

# Cognitive advantages of balanced bilingualism

*Luz Marina Vásquez Carranza*<sup>1</sup>

Recepción: 21 de abril de 2008 / Aprobación: 8 de septiembre de 2009

## Abstract

Even though before the 1960's bilingualism was generally blamed for detrimental effects on cognitive development, various researchers have argued that studies carried out before that date included unbalanced bilinguals or bilinguals from minority groups; their results were hence unreliable. In contrast, many contemporary studies have reported positive cognitive effects of balanced bilingualism, especially regarding metalinguistic skills (i.e., the ability to look at language rather than through it to the intended meaning). By and large, studies that have administered metalinguistic tasks such as grammaticality judgment tasks, word awareness tasks, phoneme segmentation tasks, and Appearance-Reality tasks to groups of balanced bilingual and monolingual children of comparable ages report superior performance by the bilingual children; the latter group shows greater levels of control and analysis, which are fundamentally metalinguistic skills. Based on the meta-cognitive advantage argued for bilingual children, the author stresses the need to design true bilingual programs accessible to all children so these can have the same cognitive advantages as balanced bilingual children appear to have.

**Key words:** metalinguistic skills, balanced bilingualism, cognition, advantages of bilingualism.

## Resumen

Aún cuando antes de los años sesenta el bilingüismo era acusado de tener efectos negativos en el desarrollo cognitivo, varios investigadores han alegado que tales estudios incluían niños bilingües no balanceados (i.e., con niveles de competencia lingüística diferentes en los dos idiomas) o niños bilingües de grupos minoritarios; tales resultados no eran válidos. En comparación, muchos estudios recientes han reportado efectos cognitivos positivos en el bilingüismo balanceado, en particular en lo que se refiere a habilidades metalingüísticas (i.e., la habilidad de ver el lenguaje y no a través de este para discernir su significado). En su mayoría, los estudios que han aplicado pruebas metalingüísticas tales como juicios de gramaticalidad, conocimiento de palabra, segmentación de fonemas y pruebas de Apariencia-Realidad a grupos de niños(as) bilingües y a niños(as) monolingües de edades afines, reportan resultados superiores en los grupos bilingües; estos han mostrado niveles más altos de control y análisis, los cuales son habilidades fundamentalmente metalingüísticas. Con base en las ventajas meta-cognitivas que se adjudican a los y las niñas bilingües, la autora enfatiza la necesidad de desarrollar programas verdaderamente bilingües que sean accesibles a todo niño o niña para que estos puedan disfrutar de las mismas ventajas cognitivas que tienen los y las niñas bilingües balanceados.

**Palabras clave:** habilidades metalingüísticas, bilingüismo balanceado, ventajas del bilingüismo.

## INTRODUCTION

Before 1962, bilingualism was generally blamed for detrimental cognitive effects; in fact, many early studies on the relationship between bilingualism and cognition referred to bilingualism as a 'language handicap'. Bilingualism was blamed for hindering bilingual children's intellectual development on academic tasks, since intellectual potential presumably depends heavily on verbal abilities (as reported in Darcy, 1953 and Díaz, 1983). According to Díaz, early studies described bilingual children as

having smaller lexicons, deficient articulation, lower standards in written composition, more grammatical errors, and lower non-verbal abilities (i.e., limited mathematical competence), as compared to monolingual children of the same age. These negative connotations about bilingualism were mainly based on bilingual children's poor achievement on verbal and academic tasks.

