

Effects of Bilingualism on Cognitive Abilities

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Abstract

The aim of this study is to focus on the relationship of cognition, education and proficiency between first and second language in bilingual children. Other articles also support the notion that learning a second language in childhood is associated with positive cognitive gains. Bilingualism in children is positively related to concept formation, classification, creativity and analogical reasoning. We conducted our own study with Japanese students studying English in Gifu, Japan, and native-English students from Ontario, Canada. We had the participants take the Eiken level 5 test in order to compare the cognitive abilities of bilingual versus monolingual children. The results were in favor of the bilingual students.

Key words

Second Language Acquisition, Education, Cognition, Bilingualism, monolingualism

Introduction

The aim of this study is to focus on the relationship of cognition, education and proficiency between first (L1) and second language (L2) in bilingual children. It will also evaluate the evidence related to the cognitive development, linguistic proficiency and education in bilingual children and describe this development and proficiency compared to adults. It has been acknowledged that learning a second language has a positive effect on intellectual growth. It enriches and enhances a child's mental development; it leaves students with more flexibility in thinking, greater sensitivity to language, and a better ear for listening. It also improves a child's understanding of his/her native language.

On the other hand, it gives a child the ability to communicate with people he or she would otherwise not have the chance to know. It opens the door to other cultures and helps a child understand and appreciate people from other countries and gives a student a head start in language requirements for later school years. Jim Cummins, argues that the cognitive factor has a central role in the speed and success with which the language is acquired (Cummins, 1991). He also states that other individual factors, such as motivation, and conversational factors that determine the size and type of exposure to the second language, are also central to the acquisition process and interact with cognitive factors.

He adds that the process of second-language acquisition can be clarified by differentiating between two dimensions of proficiency, namely, the attribute-based and input-based aspects of proficiency. The cognitive and personality variables are examples of attributes that influence proficiency in acquiring a second language. The input-based aspects of proficiency are related to the quality and quantity of L2 input acquired from the environment. Cummins further argues that the differences between the two dimensions may not be apparent at the beginning, but over time the influences of each dimension will become more apparent on the individual. He also supports the view that there should be a distinction between contextualized (conversational) and de-

contextualised (academic) language in order to understand the nature of children's language and literacy development. Some examples of these distinctions are between communicative and analytic competence, utterance and text, conversation and composition. This view is also consistent with the view of another researcher, Biber (1986). Biber applies one of the distinctions concerning the difference between individual and environmental sources of influence in acquiring language proficiency to the problem of how the first language influences the development of proficiency in the second language. He adds a further distinction between contextualized and decontextualised uses of a language.

Other articles also support the notion that learning a second language in childhood is associated with positive cognitive gains. Bilingualism in children is positively related to concept formation, classification, creativity and analogical reasoning. In addition, bilingual children demonstrate a refined awareness and control of the objective properties of language, commonly referred to as metalinguistic skills.

Summary of previous studies

More recently, Bialystok (1986) has shown that children's bilingualism positively affects their increasing ability to solve problems involving high levels of control of linguistic processing. The research states that a number of researchers have produced substantial empirical evidence in their studies for making this distinction with regard to second language acquisition. In this respect, an empirical study was carried out on immigrant students who are originally Finnish and living in Sweden. It consists of studies reported by Linde and Lofgren (1988). The purpose was to assess the extent to which students' acquisition of Swedish (L2) academic skills is related to their Finnish (L1) proficiency.

A variety of tests in both languages were used; most assessed cognitive and academic abilities such as vocabulary knowledge, synonyms, antonyms, etc. as well as academic achievement in reading, math and other school subjects. The data can be summarized as follows: Those who attended school in Finland (prior to immigration) approached the level of achievement of normal Swedish pupils in the written comprehension test considerably more often than those who began school in Sweden. Those who attended school in Finland for at least three years did best.

Research has shown positive effects of bilingualism on the following metalinguistic abilities: early word distinction; sensitivity to language structure and detail; detection of ambiguities; correction of ungrammatical sentences and detection of language mixing and control of language processing.

However, an important question remains unresolved, no explanatory model of how or why bilingualism has such positive effects has yet been developed or tested. So far, it is not clear, for example, how bilinguals' metalinguistic skills are related to advantages in cognitive abilities not directly related to language, such as classification or visual skills. Another hypothesis put forward by Peal and Lambert (1962) stated that the possibility of switching linguistic codes while performing cognitive tasks gave bilingual children an added flexibility that monolingual children did not enjoy. This hypothesis gave rise to a popular concept regarding bilinguals' cognitive advantages, namely, bilinguals' cognitive flexibility. Even though some researchers have suggested caution in the interpretation of results on account of methodological shortcomings, the consistency of positive findings across different samples, measures, and research designs provides substantial support to the above hypotheses.

