Cognitive development of Arabic-English bilingual children: A cross-validation study of Bialystok's theory of analysis and control

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النمو المعرفي عند الأطفال ثنائي اللغة (عربي/انجليزي): دراسة لقياس صحة نظرية بيلاستوك "التحليل المعرفي اللغوي والضبط ألانتباهي"

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ملخص البحث

معظم الدراسات التي تناولت تأثير ثنائية اللغة على القدرات المعرفية واللغوية للأطفال أجريت على أطفال اكتسبوا لغتين متقاربتين في المنشأ كاللغة الانجليزية والفرنسية ولهم نفس الخلفية الثقافية والاجتماعية. لذلك من الصعب تعميم نتائج هذه الدراسات على ألأطفال ممن اكتسبوا لغتين تختلف في المنشأ كاللغة العربية والانجليزية ويختلفون في خلفيتهم الثقافية والاجتماعية. تهدف هذه الدراسة بشكل عام إلي التحقق من صحة نظرية بيلاستوك في فئة الأطفال ثنائي اللغة ممن اكتسبوا لغتين تختلف في المنشأ وفي محيطهم الثقافي والاجتماعي. لتحقيق ذلك قامت الدراسة بتوزيع عينة الدراسة إلي ثلاث فئات وفقاً لاداءهم في اختبار القدرة اللغوية ونتائج الاستبانات التي وزعت على أباء وأمهات الأطفال: أطفال ثنائي اللغة مستواهم اللغوي في اللغتين العربية والانجليزية متوازن، أطفال أحادي اللغة (لغتهم الأم الانجليزية)، وأطفال ثنائي اللغة مستواهم في اللغتين العربية والانجليزية غير متوازن. بعد ذلك تم إعطاء الأطفال مجموعة من الاختبارات العقلية التي تقيس قدراتهم المعرفية واللغوية بحيث يقيس بعضها العنصر الأول من نظرية بيلاستوك (التحليل اللغوي المعرفي) والبعض الأخر يقيس العنصر الثاني من نظرية بيلاستوك (الضبط ألانتباهي). جاءت نتائج الدراسة منسجمة مع الدراسات السابقة التي خلصت إلي أن الأطفال ثنائي اللغة يقل تحصيلهم في مفردات اللغتين مقارنة بالأطفال أحادي اللغة. بخصوص نظرية بيلاستوك، فإن نتائج الدراسة قد أثبتت صحة العنصر الأول من نظريتها حيث لم يوجد اختلاف كبير بين ثنائي وأحادي اللغة في قدرتهم على التحليل اللغوي المعرفي. العنصر الثاني من نظريتها لم يتم تأكيد صحته حيث تفوق أحادي اللغة على ثنائي اللغة في أداءهم للاختبارات التي تتطلب ضبط انتباهي عالي.

Cognitive development of Arabic-English bilingual children: A cross-validation study of Bialystok's theory of analysis and control

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Abstract

This study cross-validated Bialystok's theory of analysis and control in a bilingual population. Twenty Arabic-English bilingual children in grades I and 2 and 5 English monolingual children participated in this study. Six metalinguistic tasks and a language proficiency test were administered to all children. Half of these tasks examined the children's ability to focus their attention on certain linguistic properties, while the other half examined their ability to analyze their linguistic knowledge. The results supported Bialystok's claim that bilingual and monolingual children will show no significant difference in solving metalinguistic tasks that require high analysis of linguistic knowledge. However, the results didn't support Bialystok's findings that bilingual children will perform better than monolingual and partially bilingual children on metalinguistic tasks that require high control of attention. English monolingual children outperformed Arabic-English bilingual children on the symbol substitution and grammaticality judgment tasks. Nevertheless, they didn't differ from each other in terms of the language arbitrariness task.

Introduction

During the past three decades or so there has been remarkable interest in the relationship between bilingualism and metalinguistic awareness. A significant amount of theoretical and empirical research has indicated that learning more than one language at an early age results in better performance on different metalinguistic tasks (Bialystok, 1986a, 1986b, 1988; Cummins, 1978; Feldman & Shen, 1971; Galambos and Goldin-Meadow, 1990; Ricciardelli, 1992). The accumulating evidence since the classic work of Peal and Lambert (1962) changed the view that bilingualism had a negative effect (e.g., Saer, 1923) on the cognitive and linguistic development of young children. However, some studies (e.g., Al-Dossari, 2005; Gathercole, 1997; Rosenblum & Pinker, 1983) reported no bilingual advantages in solving metalinguistic tasks.

Several studies have compared monolingual and bilingual children in their performance on a variety of metalinguistic tasks. The earliest evidence to support the claim that bilingual children outperform their monolingual counterparts on

metalinguistic tasks comes from word awareness studies. Word awareness can be defined as the children's ability to demonstrate that they understand that words are the primary meaning constituents of language and that they know about the properties of words (Bialystok, 1993). One of the first word awareness studies to report data relating to bilingualism and metalinguistic awareness was that conducted by Feldman and Shen (1971) who compared the performance of 15 Spanish-English bilingual children and 15 English monolingual children on different word awareness tasks. The findings in general indicated that bilingual children outperformed their monolingual counterparts on all word awareness tasks. More specifically, bilingual children were better than monolingual children in switching names and using names in sentences. However, the knowledge of names and facility for acquiring new names were equivalent in the two groups. Feldman and Shen's (1971) findings must be considered with caution because their subjects were not matched for Intelligence Quotient (IQ) or other cognitive measures (Cummins, 1987).

Ianco-Worrall (1972) conducted a study to find empirical support for Leopold's (1961) observation that bilingual children show earlier separation of word sound from word meaning. She carried out two experiments. Subjects were 30 Afrikaans-English bilinguals in grades 2 and 3. Each bilingual was paired to two monolingual children, one Afrikaans speaking, and the other English speaking. They were matched on several variables: intelligence, age, sex, school grade, and social class. The findings supported Leopold's (1939) observation of earlier separation of word sound from word meaning in young bilingual children. Ianco-Worrall (1971) found that bilingual children reach a stage of cognitive development some 2-3 years earlier than their monolingual peers. She also found that, as a result of acquiring two languages, bilingual children tended to believe that language is arbitrary. For bilinguals, names and objects are separate. Thus, names can be interchangeable. The dependent measures that Ianco-Worrall used can be questioned. For example, in evaluating children's awareness of the arbitrary nature of the word-referent relation, she did not ask children to justify their responses (Cummins, 1978). Therefore, saying "yes" to the question does not necessarily imply that the children understood the arbitrary assignment of words to referents.

