when bilinguals learn their second language at a very early age. The earlier the children begin to grasp their second language, the more gains they will see. In the study done by Kormi-Nouri (2008) [13], 144 bilingual and monolingual children were compared in regards to episodic and semantic memory tasks. There was a distinct advantage when the bilingual children belonged to "communities in which their first languages were dominant and the second language was used mostly in school" [13]. This shows that the longer a child utilizes both languages equally on a daily basis, the more they will profit from being a bilingual. This reasoning presented by Kormi-Nouri (2008) [13] aligns itself with those made by [14,15], in which they stated that the longer and more in depth you know your two languages, the greater the amount of positive effects on cognition will be seen. Furthermore, it should be noted that if a bilingual knows languages that are dissimilar from each other when compared to one who know similar languages, the former would experience more cross-language interactivity than the latter. This was presented in the study done by Kormi-Nouri (2008) [13] when a greater cognitive advantage was found for Turkish-Persian bilinguals when compared to Kurdish-Persian bilinguals. The reason for this difference was that there was a greater dissimilarity in the languages known by the first group than the latter. The validity of the Kormi-Nouri's (2008) [13] research study is enhanced since the sample consisted of an equal amount of males and females, meaning that the results of this study are applicable to both genders. Furthermore, since an experiment was utilized to collect the data, cause and effect was present, meaning bilingualism or lack thereof was clearly the factor that affected how the participants performed on the episodic and semantic memory tasks. It was established by Kormi-Nouri that bilingualism had a positive effect on the cognition of children when tested in semantic and episodic memory tasks.

[15] had results that were converse to those of Kormi-Nouri's (2008) [13]. English monolinguals and Spanish-English bilinguals were tested in a wide variety of semantic categories. It was found that the bilinguals faced cross-language interference, meaning that alternating between their two languages came at a cost. There was a bilingual disadvantage for both the category

and letter fluency tests among the adult bilingual participants in their research study. It is important to note that Kormi-Nouri (2008) [13] employed children whereas Gollan, Montoya, and Werner (2002) [16] employed adults in their samples. Adult bilinguals have a greater chance of cross-language interference when compared to children [17]. Furthermore, their research had limitations since the bilinguals' proficiency in their first and second languages was not measured. The bilinguals simply answered a questionnaire on the history (in terms of acquisition) of their languages via self-reporting which could have caused demand characteristics. The participants might have answered the questionnaire unnaturally. The subjects could have possibly thought of English as their main language since this was not asked on the questionnaire, effectively make the bilinguals in Gollan, Montoya, and Werner's (2002) [17] sample pseudo-bilinguals. These factors could very well be the cause of the discrepancies between the results of the two research studies.

### Inhibitory advantage

As highlighted by Bialystok (1999) [6], attention, a cognitive process, is when the brain chooses to concentrate on specific stimuli in their environment while inhibiting the misleading or unimportant ones. Evidence from a plethora of studies points towards the fact that bilingualism has a positive effect on the inhibitory control procedures that control the cognitive process of attention. Bilinguals have a greater capacity to inhibit information or stimuli in the environment that is irrelevant [10]. In the study done by Bialystok (2001) [4], it was claimed that bilingual speakers halt the interruptions of language since they have an enhanced ability to hold onto the relevant information and discard the irrelevant. This analysis would mean that bilingual children would exercise such practices on a daily basis when they alternated between their different languages, thus further improving their inhibitory skills.

In the study done by Bialystok (1999) [3], a dimensional change card sort or DCCS task was implemented to assess the executive function in preschool children. Sixty children were divided into two equal groups. One group consisted of monolingual English speakers while the other groups was composed of English-Cantonese or Mandarin speaking bilinguals. All participants were selected from the same middle class care center. The subjects had not yet entered the first grade. In the DCCS, the children participants who were approximately three years old were provided with a range of cards and were asked to sort by dimensions such as texture. They were then asked to sort by another dimension such as color. In this task children are generally able to sort properly in the initial stage but once the dimensions are switched, they have trouble sorting properly. Once subjects reach an age of around five years however, they are able to sort successfully in both trials. According to as cited by Hukata and Diaz (1985) [9], "the difficulties that young children face in the DCCS task are due to incapacity to exemplify complex rules as well being unable to utilize working memory and inhibitory control." To support this theory, it was found in the experiment conducted by Bialystok (1999) [3] that the English-Chinese bilinguals had significantly greater performance than the monolingual English speakers in the DCCS. This was because the bilinguals were able to ignore the features of the previous dimension and focus on the new one. From this study, Bialystok (1999) [3] concluded that inhibitory advantages were also applicable to other cognitive processes. Due to the exposure to different languages at a young age, bilingual children develop the ability where they are able to rapidly switch between different