In another study carried out by Diaz and Klinger (1991), they stated that the positive effects of bilingual-

ism were so clearly connected to low levels of second language proficiency that a new threshold hypothesis was formulated. This was in contrast to Cummins' threshold hypothesis. Diaz suggested that only before a certain threshold of second-language ability, would bilingualism have a strong impact on cognitive ability. It seems that the data suggests that the effects of bilingualism on cognitive development are most likely mediated through the processes and experiences associated with early phases of second language learning in an additive context.

In a study of a sample of Mexican-American bilingual pre-school students, Diaz and Padilla (1985) reported positive effects of bilingualism on several age appropriate tasks of cognitive ability. A total of 32 pre-school students who attended Spanish-English bilingual pre-school programs in Texas, were videotaped while performing three different tasks: block designs, classification, and story-sequencing tasks. After brief instructions, children were asked to work on their own for a period of five minutes for each task. The effects of bilingualism on performance on the three tasks were analyzed in multiple-regression equations controlling for ability in the first language and months of preschool education. Children's degree of bilingualism predicted significant portions of performance variance in both classification and story-sequencing tasks.

In an article by Homel and Palij, they examine bilingualism and its relation with Cognitive development from three perspectives, namely: 1. Historical, 2. Examination of issues related to methodologies, and 3. The role theory has played in guiding research and what is expected to happen in the future. The authors argue that in the past, bilingualism was viewed as a worry for the parents. It was believed that it caused confusion in children and it impeded their first language learning abilities. However, since that time, a different picture has emerged, a picture which is optimistic and supportive of bilingualism in childhood. The turning point took place, however, in 1992 with the publication of Peal and Lambert's study of bilingual children in Montreal schools. Ironically, the original intention of the study was to document how bilingualism negatively affected intellectual performance so that appropriate solutions could be developed to solve the existing problems.

The result of the research was unexpected. Under a study of two groups, one monolingual and the other bilingual and after setting certain conditions and factors in place, the bilingual group performed significantly better than the monolingual group on most of the measures, including verbal intelligence. With regard to methodologies, they state that the differences in the results between earlier studies and the results of Peal and Lambert (1962) and later researchers could be due to the quality of the methodology used. Also, to be taken into consideration are the variables and factors introduced in earlier researches which may have caused the poor performance results of bilinguals. Their analysis with regard to the above agrees to a large extent with that of Cummins, Diaz and Klinger.

Starting in the 1960's and continuing into the 1990's, dozens of studies were conducted on the relationship between learning a second language early in life and cognitive ability. Robinson (1992) summarized many of them in one of his articles by concluding: "the picture that emerges is a youngster whose experience with two language systems seems to have left him or her with a mental flexibility, a superiority in concept formation, and a more diversified set of mental abilities." The studies also demonstrated that children who have studied a foreign language perform better on standardized tests and tests of basic skills in English, math and social studies. Data from the College Board's 1992 edition of College Bound Senior in the United States revealed that students who had four or more years of foreign language scored higher on the verbal sec-

tion of the School Test than those who had had four or more years in any other subject area. It is clear that the development of bilingualism is described by acquisition patterns both within the school context and outside the school.

Study

After analyzing the studies, we decided to conduct a simple study of our own in order to test the theories stating that bilingual children have a higher level of cognitive development than that of monolingual children.

We lead the study with Japanese students studying English in Gifu, Japan (G1), and native-English students from Ontario, Canada (G2). The study was carried out with the cooperation of Creative Kids Preschool of Alliston and Marty's International Kinder, Ogaki. In the study, a group of 10 students from each country (N = 20) was selected to participate in what is known in Japan as the "Eiken Grade 5 level Test". The criteria for eligibility into G1 were; (1) Children have to have been enrolled in the English school system for a minimum of 2 years, (2) Children had to have been monolingual (Japanese) before they entered school, (3) Children must be 5 years old at the start of the school year. As for G2; (1) Children must have attended Junior Kindergarten and currently be enrolled in Senior Kindergarten, (2) Children must be monolingual (English). Children from both groups were given sample questions from the test, prior to the examination, in order to familiarize themselves with the types of questions being asked. The instructions were translated from Japanese to English for G2, other than that, the test remained the same for both groups. The scoring for the test was divided into reading comprehension and oral comprehension.

The results were surprisingly positive in favor of G1. When it came to reading comprehension, G1's results were considerably higher than those of G2. The average score for G1 in the reading comprehension was 23/25, and for G2 17/25. As for the oral comprehension, G1 (21/25) and G2 (23/25) shared similar results.