Ben-Zeev (1977) compared the performance of bilingual children and monolingual children on a symbol substitution task. The subjects were 96 children aged 5;4 to 8;6 years, who were divided into four sample groups. One group of Hebrew-English-speaking bilingual children was tested in the United States. The second group was tested in Israel. The third and fourth groups were both monolingual: one group tested in the United States spoke only English, the other tested in Israel spoke only Hebrew. All subjects were from middle-class backgrounds. In the symbol substitution task, children were asked to substitute one meaningful word for another in a fixed sentence frame, including sentences where the substitution resulted in a violation of the language. For example, children were told to substitute *I* with *macaroni*, so that the correct sentence "I am warm" became "Macaroni am warm." The findings showed that bilingual children have more understanding of the arbitrary relations between a word and its referent. For them, the

meaning of a word was "more convention than necessity; more agreement than truth" (Bialystok, 2001a, p. 171). In contrast, monolingual children focused their attention more on meaning, which made it very difficult for them to separate the word from its referent. Ben Zeev (1977) interpreted the findings to mean that bilingual children develop a more analytic orientation toward language than do monolingual children as means of overcoming interference between Hebrew and English. She concluded that bilingual children's acquisition of two different linguistic systems help them exert more processing efforts in solving verbal tasks than do monolingual children.

In an attempt to replicate the findings by Ianco-Worrall (1972), Cummins (1978) investigated the effect of bilingualism on the development of children's awareness of certain properties of language and on their ability to analyze linguistic input. Subjects were 80 children in grade 3 and 26 in grade 6. They were chosen from four middle-class schools in Dublin, Ireland. Irish was taught in two schools, and English was the medium of instruction in the other two schools. He used three tasks. The first task involved meaning and reference. Children were given questions about the stability of the meaning of words after the disappearance of their referents. For example, they were asked what their answer would be if they were asked by someone about the word *giraffe*, after all *giraffes* became extinct. The second task measured the children's ability to comprehend the arbitrariness of language. This task was similar to the one used by Ianco-Worrall (1972). The last task comprised questions on nonphysical nature of words. For instance, children were asked questions like "Is the word 'book' made of paper?" The results showed that bilinguals at both grade levels demonstrated a significantly greater awareness of the arbitrary nature of word-referent relationships. Cummins concluded that bilingualism does promote awareness of linguistic operations.

Within the framework of Cummins's (1978) threshold theory which postulates that metalinguistic benefits of access to a second language will accrue only after some threshold level of competency in the second language has been reached, Ricciardelli (1992) examined the relationship between bilingualism and different indicators of cognitive development, including metalinguistic tasks. She tested the hypotheses that bilinguals with a high level of proficiency in their two languages would perform better than bilinguals and monolinguals that have a high level of proficiency in only one language. She also examined the hypothesis that bilinguals who have a low level proficiency in both languages would perform worse than bilinguals with a high level of proficiency in at least one language or monolinguals. Subjects were 57 Italian-English bilingual children and 55 English-speaking monolingual children. They were all drawn from kindergarten and grade 1 classes. The first task was word discrimination. Children's understanding of the term 'word' and their awareness of words in spoken language were assessed. For example, they were asked whether words like 'candle' and 'the fire' consists of one or two words. The second task was word length. Children were asked whether short words refer to referents which are long (e.g., the word 'truck' and its referent 'the actual truck'). Similarly, this task assessed the children's understanding of the term 'word' and their ability to distinguish the word from the referent. The third task assessed children's

understanding of words and letters in print. For example, children were required to circle a given part of print (words like on, numbers like 6). Finally, Ricciardelli used a task similar to the one used by Ben Zeev (1977), in which children were asked to substitute a given word for a target word in a sentence, even though the results violated semantic and syntactic rules. The findings were consistent with the threshold theory. Bilingual superiority on the cognitive measures was found only for those children with a high degree of proficiency in both languages. Bilinguals who were highly proficient in English but have low proficiency in Italian showed no superiority. Moreover, it was found that bilinguals who had achieved a low level of proficiency in both of their languages performed significantly more poorly than the bilinguals who had attained a high level of proficiency in at least one language.

Yelland, Pollard, and Mercuri (1993) examined whether metalinguistic benefits of childhood bilingualism extend to children who are "marginal bilinguals" (p. 423). Four groups of 14 children took part in the experiment: two groups of children in the first year of schooling and two groups in their second year of schooling. One group was strictly monolingual in English. The other group included English monolinguals who were participating in a second language program that provided 1 hour of Italian instruction each week. The metalinguistic task included single pictorial stimuli, in which children were asked to make a decision about the size (big or little) of a given word. Over a period of only six months, it was found that the metalinguistic benefits from exposure to a second language that exist for bilinguals extend to children who have only very limited contact with a second language. This finding supports Bialystok's claim that the more rapid development of metalinguistic skills by children with access to a second language is not dependent on an equivalence of competence in the two languages. This, on the other hand, contradicts Cummins's (1978) threshold theory, which postulates that the attainment of a higher threshold level of bilingual proficiency is a must in order to gain positive benefits from bilingualism.