languages, thus creating an inhibiting effect. This effect is an imperative part to the bilingual advantage in cognition because it causes an individual to be able to subconsciously filter through information, holding only on to that which is relevant. The experiment done by Bialystok (1999) [3] lacks some generalizability since the sample consisted of only sixty participants from the same area and culture. The results might not be applicable to the general population. Nevertheless, Bialystok (1999) [3] employed participants that had similar socioeconomic statuses since all the participants came from the same middle class care center. This reduced the likelihood of confounding variables in that it eliminated the possibility that the difference in cognition was caused by different socioeconomic statuses of the participants rather than bilingualism. Furthermore, the researchers insured that the bilingual participants had equal proficiency in English compared to the monolinguals, which furthered the reduction of confounding variables, which in turn increased the validity of the research.

### Cognitive flexibility

Cognitive flexibility can be defined as the ability to look at a situation from multiple perspectives as well as being able to “think outside the box,” as per Adi-Japha (2010) [8]. The effects of bilingualism on cognitive flexibility are discussed by Ben-Zeev (1977) [5]. In her experiment, she compared ninety-six Hebrew-English bilinguals to English or Hebrew monolinguals. The subjects were split into two groups; one group was in the United States while the other one was in Israel. Both groups had equal socioeconomic statuses since all the participants were middle-class Jews. As a result, it was found that the Hebrew-English bilingual children performed in a superior manner than their monolingual equivalents in tasks such as the symbol substitution test as well as the verbal transformations test. The symbol substitution test was implemented to see how readily and naturally the children were able to substitute certain words with different ones. For example, the researchers told the participants “for this game the way we say I is to say macaroni. So how do we say ‘I am warm?’ [Correct answer: Macaroni am warm.]” [5]. Bilinguals are superior in this task because they approach the task with a more analytical approach. Since bilinguals are accustomed to using two different language systems and switching between them on the fly, ignoring the rules of one while implementing those of the other, they should be successful at this task. This is because in the substitution task, “to answer correctly, the child must be able to resist the mutual interference of the substituted item and the sentence frame” [5]. They must be able to ignore the rules of the language being utilized, just as if they would when switching between their two languages. The verbal transformation task, on the other hand, involved the playback of a two-minute loop consisting of nonsense words. Afterwards, the subjects were asked to report any changes in the loop. Bilingual children are expected to find more transformations in the sound loop. Since they know two different languages, they are used to negotiating through two different concepts. This would have caused the bilinguals to report more changes because they are always on the lookout for different languages and deciding which language to implement depending on the situation present.

A limitation of this study was that there was a lack of generalizability since all the participants were middle class Jews whose parents had occupations in the educational and professional fields. This means that the data collected might not be applicable to other demographics such as communities with lower

income. Conversely, the researchers looked at participants in both the United States and Israel, thus improving generalizability since the results were found in different regions. The distribution of sexes was approximately equivalent in this research study, meaning that the effects of bilingualism were observed in both males and females.

It was concluded by Ben-Zeev (1977) [5], that the bilingual children in her sample had been, at an early age, confronted with different concepts (languages) which rendered it difficult for them to realize that the rules belonged to two different languages rather than one. This caused the children to develop an ability wherein they could easily determine where the rules belong depending on the situation presented.

### Metalinguistic awareness

Metalinguistic awareness is the ability to reflect and manipulate features of a language. The study done by Mohanty and Babu (1983) [7] shows how bilinguals are at an advantage in terms of cognition because they have an enhanced metalinguistic awareness of a language. A sample of 180 balanced bilingual and monolingual Konds from a tribal society in Orissa, India was selected since both groups shared the same culture, thus eliminating confounding variables such as a participant’s culture affecting their cognition. Furthermore, all participants had similar socioeconomic statuses. The ten to sixteen year old participants were tested in their metalinguistic abilities to see if there was a bilingual advantage. It was found that when “compared to the monolinguals, the bilinguals demonstrated a better understanding of the arbitrariness of language, the non-physical nature of words and the relationships between the meaning and its referent,” Mohanty and Babu (1983) [7]. As discussed by these researchers, the bilinguals can be thought to be superior in metalinguistic activities because their second language has an effect on their cognitive processes. “It shows that the ability to encode experiences in two languages rather than one enables individuals to develop an objective orientation towards the language and its properties” [7].