In concurrence with the results from the other professionals mentioned earlier, we could explain the results as follows: G1 had greater cognitive abilities in reading comprehension due to the mental flexibility they acquired when learning a second language. Having two languages at their disposal, G1 was able to understand concepts in either language and apply it to the other.

Discussion

"Bilingualism is to intelligence as food is to human fitness A simple statement about bilingualism and intelligence is as impossible as prescribing one simple food for human survival" (Baker 1988). For 30 years experts have had ongoing discussions concerning the bilingual child and his mental abilities relating to intelligence and education. Originally, experts believed that a bilingual person could not be an intellectual, since he/she was carrying two or more languages in their head. Consensus has changed considerably over the past three decades, with the development and use of new testing. Children with bilingual ability offer an opportunity for researchers' to explore the connections between language and thought (Bialystok, 2002). Bilingual children have advantages in education, due to cognitive development, divergent thought, and mental flexibility.

Cognitive ability relates to mental activity, such as thinking, remembering, learning, or using language. Research demonstrates the differences in cognitive functioning between monolinguals and bilinguals. Analysis and control are language components that develop later in monolinguals than in bilinguals (Bialystok,

2002). These abilities refer to representation and selective attention in language that aid in comprehension and understanding. Adults who speak two languages in childhood are profoundly affected in their cognitive development. This advantage can manifest itself in several ways. The majority of field researchers conclude that this ability allows bilinguals the advantage of diversity and flexibility in cognition to a significant level over monolinguals (Latham 1998, 79). Gonzalez proposes that bilingual children naturally develop cognitive representation verbally, non-verbally, and symbolically. Truly bilingual students surpass monolingual students on many intelligence tests, both verbal and nonverbal. Language fluency is determined by listening, speaking, and reading abilities (Rosenberg 1996).

However, since levels of bilingualism exist, the affect to cognitive development is correlative. In a study conducted by Ellen Bialystok, both monolingual and bilingual children were shown sets of cards depicting red and blue boats and rabbits. They were then asked to separate the cards based first on color and later on subject. The bilingual children demonstrated the ability to separate and distinguish between the first instructions and the second set of instructions. The tendency was for the bilingual subjects to perform as requested with disregard to the previous test's parameters. They, therefore, demonstrated a level of superiority in the cognitive function of analysis and control. Single language children are less effective at solving problems, which contain distracting, but pertinent information. Also according to Bialystok's research, this superiority is expected to continue because of the representative function (higher order rule) as awareness and inhibition is needed to solve the problem. Representative function relates directly to executive functioning.

Executive functioning of cognitive development allows for internal prioritizing of valuable information for the retrieval at a later time. Without this ability for example a woman would be unable to plan and structure her day at the office and, therefore, would complete nothing during the day. Executive functioning is a valuable tool in respect to learning and cognition (Bialystok 2002). Bialystok believes that the development of executive functioning is positively impacted by the bilingual ability. Latham also agrees bilingualism is conducive to cognitive development. Executive functioning leads to mastery of metalinguistic awareness.

Metalinguistic awareness is strengthened by bilingual capability. This awareness allows an individual to associate different sources of information in language and consequently apply it to other areas of thought and aids in problem solving ability. This ability is a resource in word recognition. Intelligence development is positively impacted by metalinguistic awareness. Metalinguistic awareness is a key contributor to divergent thinking as well as creativity and the ability to think freely. It has been supported by many years of research in the field that generally bilingual subjects are superior to monolinguals in the arena of divergent thinking.

Divergent thinking is creativity, imagination as well as the ability to think freely and maintain an open mind in respect to the acquisition of knowledge (Baker 1988). This ability was also demonstrated in the boats and rabbit test conducted by Bialystok. Since the children demonstrated the ability to process the information in a way that accomplished the task asked of them. Divergent thinking is also demonstrated in other tests that were analyzed by Colin Baker. Baker speaks of a test involving an empty metal juice can. The participants are asked to list as many uses as they can in a limited amount of time for the can in question. The measure of the test is to gauge the number of original uses for the object. If a participant offered the suggestion of a bed for a pet (hamster) and the also for a cage the two answer only gain a score of one, since the solutions are not independent. If the answers are: pet bed, pet cage, insect house, hair roller, hole for golf green and tie

together and put a board on top to make a raft, then the score is four due to the original nature of answers (Baker 1988). In the orange juice can study it was concluded that the bilingual children gave more diverse solutions for the use of the orange juice can, tending to offer more classifications with less inconsistency and more attention to detail (Baker 32). Due to the process of divergent thought and the creative imagination, bilinguals gave more varied and valid answers (Baker 1988). Creative or divergent thinking is based in the acquisition of a varied knowledge base (Feldhusen 2002).