Not all studies reported a bilingual advantage on word awareness tasks. Rosenblum and Pinker (1983) investigated the claim that bilingual children are better than monolingual children in understanding the arbitrariness of the word-object relations. The children were 12 English monolingual and 12 Hebrew-English bilingual preschoolers ranging in age from 4; 0 to 5; 10. The two groups were matched on age, sex, nonverbal intelligence, and socioeconomic status. The children were given different renaming tasks that measured their understanding of word-object relations. In one of the tasks, for example, the children were asked: "Can you call the boat a cow?" The results showed that all children, both bilinguals and monolinguals, performed well on all the renaming tasks. However, bilingual children were more likely to state the social contexts to justify their response. In contrast, monolingual children were more likely to refer to the physical properties of the renamed objects when justifying or denying their responses. Rosenblum and Pinker (1983) concluded that neither bilingual children nor monolingual children have a special mechanism that enables them to comprehend word-object relations. Simply, monolingual children have learned that an object can have more than one name as a result of its

diverse attributes, whereas bilingual children have learned that an object can have more than one name by virtue of the various social contexts in which its name is used.

Influenced by the early findings obtained from word awareness studies, researchers developed interest in investigating syntactic awareness in bilingual children to find out how they process the grammar of the two languages and how they may differ from monolingual children. Syntactic awareness is defined as the ability to judge sentences as grammatical or ungrammatical, to identify the error, to correct the error, and to state the rule being violated (Bialystok, 2001a, Galambos & Goldin-Meadow, 1990).

In a 3-year longitudinal study, Hakuta (1987) investigated the relationship between degree of bilingualism and metalinguistic abilities in Mainland Puerto Rican children. The subjects were students in the bilingual education programs in the New Haven public schools. They were considered nonbalanced bilinguals who were in the process of becoming balanced bilinguals. The subjects were 83 children in grades K and 1 and 111 children in grades 4 and 5. Metalinguistic awareness was measured for younger subjects by two grammatical correction tasks. Older subjects were asked to listen to sentences played over a tape recorder. They were asked how many meanings the sentences contained and to paraphrase the meaning of each sentence. The metalinguistic awareness measures showed a consistently strong and positive relation with Spanish, but there was little evidence showing a relation with degree of bilingualism.

Galambos and Hakuta (1988) examined the relationship between bilingualism and metalinguistic awareness in Puerto Rican Spanish and English-speaking children. The subjects were from low-income backgrounds and were enrolled in a transitional bilingual education program in the United States. Two longitudinal studies were carried out. The first study examined the abilities to note and correct ungrammatical sentences in Spanish. Subjects in this study were 104 children in first and second grade at the beginning of the study, and were followed over a period of two years. The second study investigated the children's abilities to detect ambiguity in sentences, and to paraphrase the different meanings. In this study, 107 children in fourth and fifth grades were followed over two years. The findings from both studies indicated that native proficiency as well as the degree of bilingualism affected metalinguistic awareness. Bilingual children were found to do well on tasks requiring more attention to the form of the language being learned. They also were found to do better than those who were at a low level of bilingual proficiency.

In a similar study, Galambos and Goldin-Meadow (1990) investigated whether bilingualism promotes children's awareness of the language(s) they are learning to speak. The subjects were 64 monolingual children and 32 bilingual children ranging in age from 4;5 to 8;0. Half of the monolingual children were Spanish-speaking children from a parochial school in El Salvador. The other half were English-speaking children in two parochial schools in New Haven, Connecticut. The 32 bilingual children were Spanish-English bilinguals drawn from the American School in El Salvador. The subjects were given tests containing 15 different ungrammatical

constructions and 15 grammatically correct fillers. They were asked in the native language (Spanish for the bilinguals) to observe whether the construction was grammatically correct or incorrect. Then, they were told to correct the errors they noted, and to account for those errors. The findings indicated that children's development of noting and correcting errors is similar in the ages studied. However, bilingual children progressed faster than monolingual children and demonstrated advantages at all ages tested. The bilingual and monolingual groups were not different in terms of the explanations of the violated rules they gave. Galambos and Goldin-Meadow concluded that the experience of learning two languages simultaneously hastens the development of linguistic awareness in young children. However, it does not change the course of development.

As with word awareness, bilingual children do not always perform better than monolingual children on grammatical tasks. Gathercole (1997) examined the acquisition of the linguistic mass/count distinction in English by bilingual (Spanish-English) children. There were 72 children between 7 and 9 years old. The findings did not support the common claim that bilingual children are better than monolingual children on grammaticality tasks. The results indicated that bilingual and monolingual children at 7 years of age do not draw inference from the linguistic context in which a new noun is presented to determine whether the noun refers to an object or a substance. Even fluently bilingual children performed like monolinguals. Moreover, bilingual children who had lower English abilities were less dependent than monolingual children in solving these problems.

As with word and syntactic awareness, researchers examined phonological awareness in bilingual children to find out whether the acquisition of two languages at an early age enhances their ability to perceive the properties of speech sounds in the two languages and whether bilingual children outperform their monolingual counterparts in this aspect. Phonological awareness can be defined as the ability to reflect on and manipulate sublexical phonological units such as syllables, onsets, rimes and phonemes (Bruck & Genesee, 1995)

In a longitudinal study, Bruck and Genesee (1995) compared the performance of bilingual children and monolingual children on a battery of phonological awareness tests. The bilingual group included 91 English-speaking children who were attending French schools. The monolingual group consisted of 72 English-speaking children who were attending English monolingual school. The phonological awareness test battery included measures of syllable awareness, onset-rime awareness, and phoneme awareness. The findings indicated that schooling in a second language can affect the patterns of development of the young children's phonological skills. The bilingual children were found to have higher levels of phonological awareness than their monolingual counterparts in kindergarten. They performed better than monolingual children on the tasks that tap onset-rime segmentation. Nevertheless, the two groups did not differ significantly on tasks of syllable or phoneme awareness. In Grade 1, both bilinguals and monolinguals scored similarly on the onset-rime task. Monolingual children performed better than bilingual children on the phoneme

counting task. In contrast, bilingual children demonstrated superior skills in syllable awareness.