However, many contemporary researchers have pointed out that most studies before the 1960's involved bilingual children from disadvantaged

1. Ph.D. en Lingüística Aplicada con énfasis en desarrollo del lenguaje y profesora en la Sección de Lenguas Modernas, Sede Regional Occidente, Universidad de Costa Rica; [lvasquez@so.ucr.ac.cr]

minority socio-economic groups; that is, children from immigrant labor families whose first language was gradually being replaced by the dominant language. In contrast, the monolingual children used as control groups in such studies normally belonged to dominant occupational and executive classes (Díaz, 1983; Cummins, 1979). Similarly, early studies also ignored the children's degree of bilingualism; in fact, in studies such as Brunner (1929; cited in Díaz, 1983), the degree of bilingualism was determined based on the foreignness of the parents, while according to Díaz, other studies did so based on family names or place of residence. Díaz even states that most of the children in early studies were at best monolinguals with a minority language. Given the inconsistencies involved in early studies, a strong claim in recent years is that unfavorable claims about bilingualism are unreliable (Cummins, 1978 & 1979; Díaz, 1983; Bialystok, 1988).

Starting with a study carried out by Peal and Lambert (1962), much research has clearly supported the claim that bilingualism itself does not cause academic delays. In fact, the great majority of these studies present clear evidence of various positive effects that bilingualism appears to have on cognitive development.

In an effort to understand why bilingualism might have negative effects on cognitive development, Cummins (1979) proposed a theoretical framework that assigns a central role to the interaction between socio-cultural and linguistic factors in explaining the academic and cognitive development of bilingual children. He proposed the Threshold Hypothesis, which states that in order for bilingualism to be beneficial, a bilingual child must attain a *threshold* level of linguistic proficiency in the two languages. According to Cummins, the aspects of bilingualism that might possibly influence cognitive growth are unlikely to exert a significant long-term effect unless the child is truly a balanced bilingual (i.e., having a similar level of proficiency in the two languages). He further suggested that a higher threshold level is necessary in order to evidence accelerated cognitive growth; "bilinguals with high levels of proficiency in both languages should show a clearer correlation with academic success" (Cummins, 1979, p.230).

Given that balanced bilingual children appear to show advanced cognitive skills, this article only reviews empirical studies that have assessed the correlation

between *balanced* bilingualism (as defined by Cummins, 1979) and cognitive development. Additionally, given that the large majority of studies have assessed metalinguistic skills (defined in detail below), and due to limitations in length, this report only reviews studies that have looked at four types of metalinguistic skills: syntactic, word awareness, phonology, and Theory of Mind (defined later). By studying the possible cognitive benefits of bilingualism, one can establish a clear relationship between language and cognition, which is the aim of this review.

At the outset, the article reviews possible reasons why bilingualism shows positive effects on cognitive development; this is done from a historical perspective. Subsequently, a definition of metalinguistic skills is presented, together with reports on various studies that have assessed metalinguistic skills in balanced bilingual children at various levels. The final section summarizes the main conclusions from all the studies and brings up the implications from the argument that balanced bilingualism might enhance cognitive growth, as well an interpretation regarding the relationship between language (in this case, balanced bilingualism) and cognition.

## **WHY DO BILINGUALS SHOW COGNITIVE ADVANTAGES?**

### **A HISTORICAL ASSESSMENT**

In his study on the simultaneous acquisition of German and English by his daughter, Leopold (1961) postulated that simultaneous bilingual children appear to show great ability to recognize the arbitrariness of language meaning, and that bilingualism promotes an early separation of the word sound from the word meaning. This arguably leads to an early awareness of the conventionality of words and the *arbitrariness* of language (i.e., that language symbols are not inherent properties of lexical items). Along the same lines, Vygotsky (1962) suggested that the bilingual child's ability to express the same thought in different languages would enable him/her to see language as one particular system among many, which would lead to awareness about linguistic operations.

Peal and Lambert (1962) in a study with English-French bilingual children and French monolinguals revealed that the bilingual group showed superior responses on tasks requiring mental manipulation

and reorganization of visual stimuli than the French monolinguals (the control group). Peal and Lambert were the first to suggest that bilingual children appear to think verbally while performing nonverbal tasks, and that they switch from one language to the other while carrying out the task; these two features stimulate the bilingual child's ability to "more readily discard doubtful hypotheses and formulate new ones to find a correct solution to the problem involved" (originally cited in Díaz, 1983, p.35).