Conclusion

Being bilingual may give advantages to individuals because of greater mental flexibility, concept superiority, information diversity, and higher verbal IQ ability. It is believed that bilinguals have an advantage in mental skill sets and flexibility. The dominant belief at this time is that there is a superiority of divergent thinking abilities among bilinguals. The ability of children with two languages gives rise to control and divergent ability over problems of a nonverbal nature due to the diversified skill sets at work. Therefore the problem solving process is different from others used previously at a young age by children who only have a single language knowledge base. Due to this flexibility, and increased knowledge base, bilingual children are more likely to express themselves without the constraints of symbols. When a child must learn their literacy skills in two languages at the same time the advantage of bilingualism may be lost. Children must discover the relation between written code and sound, as well as, sound to written code (Estes 2002). Bernardo agrees, and proposes the use of word problems in dominant language for the acquisition of math knowledge. Thus, we can say that children can learn second language quickly as compare to the adults.

Reasoning behind this research study was to help justify and clarify the rearing of the researcher's children who are both four years old in a bilingual environment. The children in question have the cognitive ability to relate in two languages their thoughts, memory, and compared to others they seem to learn seamlessly. Their thinking pattern when engaged in either of the two languages seems to switch instantly within their surroundings. Raising children in a bilingual setting, we can see first hand the difference in the cognitive process.

Works Cited

- Baker, Colin. *Key Issues in Bilingualism and Bilingual Education*. Philadelphia: Multilingual Matters. 1988.
- Bialystok, E. "Children's concept of word." *Journal of Psycholinguistic Research*, 15 (1), 13-32. 1986.
- Bialystok, Ellen. "Acquisition of Literacy in Bilingual Children: A framework for Research." *Language Learning* 52. 1 : 159-99. 2002.
- Biber, Douglas. "Spoken and written textual dimensions in English: Resolving the contradictory findings. Language". *Journal of the Linguistic Society of America*. 1986.
- Cooper, T. C. "Foreign Language Study and SAT-Verbal Scores." *The Modern Language Journal*, 71/4, 381-397. 1987.
- Cummins, J. "Interdependence of first- and second-language proficiency in bilingual children." In: Bialystock, E. *Language Processing in bilingual children*. New York: Longman. 1991.
- Diaz, R. M., & Padilla, K. "The self regulatory speech of bilingual preschoolers." Paper presented at the 1985 Meetings of the Society for Research in Child Development, Toronto, Canada. 1985.
- Diaz, R. M. and Klingler, C. "Towards an explanatory model of the interaction between bilingualism and cognitive development". In: Bialystock, E. *Language Processing in bilingual children*. New York: Longman. 1991.

- Estes, Thomas H. and Herbert C. Richards. "Knowledge of Orthographic Features in Spanish Among Bilingual Children." *Bilingual Research Journal* 26. 2 : 213–25. 2002.
- Feldhusen, John F. "Creativity: the knowledge base and children" *High Ability Studies*. 13. 2 : 179–83. 2002.
- Latham, Andrew S. "The advantages of Bilingualism." *Educational Leadership* 56. 3: 79–80. 1998.
- Linde, Sylvia G., and Horst Löfgren. "The Relationship between Medium of Instruction and School Achievement for Finnish-Speaking Students in Sweden" *Särtryck och småtryck från Institutionen för pedagogik och specialmetodik*, Lärarhögskolan, Malmö, 637. 1989.
- Palij, M. and Homel, P. "The relationship of Bilingualism to Cognitive Development: Historical, Methodological and Theoretical Considerations." In: Homel, P., Palij, M., Aarson, D. *Childhood Bilingualism: Aspects of Linguistic, Cognitive, and Social Development*. New York University. Lawrence Erlbaum Associates Publishers. London 1987.
- Peal, E., & Lambert, W. E. "The relation of bilingualism to intelligence" *Psychological Monographs*, 76 (27, Whole No. 546), 23. 1962.
- Robinson, D. W. "The Cognitive, Academic and Attitudinal Benefits of Early Language Learning." In Met, M., ed. *Critical Issues in Early Language Learning*. White Plains, New York: Longman. 1992.
- Rosenberg, Marsha. "Raising Bilingual Children." The Ambassador, The American School in Japan Alumni & Community Magazine Spring 1996. (<http://iteslj.org/Articles/Rosenberg-Bilingual.html>). 29 July. 2008.