A limitation of Mohanty and Babu’s (1983) [7] experiment was that there was poor gender distribution. Out of the sample of 180 participants, only 45 were females. Furthermore, all the participants were from one culture, lowering the generalizability of the study. Other cultures around the world may not see the same positive effects of bilingualism on cognition. A large sample of 180 participants was also present. The data was collected from a large amount of participants meaning that the generalizability of the results is enhanced in that they have a greater likelihood of being seen in other situations.

Another instance where the bilingual advantage in metalinguistic tasks can be seen is in the aforementioned study done by Ben-Zeev (1977) [5]. She hypothesized that due to their knowledge of different languages, bilinguals develop an ability to analyze language since they frequently have to block the interference that one language causes to another. Ben-Zeev (1977) [5] concluded that the bilinguals were more open to reorganizing and changing the structure of a language. Because they have encountered complex verbal atmospheres in which they shifted amongst two languages constantly, they were able to notice the fundamental patterns they came upon. Consequently, the bilingual children were able to develop a distinctive capacity to determine the rules needed and when to implement them, depending on the situation. This was evident when “the bilinguals made significantly more verbal transformations, reported

more different forms, and began hearing them earlier” than the monolinguals [5]. In the studies discussed, the bilingual superiority regarding metalinguistic capabilities can be observed in a wide variety of tasks. Bilingual children have shown that they are better able to interpret the differences between words in terms of their meaning rather than their sounds. They possess an increased ability to differentiate words from their semantic meaning, making them more aware of language skills than their monolingual peers. Data triangulation is present in regards to the studies done by Mohanty and Babu (1983) [7] and Ben-Zeev (1977) [5] since similar results were achieved by implementing different participants who spoke different languages and were from different places around the world. This increases the legitimacy of the research as it suggests that a bilingual advantage in metalinguistic awareness can be found in multiple locations, cultures and languages.

### Conclusion

From this investigation, it was found that **the fundamental cognitive processes that are linked with bilingualism have a positive effect on cognition in children**. Such effects are beyond the obvious benefit of knowing how to speak two languages. The empirical data that has been presented supports that children who learn two languages at an early age, and are balanced in terms of their knowledge of both languages will see greater cognitive gains than children who are monolingual or pseudo-bilinguals. In the earlier part of the nineteenth century, these findings were not evident. Researchers found that the monolinguals were superior to their bilingual counterparts on cognitive functions. These conclusions could be considered false, however, due to the array of methodological weaknesses that were present. The researchers did not utilize balanced bilinguals, but rather pseudo bilinguals in their samples. Furthermore, the bilinguals in these early research studies did not have the same socioeconomic status as their monolingual counterparts. Recent research studies such as the one done by Peal and Lambert (1962) [1], Kormi-Nouri (2008) [13] and Ben-Zeev (1977) [5] have employed balanced bilinguals and accounted for socioeconomic statuses in their samples. As a result of these considerations, positive effects were observed for bilinguals in the cognitive domain. Furthermore, greater amounts of positive effects were observed when bilinguals knew languages that had greater dissimilarities.

Upon analyzing empirical data from a wide array of peer edited psychological research, it was found that bilingual children are superior to their monolingual counterparts in four different cognitive capacities. Bilinguals have an **inhibitory advantage**—meaning that they are able to filter out the useless information and retain what is important. They benefit from **cross language interactivity**, which is when cognitive development is enhanced when an individual is in the midst of learning two languages and differentiating between the two. Greater **metalinguistic awareness** is also present, meaning that bilinguals are able to form an objective orientation towards language and its properties since they have the ability to encode their experiences in two different languages rather than one. Bilingualism also causes greater **cognitive flexibility**, or in other words, the ability to switch between different perspectives and think outside the box.

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