Lambert and Tucker (1972) proposed that bilingual children engage in a form of contrastive linguistics as they compare similarities and differences between the lexicons and syntactic structures of their two languages; this allows for a greater analytic orientation to language than that shown by monolingual children.

Bialystok and Ryan (1985) stated that bilingual children appear to outperform their monolingual peers in tasks that demand high levels of control; that is, ability to selectively attend to specific aspects of a representation, particularly in sentences that contain semantic errors. The same applies for tasks demanding high levels of analysis; that is, ability to represent increasingly explicit and abstract structures. Yet, according to Bialystok (1988), only the more balanced bilingual children show higher degrees of analysis. High levels of control and analysis lead to "an increasingly metalinguistic and literate use of language" (Bialystok & Ryan, 1985, p.635), and numerous studies have shown bilingual children's advanced *metalinguistic skills* (e.g., Ben-Zeev, 1977, Ianco-Worrall, 1972, Vygotsky, 1962, Cummins, 1978 & 1979; Bialystok, 1988 & 2001, Bialystok & Senman, 2004; Tunmer & Myhill, 1984).

Before presenting details on these studies, it is imperative to provide a working definition for *metalinguistic skills*. According to Cummins (1978), metalinguistic skills are "the ability to look at language rather than through it to the intended meaning" (p.57). Cromdal (1999) points out that metalinguistic skills apply to all levels of language and that they are instantiated whenever people reflect on rhymes, synonymy, or grammaticality. Bialystok (2001) states that metalinguistic skills are very complex and

that they include at least three different elements: knowledge, ability, and awareness. She further states that metalinguistic knowledge refers to the abstract structure of language that unconsciously organizes rules; metalinguistic ability is the capacity to use knowledge about language and not just the ability to use language, and metalinguistic awareness refers to one's consciousness about events. Bialystok (2001) claims that while both, monolingual and bilingual children develop metalinguistic knowledge, balanced bilinguals appear to develop metalinguistic ability and awareness earlier than monolinguals. Bialystok argues that any linguistic skill is a candidate for a metalinguistic counterpart in development; therefore, metalinguistic skills (which are cognitive domains) are normally classified according to the aspect of linguistic skills from which they derive (syntax, word awareness, phonology, semantics, or pragmatics). Nevertheless, Bialystok states that metalinguistic skills are separate from linguistic skills in that the former has a higher level of demand (i.e., attention to form rather than to meaning, talking about language rather than simply using it).

Many researchers have argued that there is a clear correlation between metalinguistic skills and high levels of reading acquisition and academic achievement, both of which also require high levels of analysis and control (Tunmer & Myhill, 1984; Bialystok, 2001).

### **Studies on metalinguistic awareness**

A large number of studies have reported various cognitive benefits in bilingual children at a metalinguistic level,<sup>2</sup> although numerous studies have also reported benefits at other cognitive levels. Many tasks and variations of the same tasks have been used to assess bilingual children's performance on metalinguistic tasks. While some tasks assess syntactic awareness, others test language arbitrariness, and others assess phonological awareness.

#### **a. Tasks on syntactic awareness**

According to Cromdal (1999), syntactic awareness refers to the ability to detect and correct grammatical

2. Several non-linguistic positive cognitive effects have also been reported for bilingual children, including conservation and measuring of length, solution of linear numerical problems, matrix transposition and naming dimensions and verbal transformation abilities, concept of horizontal coordinates and ability to perceive and analyze patterns (e.g., Liedke & Nelson, 1968; Bain, 1974; Ben-Zeev, 1977; Bialystok & Majumder, 1998); however, these studies will not be included in the present review, as the paper focuses primarily on metalinguistic skills.

errors by focusing on the form of a sentence. Cromdal argues that bilingual children have great ability to pay attention to form and to ignore meaning because they are constantly inhibiting one of their two languages; they seem to have an earlier onset of analysis and higher levels of control than their monolingual peers for whom “explicit representations of language may be of lesser importance for everyday communication” (Cromdal, 1999, p.5). Syntactic awareness is normally assessed through *grammaticality judgment tasks*, which assess the degree of analysis and control that children possess. High levels of control are required in suppressing semantic anomalies, whereas analysis is required in detecting errors and correcting grammatical as well as semantic errors.