In a small-scale study, Campbell and Sais (1995) examined whether bilingual background enhances the ability to manipulate sublexical sound structures in children in nursery school classes. The children were 15 Italian-English speakers and 15 English speakers. They were matched on different variables: age, economic status, and ethnicity. Four measures were utilized: sorting by meaning and initial sound, morpheme deletion, syllable deletion, and letter deletion. The results indicated that the bilingual children outperformed monolingual children in all phonological tasks, except letter deletion in which both groups did the same. The findings must be taken with caution. The sample was small and the cognitive differences between children were not properly controlled (Bialystok, 2001a, 2001b). Furthermore, Campbell and Sais (1995) examined preschool children. Similar studies reported that these early advantages were temporary and disappeared in first grade (Bruck & Genesee, 1995; Eviatar and Ibraham, 2000).

To conclude this part of the paper, the findings in general suggest that bilingualism fosters the development of metalinguistic capabilities in a more straightforward manner because the process of becoming bilingual requires the child to view language as an object of thought (Cariles et al, 1999; Cummins, 1978). This conclusion is consistent with Vygotsky's (1962) hypothesis that bilingualism can enhance awareness of linguistic operations, which was later supported by a number of researchers (e.g., Ben Zeev, 1977; Bialystok, 1988b; Cummins, 1978; Ianco-Worrall, 1972). However, none of these studies provided a solid framework that accounts for the cognitive processes that are responsible for either the differences or similarities between the bilingual and monolingual children in terms of metalinguistic abilities. It is obvious that the majority of these studies were concerned with describing the ability of bilingual and monolingual children to solve certain metalinguistic tasks in purely structural terms (Bialystok, 2001a). If the assumption is that bilingual children, as a result of acquiring two different linguistic systems, perform better than their monolingual counterparts, then one would expect bilingual children to have specific cognitive components that are implicated in the solution of these particular metalinguistic tasks (Bialystok, 2001a).

In the next section, we present Bialystok's theory of analysis and control which is considered one of the most serious and appealing theories that account for the relationship between bilingualism and metalinguistic awareness

Bialystok's theory of analysis and control

Bialystok (1990, 1991, 1993, 2001a, 2001b) argues that in order to reconcile the diverse and conflicting findings concerning the relationship between bilingualism and metalinguistic awareness, a more detailed framework of metalinguistic awareness is required. Bialystok (2001a) argues that the term "metalinguistic" should not be

defined in structural terms by pointing to tasks that indicate the ability. Rather, it should be defined in processing terms through the identification of cognitive components that are implicated in the solution of a set of metalinguistic tasks. She proposes a cognitive theory that seeks to identify the mental processes which are implicated in learning and using language. The theory is built around two cognitive processing components: analysis of linguistic knowledge and control of attention. Bialystok (1994a) claims that since change in mental representation constitutes the basis for learning, then the two processing components lead to learning. They independently account for children's ability to solve a variety of metalinguistic problems (Bialystok, 1988a, 1988b). For instance, children's performance on metalinguistic tasks that rely on a high level of analysis of knowledge is unrelated to their performance on metalinguistic tasks that rely on a high level of control of attention. The two components are independent in that each is responsible for a different aspect of processing. Analysis of linguistic knowledge is at the basis of accuracy, and control of attention is at the basis of fluency (Bialystok, 1990, 1993). However, they are not completely separable because all problems require both, but in most cases, one of these processes predominates (Bialystok, 1990).

Bialystok (2001b, p.131) defines analysis of linguistic knowledge as the learner's "ability to represent increasingly explicit and abstract structures." She views analysis of linguistic knowledge as the means by which mental representations, based on more unanalyzed (implicit) knowledge and knowledge of the world, become reorganized into analyzed (explicit) knowledge of which a learner is aware. The need for a processing component for analysis is based on the view that children's representations of knowledge undergo significant and systematic change. Bialystok argues that quantitative changes are essential to the development of language proficiency.

In relating the component of analysis of linguistic knowledge to bilingualism, Bialystok (1988b) claims that bilingual children who have balance proficiency in both languages are more advanced than monolingual children or partially bilingual children in their level of analysis of linguistic knowledge. She argues that bilingual children have the experience to cope with two different linguistic systems, which, in her words, "accelerate the extraction of abstract linguistic structures, rules, or concepts" (Bialystok, 1988b, p. 561). But, this advantage is only for children whose knowledge of both languages has been analyzed. Children whose knowledge of a second language is limited would lack such an advantage. Their performance on metalinguistic tasks that require a high level of analysis of knowledge would not exceed those of monolingual children.

With respect to control of attention, Bialystok defines it is as "the ability to selectively attend to specific aspects of a representation, particularly in misleading situations" (2001b, p.131). This component therefore has three basic roles: the selection of specific items of knowledge or information, the co-ordination of the selected information, and the automaticity of both the selection and co-ordination of information (Bialystok & Ryan, 1985). This component becomes most apparent

when language contains conflict or ambiguity. In this case, the child has to attend to only one of two or more representations, which may slow down the process of using the language or sometimes mislead the child to an incorrect solution. The real time constraint on the operation of control of processing makes the functioning of this component the basis for the emergence of what is referred to as fluency or automaticity. In a language task that requires less attention, the solution emerges with greater fluency or automaticity.

According to Bialystok and Ryan (1985) and Bialystok (1990), there are two experiences that enhance the development of control of linguistic processing. The first is schooling where children may benefit from the types of instruction given to them to reorganize their knowledge of language. Moreover, success at schools demands examination of problems and selective attention to relevant information. The second experience is bilingualism. The acquisition of two languages simultaneously enhances the children's readiness to cope with the complex system of language. Bialystok (1988b) claims that bilingual children are more advanced than monolingual children in their level of control of linguistic processing. She contends that bilingual children's experience with two linguistic systems that label the same conceptual system enable them to easily observe the arbitrary connection between forms and meanings. In addition, bilingual children's representation of language and conceptual information as separate structures makes tasks involving attention to linguistic features less problematic. Furthermore, Bialystok (1988b) claims that bilingual children can attend to formal linguistic features that may change even though the meaning is constant.