Bialystok (1986) examined bilingual children’s ability to solve grammaticality judgment tasks, as compared to monolinguals. She conducted a study with two different populations. The first group of children included 119 five- to nine-year-olds; 50% of these children were bilingual, English being their second language and the language spoken at school and in their community. The second group included 128 children whose first language was English. Half of these children were in an immersion French program, and they were the same age group as those in the first study. The overall results showed that the bilingual children in both groups outperformed the monolingual students in judging ungrammatical sentences and sentences that were ungrammatical and meaningless, in correcting sentences that were ungrammatical, and in identifying sentences that were both ungrammatical and meaningless. The study revealed that, unlike stated in most other studies, children as young as age five (5) are able to succeed in grammaticality judgment tasks, although older children are more successful.

Similarly, Bialystok (1988) assessed grammaticality judgments in a group of 17 first grade French-English bilingual children and 20 monolingual English children. The children were asked to identify the errors (verb tense, negation, particle placement, agreement, or word order) in a set of English sentences and to correct them. The results showed a significant advantage for the bilingual group, who corrected more syntactic errors than their monolingual peers; they showed greater levels of analysis.

In a different study, Bialystok and Majumder (1998) administered a grammaticality judgment task that

included four types of sentences: 1) sentences that were grammatically correct and meaningful (e.g., ‘the dog barks’), 2) grammatically incorrect and meaningful (e.g., ‘the dog bark’), 3) grammatically correct but not meaningful (e.g., ‘the dog meows’), and 4) grammatically incorrect and not meaningful (e.g., ‘the dog meow’). The children were instructed to listen to the sentences and to determine if they were grammatical irrespective of whether or not they were meaningful. This study included 28 monolingual English-speaking children and 26 French-English bilingual children whose mean age was 8;7 (i.e., eight years and seven months). The bilingual children performed better than the monolingual children in all types of sentences, although the difference between the two groups was not statistically significant with regard to the analysis tasks (sentence types 2 and 4). These researchers specified that the bilingual children had performed the grammaticality judgment task in a language that was not the language of schooling, namely English, which was also the “relatively weaker” language for some of the subjects (p.81).

Correspondingly, Cromdal (1999) applied a grammaticality judgment and correction task to 16 English-Swedish bilingual children and 16 Swedish monolinguals (6 to 7 year-olds). The types of sentences and procedures used were identical to those in Bialystok and Majumder (1998). The balanced bilinguals correctly identified ungrammatical meaningful sentences more often than the monolinguals, whereas only minimal differences between the two groups were evidenced in the ungrammatical anomalous sentences; Cromdal proposed that children found this task “too confusing” (p.18), as most of the children rejected these sentences due to the meaning distortions.

These studies based on grammaticality judgment tasks suggest that balanced bilinguals develop the ability to reconstruct linguistic knowledge (analysis) earlier than monolinguals. This might result from the fact that bilingual children are forced to create various hypotheses about language structure, and they continually have to elaborate on their rules in order to separate the two language systems accordingly (as proposed by Peal & Lambert, 1962).

## **b. Tasks on word awareness**

Tasks on word awareness examine children’s ability to look at language in an objective manner (Cummins,

1978). Some tasks require counting the number of words in a sentence or phrase, others require defining the term 'word', and yet others evaluate the child's understanding about the *arbitrariness* of language. According to Bialystok (2001), the solution to word awareness tasks depends on high levels of control, a fundamental part of metalinguistic skills. Bilingual children have to maintain their two languages separate, which promotes continuous self-monitoring; they are also more aware about the arbitrariness of language by having two labels for most words in their lexicon.

Several researchers have applied the *symbol or word substitution test* designed by Piaget (1929; reported in Bialystok, 2001), which asks children whether it is possible to change the names for the 'sun' and the 'moon' (the sun-moon problem), and if so, what would the sky look like at night. According to Bialystok (2001), this task demands control of processing, as the children have to ignore their usual experiences with concrete words such as 'sun' and 'moon' in order to manipulate the names of such objects.

Feldman and Shen (1971) studied 15 Mexican Spanish-English balanced bilinguals, aged 4 to 6 and 15 English monolinguals of the same age. Their test, which they called the *naming task*, required children to label common items, to learn nonsense names, and to switch common names (calling a 'cup' a 'plate', for example); furthermore, the children were to switch labels in simple relational sentences. The results evidenced that both groups of children found switching names harder than either using ordinary names or learning new nonsense labels. Bilingual children, nonetheless, showed superior performance in the use of ordinary names in relational statements and in the use of switched names.

Ianco-Worrall (1972) also administered a variation of Piaget's test to a group of 30 4 to 6 and 7 to 9 year-old Afrikaans<sup>3</sup>-English balanced bilinguals and to 60 monolingual speakers (30 Afrikaans speakers and 30 English speakers). Her task involved two parts. The first part asked children whether or not names could be interchanged, and the second part asked them to exchange names in play. Furthermore, after substituting the word 'cow' for the word 'dog',

the children were asked whether this 'cow' could give milk. While the great majority of monolinguals refused to interchange the words, the majority of bilinguals agreed that in principle this could be done. Regarding the ability to interchange the names of objects in play improved with age, but there were no differences between the bilingual and monolingual children. Ianco-Worrall concluded that the notion of arbitrariness appears to develop later than the ability to separate the qualities of objects from their names.

Ben-Zeev (1977) tested 96 Hebrew-English balanced bilinguals (5;4 to 8;6 year-olds) and two groups of monolinguals (English and Hebrew) on a similar task. The children were required to substitute a meaningful word for another in a sentence (substituting 'I' for 'spaghetti'). These results also showed superiority by the bilingual group as compared to the monolinguals.

Cummins (1978) referred to the same procedure as the *arbitrariness of language task*. His study included 53 Irish-English balanced bilingual children (40 third graders and 13 sixth graders) and 53 English monolingual children. He asked these children whether it was possible to change the names for things. First, the children had to solve the 'sun/moon' problem as designed by Piaget (1929). Next, the same task was applied; this time using a different pair of words (e.g., cats/dogs). The results revealed marked differences between bilinguals and monolinguals; while 70% of the bilinguals accepted the possibility that the names could be changed, only 27.5% of the monolinguals did so. However, the justification of why names could be changed showed a less significant difference between the two groups, which, as suggested by Cummins himself, should be interpreted with caution because application of the principle of arbitrariness is not necessarily more revealing of cognitive knowledge than the ability to state it (i.e., there was no correlation between the name changing task and IQ). The exact same tasks were applied to balanced bilingual French-English children by Bialystok (1988). Her results were identical to those in Cummins' study. Bialystok pointed out that the two groups of children had shown greater resistance to changing the names of familiar concrete objects ('cats' and 'dogs'), and she

3. Afrikaans is a Indo-European language derived from Dutch. It is mainly spoken in South Africa and Namibia (Wikipedia, Accessed On-line, April, 2008).

suggested that perhaps the two tasks might not be equivalent and that children might see celestial bodies as different from familiar objects. Furthermore, the dog/cat task was more concrete than the sun/moon task; as Bialystok herself stated, perhaps the task “was not strictly metalinguistic but included elements of a concept-formation problem” (p.564).

Cromdal (1999) asked the children in his study to substitute a word such as ‘hamburger’ for another, such as ‘tiger’, but they were instructed to only use the *singular* form (‘most hamburger is very fast’). The task was designed to place high demands on children’s ability to control linguistic processing (accepting the symbol switch, recognizing arbitrariness between word and referent, and tolerating grammatical errors). Bilingual children performed significantly better than did their monolingual peers in this task, which according to Cromdal evidenced superior concept formation skills. The bilinguals’ superior ability to ignore grammatical errors seems to suggest their great metalinguistic ability.