Bialystok (1991) further argues that the term "metalinguistic" is best defined with regard to the two cognitive components- analysis of linguistic knowledge and control of attention- necessary to solve a set of tasks. She claims that any task that places high demands on one or both of these two components is metalinguistic. That is to say, it is possible to predict which tasks will require either analysis of linguistic knowledge or control of attention. Bialystok (2001a) claims that tasks which produce an advantage for bilingual children include: counting words in sentences, symbol substitution, sun-moon problems, word-referent problems, judging grammaticality of anomalous sentences, and phoneme segmentation. These tasks include misleading information, which make them high in their demand for control of attention. In contrast, tasks in which bilingual children do not show an advantage over monolingual children include: counting words in strings, describing arbitrariness of words, detecting ambiguity, explaining grammatical errors, judging grammaticality if incorrect (but meaningful) sentences, and phoneme substitution. These tasks require detailed knowledge, making them high in their demands for analysis of representation.

Empirical evidence

In the past 16 years, Bialystok's theory of metalinguistic awareness has been empirically tested in several studies. However, the bulk of these studies were carried out by Bialystok. In her earliest examination of the theory, Bialystok (1986a) addressed the development of children's concept of the word in a population of 50 English monolingual in grade K and 1 and 12 native English speakers in grade 1 who were enrolled in a French immersion program. The study tested three hypotheses. First, word concept problems that involve greater levels of analysis or control for their solution should be more difficult than problems that involve lower levels of these skills. Second, children's ability to solve word concept problems should increase gradually over time. Third, children's level of mastery of control and analysis of knowledge should determine how difficult they find certain problems. Several word awareness asks were administered. The first was a word count task, in which children were asked to report the number of words contained in certain sentences or phrases. The second task was similarity judgment. Children were required to concentrate on a given aspect of a word, either its form or its meaning. For example, the child was given a word like 'dog' and was told to choose from the words 'puppy' and 'frog' that 'sounds the same' or 'means the same'. The last task was size judgment, in which children were asked to judge which of two words is bigger. The findings indicated that word concept improves gradually and that there was no particular point at which the child may be said to be endowed with such a construct. However, children's development of a word concept depended on their ability to grasp the category of word and to focus attention on parts of language in order to retrieve the relevant pieces of information about the word. Bilingualism was found to enhance specific aspects of the development of the word concept in children. Bilingual children were found to easily separate the connections between words and their meanings. The metalinguistic tasks with an increased demand for cognitive control were less problematic for French immersion students than for the English program students in the same grade which implies advantages for bilingual children. However, there was little evidence of a knowledge advantage for the bilingual children in terms of analysis of linguistic knowledge in either Kindergarten or grade 1. Both groups, however, had better analysis of linguistic knowledge than did the children in Kindergarten.

In another study, Bialystok (1986b) examined her theory in relation to two variables: age and bilingualism. She addressed two major hypotheses. First, older children who are literate will be more successful with high analysis and knowledge problems than will younger children. Second, bilingual children will be more successful than monolingual children with problems that involve high control of attention. Two studies were conducted to test these hypotheses. In the first study, there were 119 children, aged 5, 7, and 9. Almost half of the children of each age in each school were fluent speakers of other languages. They also were as fluent in English as were their monolingual classmates. In the second study, there were 128 French-English bilingual children. Their age was the same as those in the first study.

All children in the two studies were given the same tasks: grammaticality judgment and grammaticality correction. The overall findings indicated that the ability with which children could solve metalinguistic problems depended on at least two factors: age and bilingualism. Age affected the development of children's analysis of linguistic knowledge. Bilingualism also was found to have an effect on the development of control of attention. For example, bilingual children outperformed their monolingual counterparts on the tasks that required high control (e.g., grammatical judgment of anomalous sentences). One problem with this study is the selection of bilingual children. Bialystok based her selection on the school records that the 12 languages she listed in the study were spoken by children as a language other than English. The school records indicated that these languages were used by the bilingual children at home. How can we make sure that the children are still proficient in their home languages as compared to English? Bialystok failed to provide such evidence.

Bialystok (1988b) examined two hypotheses: (1) bilingual children would be more advanced than monolingual children in their level of control of attention, and (2) bilingual children who are fully competent in both languages would be more advanced than monolingual or partially bilingual children in their level of analysis of linguistic knowledge. Two studies were carried out to test these two hypotheses. In study 1, there were 57 children from grade 1. Twenty children were monolingual English-speaking children, 20 children were partially French-English bilingual children, and 17 children were fully French-English bilingual children. All subjects were similar in socioeconomic status. They were given three tasks: arbitrariness of language, concept of word and syntax correction task. In study 2, subjects were 41 grade 1 students. The children were Italians who had little command of their native language, Italian. Since the school curriculum was taught in English, the children were able to read in English. The subjects in study 2 were the children of working-class immigrants in Canada. They were given a grammaticality judgment in which they were asked to judge the grammatical acceptability of sentences that were read orally. The findings were consistent with the two hypotheses. Children who differed in the level of bilingualism enjoy different advantages in solving metalinguistic problems compared with each other and compared with monolingual children. Moreover, bilingual children demonstrated more skill in the analysis of knowledge tasks than partially bilingual and low-Italian proficient children.

Bialystok and Majumder (1998) tested the hypothesis that tasks requiring high control of attention will be solved well by all bilingual children, but that only balanced bilingual children will demonstrate an advantage in problems that require high levels of analysis of linguistic knowledge. Subjects were 28 monolingual English-speaking children, 26 French-English bilingual children, and 17 Bengali-English bilingual children. The French-English bilinguals were considered to be balanced bilinguals. They were proficient in both English and French. The Bengali-English bilinguals were considered to be partial bilinguals in that they were proficient in English but not in Bengali. Five tasks (three cognitive tasks, one metalinguistic task, and a language proficiency test) were used. The results showed that balanced

French-English bilinguals manifested better performance on the tasks requiring high control of attention than both the partial bilingual group and the monolingual group. No difference was found between the three groups on the tasks requiring high analysis of linguistic knowledge. The findings of this study confirmed the previous findings that all bilingual children outperformed monolingual children in solving those tasks that require high control of attention. There was no significant difference between the bilinguals, partial bilinguals, and monolinguals in terms of the items that require high analysis of linguistic knowledge. Furthermore, the findings suggested that balanced bilinguals carry over the linguistic advantage in control of attention into non-linguistic domains. The study did not account for obvious differences between children in terms of language and culture. The two non-English languages differed from each other in both the spoken and written forms. Furthermore, there were cultural differences between the three groups in terms of religious and cultural beliefs and values. Another limitation in the study was its focus on grade 3. The findings therefore may not be generizable to other children in different grades. These differences, as Bialystok and Majumder admitted, in language and culture may have contributed to the differences in children's performance.

Although Bialystok's theory has received recognition from several researchers (e.g., Ellis, 1987; Gombert, 1992), very few researchers, other than Bialystok, have attempted to test this theory empirically. Cromdal (1999) cross-validated Bialystok's theory in a bilingual population. He administered three metalinguistic tasks to a total number of 38 English Swedish bilinguals and 16 Swedish monolinguals. The children's age ranged from 6 to 7 years. The bilingual children were assigned to two groups according to relative proficiency. The three metalinguistic tasks were symbol substitution, grammaticality judgment, and grammaticality correction. They were modeled on Bialystok (1988a), Bialystok and Majumder's (1998) and Ricciardelli's (1993). In symbol substitution tasks, children were asked to switch the word 'hamburger' for 'tiger' in a sentence like 'The tiger is hungry' so that it becomes 'the hamburger is hungry'. This task was mainly designed to place high demands on children's ability to control linguistic processing. In the grammaticality judgment and correction tasks, which included items that place high demand analysis and control, children were asked to state whether a sentence is grammatical or ungrammatical, to identify the error, and to correct the error. The results supported Bialystok's (1986a, 1988b) findings in that the strongest findings concern one of the two metalinguistic skills components-control of attention. Bilingual children outperformed their monolingual counterparts on the control task (judgment of anomalous sentences). However, the findings concerning the second component—analysis of linguistic knowledge— were somehow equivocal.

In a more recent study, Al-Dossari (2005) cross-validated Bialystok's theory in a bilingual population whose two languages were unrelated typologically. Participants were 59 children in grades K and 1: 22 English monolinguals and 37 Arabic-English bilinguals whose two languages are typologically unrelated. All participants completed an English proficiency test and six English metalinguistic awareness tests (two for each of phonological, word, and syntactic awareness). All bilinguals also

completed an Arabic proficiency test and six equivalent Arabic metalinguistic awareness tests. Bilinguals were categorized as balanced or unbalanced based on their proficiency test scores. Results on both English and Arabic metalinguistic awareness tasks indicated no consistent differences in performance attributable to language experience (i.e. monolingual, balanced bilingual, unbalanced bilingual), even when tests were grouped according to those that required high analysis vs. high control. However, there were significant age-related differences across virtually all tasks, with children in grade 1 outperforming children in grade K. These results are only partially consistent with Bialystok (1986a). As she predicts, monolinguals and bilinguals did not differ in their performance on tasks requiring high analysis. However, bilinguals did not outperform monolinguals on tasks requiring high control of attention. In sum, this study suggests that children's ability to solve metalinguistic tasks improves with age and/or school experience irrespective of task demands, bilingual experience, relative typology of the two languages, or language of testing.

To conclude, Bialystok's theory provides a more reliable interpretation of how and why bilingual children perform better than monolingual children on certain metalinguistic tasks. The theory explains both the cognitive operations and the linguistic processing involved in the solution of metalinguistic problems. However, unfortunately, very few studies have attempted to cross-validate it in bilingual populations (Cromdal, 1999). Similarly, the theory has not been adequately tested cross linguistically. That is, "most bilingual studies that have been conducted so far were limited in their scope, given the fact that the languages under consideration were closely related. The analysis of children's data in two unrelated typologically languages will offer new perspectives on the role of structural properties of these languages in the process of acquisition" (Bos, 1997, p. 8). Thus, the rationale of the present study emanates from the need to fill out these gaps in the literature on the relationship between bilingualism and metalinguistic awareness.

Research problem

The majority of bilingual studies focused on children who were bilinguals in two typologically related languages (Bos, 1997) such as English and French. In addition, many of the subjects were drawn from similar sociocultural backgrounds. The socio-cultural dimension has been ignored when explaining the differences between bilingual children and monolingual children in the ability to solve certain cognitive tasks. It is not adequate to account for the differential outcomes of bilingual experience on the basis of purely linguistic criteria. Rather, the socio-cultural dimension should be considered in exploring why some children fail to profit from a bilingual experience (McLaughlin, 1984).

The inclusion of children who speak other languages which are unrelated typologically in the investigation of the relationship between bilingualism and children's cognitive development would provide more information and new perspectives on this relationship (Al-Dossari, 2005; Bos, 1997). The investigation of

the acquisition of Arabic and English by young children is an area of research that would contribute to our understanding of the relationship between bilingualism and metalinguistic development. Arabic and English are two typologically unrelated languages. They belong to two different language families, and they represent substantial linguistic and sociolinguistic differences.

One of the salient differences between the two languages lies in their writing systems. While acquiring Arabic and English, Arabic-English speaking children should be aware of these differences in the writing systems of the two languages. Arabic has a right-to-left writing system whereas English has the reverse. This variation in the script directionality may impose certain cognitive processes on bilingual children who speak both Arabic and English.

With regard to the sound system in the two languages, there are also tremendous differences. When acquiring English, Arabic-speaking children have to acquire sounds that do not exist in Arabic such as [v] and [p]. Similarly, when acquiring Arabic, they have to learn some sounds that do not exist in English or in any other language such as [ح], [خ], and [ظ]. These sounds, among others, are known to be unique to Arabic.

Moreover, the two languages differ greatly in their grammatical systems. Arabic has a basic VSO word order, as *akla ali almozata* (ate Ali the banana). It also allows SVO word order, *ali akla almozita* (Ali ate the banana). In addition, the adjective in Arabic always follows the noun it modifies, as *banat jamilat* (girls beautiful). In contrast, English follows a strict SVO word order. Unlike Arabic, it does not allow a noun to precede an adjective, except in some examples, which are exceptions to the rule.