Several similar tasks have also been used to assess children’s understanding of the arbitrariness inherent in language. Cummins (1978) for example, used the *meaning and reference task*, which assessed the child’s belief in the stability of meaning of words in instances of disappearing of the empirical referent. The subjects were asked for the meaning of nonsense and real words (e.g., ‘flimp’ and ‘giraffe’), and then they were required to describe the referent of the word. Finally, they were asked to imagine that the item described had ceased to exist, and to state whether the meaning of the word had changed once the item no longer existed. No significant differences were attested for the younger group (the 3<sup>rd</sup> graders), although “there was a trend towards bilingual superiority on the ‘flimp’ item” (p.139). Nonetheless, regarding the older children (6th grades), the bilingual group performed correctly 84.6% of the time, whereas the monolinguals performed correctly only 38.5% of the time. This task showed that bilingual children are better able to accept that the meaning of a word is totally independent from the physical existence of its referent; that is, they were better at accepting that the meaning of the word did not cease to exist once the item disappeared.

A similar task used by Feldman and Shen (1971), namely the *object constancy task*, tested simple comprehension measures. The first part of the

study consisted of physically transforming each of several objects so that, for instance, a paper plate was spray-painted. The transformations were done in front of each child, and then the ‘transformed’ object was placed next to a second object identical to the ‘pre-transformed’ object; each child was asked ‘which one was the one that I showed you before?’ Bilinguals outperformed their monolingual peers, showing a greater awareness about the arbitrary nature of language; they answered correctly 94.7% of the time, whereas monolingual children only did so 84% of the time.

Ianco-Worrall (1972) too assessed whether bilingual children are aware that words are arbitrary by calling for explanations of names. Specifically, she asked her subjects to explain why a ‘dog’ for example, was called a ‘dog’. No differences were attested between the bilingual and the monolingual group; most children provided an explanation based on attributes of the given word; for example, “a cow is called a cow because you milk it”. (p.1396). As put forward by Cummins (1978), applying the concept of arbitrariness might not show better cognitive skills; similarly, perhaps this task did not directly test for awareness about language arbitrariness but about concept formation.

Cummins (1978) administered the *non-physical nature of words task*. The task required children to determine whether a given word, say ‘book’ resembles the features of its referent (whether the word ‘book’ is made of paper, for instance). The results revealed that 3<sup>rd</sup> grade bilinguals provided an accurate answer 57.5% of the time, whereas the same age-group monolinguals answered correctly only 47.5% of the time. Regarding the older children (the 6<sup>th</sup> graders), the bilingual children answered correctly 92.3% of the time, whereas the monolinguals did so only 84.6% of the time. Cummins concluded that the bilingual children appeared to have great linguistic flexibility but not significantly greater reasoning abilities for problems that extended beyond the domain of language.

A very similar task is the concept of word task used by Bialystok (1988). The children in this study were presented with words or phrases, and they were asked whether each one was a word or not; they also had to explain their answer. A second part of the task asked the children to define what a *word* is and how one can tell when something is a word. The balanced

bilingual children performed better regarding the judging problem; similarly, in the definitions problem the responses by the bilingual children “indicated the most sophistication and the greatest level of formal knowledge of concept” (p.564).

Rosenblum and Pinker (1983) studied the extent to which 12 Hebrew-English bilingual children and 12 monolingual English-speaking children showed differences regarding their conception about the arbitrariness of language. The bilingual children were balanced bilinguals, and the average age for the monolinguals was 4;9, whereas the average age for the bilinguals was 5;1. The children were asked to substitute a nonsense word for an actual word, and the results showed no differences between the bilingual and the monolingual children. Nonetheless, Rosenblum and Pinker reported important differences regarding the explanations for their behavior: bilinguals offered more reasons than monolinguals did, and monolinguals referred to the attributes of objects (for example, that the name for ‘table’ could be substituted by ‘shig’ because it still had four legs), whereas most bilinguals explicitly stated that names could be changed under certain circumstances due to their arbitrary nature. The fact that all the children included in this study had parents who were professionals might have caused the difference in results from previous studies, as all the children (monolingual as well as bilingual) might have been exposed to reading and other literacy conditions in their homes. Yet, it is apparent that the bilingual children in this study showed better reasoning skills than did their monolingual peers.