With regard to socio-cultural factors, Arabic-speaking children belong to a culture that differs greatly from the American culture in which they acquire English and Arabic simultaneously or sequentially. This is revealed, for example, in various lexical differences. Arabic-speaking children acquiring English should understand that a word like ‘uncle’ is used in English to refer to both the brother of the father and the mother. This is not the case in Arabic where they must use two different words (*Am* for the brother of the father and *Khal* for the brother of the mother) to describe this family relationship. Similarly, they have to learn that Arabic may not have more than one word for the same concept in English where different words may be used as attributes to that concept in English. The words 'snow' and ‘pig’ are good examples of this. When acquiring English in an English environment, Arabic-English speaking children should understand the various words that are associated with these words.

Another salient difference is the way Arabic-English speaking children may approach the world which results from their socio-cultural values and beliefs. Schooling has been found to be an important factor in the development of cognition and language (Bialystok, 1990). Arabic-speaking children in the United States are usually exposed to two different types of schooling, the Arabic curriculum and the

American curriculum. The curriculum at the Arabic schools in the United States concentrates on Islam, the Islamic culture, and the Arabic language. This is not available to them in the American schools, which they may attend. In these two conflicting worlds, Arabic-English bilingual children have to reorganize their thoughts and linguistic repertoire to function properly in both worlds.

With these linguistic and socio-cultural differences in mind, the present study investigated the metalinguistic awareness of Arabic-English speaking children who live in the United States and compared their metalinguistic performance to their English monolingual counterparts. The study was carried out within the framework of Bialystok's (1986a, 1986b, 1987, 1988b, 1990, 1991, 1993, 2001a, 2001b) theory of analysis of linguistic knowledge and control of attention which has not been adequately cross-validated in bilingual populations (Cromdal, 1999).

Research hypotheses

The present study tested the following five hypotheses:

1. The acquisition of two typologically unrelated languages (Arabic and English) enhances the metalinguistic awareness of Arabic-English bilingual children.
2. There is no significant difference between Arabic-English speaking children in grade 1 and grade on the metalinguistic tasks that both require high control of attention and analysis of linguistic knowledge.
3. Bilingual children outperform monolingual children on tasks that are high in their demands for control of attention.
4. Bilingual children do not necessarily perform better than monolingual children on tasks that are high in their demands for analysis of linguistic knowledge.
5. There is a positive relationship between the degree of bilingualism and metalinguistic awareness in bilingual children.

Method

The participants

The participants in this study were 25 children. They were divided into two groups: a bilingual group and a monolingual group. The bilingual group included 20 Arabic-English speaking children in Grade 1 and 2, with 10 children in each grade. The monolingual group consisted of only 5 English-speaking children, one in grade 1 and 4 in grade 2. The children's ages ranged from 6 to 8;6 in the Arabic-English speaking group and 6 to 7 in the English monolingual group. Table 1 supplies demographical information about the children.

Table 1. Distribution of Arabic-English bilingual children according to grade, age of arrival, Length of residence, and formal instruction in L1 (Arabic) & L2 (English)

Grade	*Age of arrival in the USA*	*Years of residence in the USA*	*Years of formal instruction*	
			L1	*L2*
1st Grade				
1	1;3	5;4	1	5
2	1;7	5	5	5
3	2	5	2	5
4	2	5	5	5
5	0	7	5	5
6	2	4;6	2	5
7	0*	6	5	5
8	0	5;6	5	5
9	0	6	5	5
10	0	6	5	5
2nd Grade				
1	0	9	0**	5
2	0	9	5	5
3	0	8	5**	5
4	0	8	5	5
5	4	3	5	5
6	7	1	2	5
7	7	2	5	5
8	0	7	5	5
9	0	6;8	5	5
10	3:8	4;6	2	5

***Children with 0 arrival means they were born and raised in the USA.**

**** Children with 0 formal instruction means that they received no instruction in Arabic. Children with number 5 in both L1 & L2 means that they attended a full Islamic school in which they received instruction in both Arabic and English.**

The Arabic-English speaking children were drawn from two Islamic schools in the State of Massachusetts. One is a full-time school which is certified by the state. Children in this school are given the Arabic curriculum and the American curriculum. The children from the other school attend typical American schools during the week, and Saturday and/or Sunday Arabic schools. In both schools, the children represented different Arab nationalities: Algeria, Egypt, Palestine, Saudi Arabia, Sudan, and Syria. The English monolingual children were drawn from a Sunday school at a church in Quincy.

Degree of bilinguality

Degree of bilinguality was measured using two criteria. First, the English standardized version of the Peabody Picture Vocabulary Test (PPVT) was administered to all the children to assess their English proficiency. A non-standardized version of the (PPVT) was given to the Arabic-English bilingual children to assess their proficiency in Arabic. This version was a translated version of the English one. To differentiate between the two versions in the subsequent sections, the English version was labeled PPVT-E and the Arabic was labeled PPVT-A. Second, a questionnaire was distributed to parents. There were two versions (see Appendix I). One was given to parents of Arabic-English speaking children, in which they were asked several questions (e.g., what educational background they have, what language they use when they interact with their children at home, whether their children attend Arabic schools, etc.). The other version was directed to the parents of the English monolingual children. The major purpose of this version was to make sure that the children were not trained in a second language other than English.

These two criteria were combined together to determine the degree of bilingualism for each child. However, the difference in scores between the two tests (the PPVT-E and PPVT-A) was used to operationalize the degree of bilingualism for each child in the two groups. Even though the PPVT-A has not been standardized, "it is roughly the case that similar levels of language mastery would be reflected in similar levels on the PPVT test" (Bialystok & Majumder, 1998, p.79).

The metalinguistic tasks

Six metalinguistic tasks were administered to the children. One half of these tasks measured the children's analysis of linguistic knowledge while the other half measured their control of attention. The purpose of dividing these tasks into two groups (control versus analysis) was to test the four hypotheses stated in the introduction. Each task was preceded by a set of instructions on how to perform the given task. All these tasks are included in Appendix II, and are described below.