### c. Tasks on phonological awareness

Phonological awareness refers to the ability to segment and manipulate the sounds of speech, which appears to predict children’s initial progress in learning to read; there is a clear correlation between phonological awareness and the acquisition of alphabetic literacy (Bialystok, 2001). Unfortunately, very few studies have assessed phonological awareness in bilingual children, and most such studies have included unbalanced bilinguals (Bruck & Genesee, 1995). However, at

least two studies by Bialystok, Majumder, and Martin (cited in Bialystok, 2001) have examined this phenomenon in 5, 6, and 7 year-old balanced French-English bilinguals. They used the *phoneme substitution task*, which asked children to replace the first sound in a given word such as ‘cat’ with the beginning sound of another word such as ‘mop’; then each child had to state what the new word was (‘mat’). The preliminary results showed no differences between the bilingual and monolingual children in their ability to solve the problem. A subsequent study was conducted with two different groups of balanced bilinguals of the same age (Chinese-English and Spanish-English) and three different phonological tasks: the *sound naming task* (i.e., selecting which of two words matched a target for either the sound or meaning), the *segmentation task* (i.e., determining the number of phonemes in common words), and the *phoneme substitution task*. Only the Spanish-English bilingual group showed any advantages, and this was only for the segmentation task. These researchers suggested that there is “some advantage to bilingual children in learning about the sound structure of spoken language, but it is evident only on relatively simple tasks and apparent only for children whose two languages bear some resemblance to each other” (p.143).

### d. Other cognitive tasks

In a recent study, Bialystok and Senman (2004) explored a different connection between cognition and bilingualism by examining children’s development of Theory of Mind (ToM); a meta-analysis type of task that marks the beginning of a person’s ability to develop theories about the world and how things work. ToM refers to children’s ability to understand that others have beliefs that are independent from them -- the children—(Wellman, Cross, and Watson, 2005). ToM develops at pre-school age (i.e., at around age 4;0),<sup>4</sup> and it coincides with the development of cognitive processes such as planning, inhibition, mental flexibility, representation, and working memory (e.g., Carlson & Moses, 2001; Duncan, 1986).

4. Before age 4, children who are presented with an object that looks like something deceiving (e.g., a sponge that looks like a rock) will say that the object is what it looks like even if they are explained that it is something else; their assessment is based on realia alone (on what they see). Furthermore, if they are asked to state what they think another person would say the object is, they would argue that the other person would think as they do; i.e., they do not understand that other people have their own beliefs about reality, different from theirs (Astington & Gopnik, 1991; Carlson & Moses, 2001).

The researchers predicted that, given the high levels of control that bilingual children have been shown to possess, they would be more successful than their monolingual counterparts. The study included Appearance Reality tasks in order to test the children's ToM. The first task involved a reality question: each child was presented with an object that was deceiving in that it was not what it appeared to be (e.g., a box of crayons that, instead of having crayons inside, had legos); the children were asked what they thought the objects were (e.g., a box of crayons) and what the objects truly were, once the contents in the object were revealed (e.g., a box of legos). This task additionally involved a false-belief task where children were asked what another person would think the object was, after they (the children) knew the object's true identity. The second task involved representational objects (i.e., objects that represented a function but that did not constitute the real object themselves, as in the case of a book shaped like a snowman). Both tasks demanded high levels of inhibition, as the children had to ignore pre-conceived concepts and assign new, unexpected ones. Fifty-two monolingual and forty-three bilingual children with a mean age of 4;5 were tested. The bilingual children outperformed the monolingual children, arguably as a result of their high inhibitory skills developed in their need to switch back and forth from one language to the other.

## CONCLUSIONS AND IMPLICATIONS

In contrast to studies on the relationship between bilingualism and cognition carried out before the 1960's, the great majority of studies described here showed that balanced bilingual children perform better in metalinguistic tasks. In grammaticality judgment tasks, for example, bilingual children by and large evidenced a superior ability of selection by applying knowledge at will, as they noticed more semantic errors and were able to correct more grammatically and semantically erroneous sentences (i.e., high levels of control and analysis). These results suggest that selective skills develop earlier in bilingual children than in monolingual ones, at least at the syntactic level. The difference between the two groups presumably results from the bilingual's particular language experience where he/she is constantly forced to create hypotheses about language structure and to change or elaborate on such rules in order to match the language of the context (they are able to overlook semantic errors and to focus on language structure instead).

The tasks assessing word concepts also revealed a higher awareness about the arbitrariness of language on the part of the balanced bilingual children; they accepted that word labels could be changed without changing the essence of things more often than did the monolingual children, and they also showed a clear understanding of the conventional relation by which words convey designated meanings. As stated by Bialystok (2001), the studies described here suggest that the bilingual child is better able to ignore meaning and focus on formal instructions, whereas monolingual children appear to be "wedded to the familiar meanings of words" (Bialystok, 2001, p.136). Furthermore, Felman and Shen (1971) showed evidence that switching names that the child already knows is more demanding and hence more difficult than using nonsense words; this might help to explain why the tasks in Rosenblum and Pinker (1983) showed no significant differences between bilingual and monolingual children: the substitution task appears to be very simple; hence both groups of children are capable of obtaining optimistic results. However, had the tasks in Rosenblum and Pinker (1983) been more demanding, the bilingual children would have probably evidenced superior control aptitudes.

The studies on phoneme substitution tasks only showed benefits for one group of bilingual children, namely the Spanish-English bilinguals; these two languages have similar phonological systems. As pointed out by Bialystok (2001), bilingual children show clear advantages in some tasks, whereas their performance in other tasks is less clear (as in the case of phonological awareness tasks). The fact that there are very few studies in this particular area makes it difficult to interpret the scant data available.

Finally, the study on ToM by Bialystok and Senman (2004) reported higher level of success by bilingual children, as compared to monolinguals, in tasks involving Appearance-Reality tasks; the skills involved in these tasks are essential in developing a ToM, which in turn directly relates to cognitive growth.

Overall, it is evident that bilingualism appears to accelerate the child's ability to reflect upon and manipulate language, even though such advantages occur mainly for tasks based on the ability to selectively attend to information when there is misleading or competing information present. This, in turn, reinforces a clear link between language and

cognition, where language can significantly impinge on cognitive growth.

In addition, as suggested by Peal and Lambert (1962), the bilingual child's conceptual development derives from his/her experience with more than one language, and this forces constant revision of existing theories in light of new evidence (input). The reality of a bilingual child (the bilingual environment) seems to highlight certain phenomena such as the arbitrary nature of language, which then has an effect on cognitive development skills such as reading and academic achievement.

Despite the metalinguistic benefits reported by the various studies cited here, unfortunately, there have been no longitudinal studies that look at how monolingual and bilingual children develop both linguistically and cognitively over an extended period of time (this is perhaps a very demanding task). Such studies would reveal whether the differences evidenced in the two groups prevail or whether the monolingual children eventually catch up as a result of more linguistic experience and no further cognitive differences can be observed between the two groups. Notwithstanding, the relation evidenced between bilingualism and cognitive skills indicates that one's linguistic experience can and does affect cognitive development.

These findings are important for school and pre-school teachers and for educational law makers, as they indicate a need to incorporate true bilingual programs accessible to children from all social levels. As shown by the research reviewed here, bilingualism appears to exert a significant impact on cognitive development, and this benefit should be available to all. Otherwise, those who have access to bilingual programs will have a better opportunity to excel academically, and this creates a type of social discrimination that we might still be in time to prevent.

What this implies is that there is need for truly bilingual teachers who can help young children become bilingual?

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