Language Arbitrariness (Control). This task, which assessed the children's understanding of word-referent relations, was adapted from Ricciardelli

(1993) and Eviatar and Ibraham (2000). Children were required to accept new names for given referents and then answer questions about them. For instance, they were told *we will call the sun the moon and the moon the sun. And now the question: when you go to sleep at night, what do you see in the sky?* This task places greater demands on the control of linguistic processing. The number of items was eight.

Symbol substitution (Control). This task is based on the work of Ricciardelli (1993), and was first developed by Ben Zeev (1977). Tasks similar to this one were used by Ricciardelli (1992) and Cromdal (1999). This task evaluated the children's ability to understand the arbitrary nature of language. The children were required to substitute given words for target words in sentences, despite the fact that the results violated semantic and syntactic rules. For example, the children were told that the way we say *she* is to say *fish*. So how do we say *She likes swimming.* Hence, this task placed higher demands on children's ability to control linguistic processing. There were eight items in the test.

Symbol substitution (Analysis). This task, too, was adapted from Ricciardelli (1992, 1993). This task follows the same procedures in the previous task, except that children were asked to correct the resulting grammatical error. Thus, greater demands were placed on the analysis of language. For instance, children were told to substitute the word *she* with *they* in *She is laughing*. Then they were asked to do the necessary changes to make the sentence sound right. That is, the children were told to change *is* to *are* so that the sentence could be read as *They are laughing.* There were eight items in the test.

Word order correction (Analysis). This task was also adapted from Ricciardelli (1992, 1993), who adapted it from Pratt et al (1984). This task evaluated children's grammatical awareness. The children were given ungrammatical sentences to correct. For example, the children were given sentences like *Mum late is* and told that there is a mistake in it. Then they were asked to say the sentences correctly after they did the necessary changes. This task therefore places high demands on the analysis of linguistic knowledge. There were eight items in this task.

Grammaticality judgments (analysis and control). This task assessed the children's grammatical awareness. It was adapted from Bialystok (1988a,1988b), Galambos and Goldin-Meadow (1990), Ricciardelli (1993), Bialystok and Majumder (1998), and Cromdal (1999). The children were given two types of grammaticality judgment tasks. The first task assessed the children's ability to analyze linguistic knowledge. The sentences in this task were ungrammatical but meaningful (e.g., the man a book reads). There were 29 items in the test.

The second type included items which were grammatical but anomalous (e.g., the dogs are flying). This task assessed the children's ability to focus their attention on certain aspects of the sentences. There were 81 items in the test.

In both types, there were some grammatical sentences. They were used to minimize the effect of test wiseness. However, these sentences were not scored and thus not discussed.

Procedures

Procedures for administration of tasks. A written parental consent was obtained for the children to participate in the study. Permission from the participant schools was obtained. All children were tested individually in a quiet area of the school and the church. The tasks were all administered by a native English speaker, except the Arabic version of the PPVT-A was administered by the researcher, who is a native speaker of Arabic. The children were given some items to practice before the administration of each experimental task. The children's responses to all items were recorded on an answer sheet. The tasks were administered in one session which lasted 30-40 minutes per child.

Procedures for scoring. For the PPVT-E and PPVT-A, the children's raw scores were calculated through subtracting the number of errors from the ceiling item, which is the last item in the ceiling set (the last item a child scores in the test). Then, the standard score was obtained according to each child's age. For example, if the ceiling item for child A is 72 and his total number of errors is 17, then the child's raw score is 55. According to the norms used for PPVT (Form IIIA), the child's standard score is 89. Following Bialystok and Majumder (1998) and Cromdal (1999), the child's degree of balance in bilingualism was calculated by subtracting the score on the PPVT-E from the scores on the PPVT-A. The closer this different score to 0, the highly proficient the child is in the two languages.

In the language arbitrariness task, each correct response was assigned the value of 1. Each incorrect response was assigned 0. The same procedures were used to score the children's responses in the word correction task and the symbol substitution task (control). For the symbol substitution task (analysis), the child's correct substitution of the second word for the first word in the given sentence was assigned a score of 1. The child's ability to change the wrong sentence into a correct one was assigned a score of 2. Wrong substitution or change was assigned the value of 0.

With regard to grammaticality judgments, the child's ability to judge whether sentences are grammatical or anomalous was assigned a score of 3. The child's ability to detect the error was assigned the value of 2, and to explain the error was assigned a score of 1. The child's failure to judge the grammaticality of the given sentences was assigned a score of 0.

The results were presented statistically in tables using the Statistical Package for the Social Sciences (SPSS). A one way ANOVA and t-test were used to give

statistical summaries of the results. The mean scores and standard deviation were also given.

Results

The performance of the children on the various measures of metalinguistic awareness and PPVT are reported under three different categories. First, the performance of Arabic-English speaking children in grades 1 and 2 is analyzed and compared. Second, the performance of Arabic-English speaking children as a group is presented in comparison with the performance of the English monolingual children. Finally, the Arabic-English speaking children are classified into two groups: 'balanced Arabic-English bilinguals' and 'unbalanced Arabic-English bilinguals.' Their performance is then compared to the English monolingual children.

Performance of Arabic-English speaking children by grade

Language Proficiency

Table 2 reports the mean scores and standard deviations on the PPVT-A and the PPVT-E for the Arabic-English speaking children in grades 1 and 2.

Table 2. Mean scores and standard deviations on the PPVT-A and the PPVT-E for Arabic and English proficiency by grade.

	1st Grade (n=10)		*2nd Grade (n=10)*	
	m*	sd**	m	sd
PPVT-E	94.40	18.98	84.30	10.55
PPVT-A	92.40	16.90	92.70	14.54

***m=mean. **sd=standard deviation**

The Arabic-English speaking children in grade 1 and 2 seemed to differ less in their mean scores on the PPVT-A (92.40 for first graders and 92.70 for second graders). However, the two groups differed in their mean scores on the PPVT-E. The mean scores of Arabic-English speaking children in grade 1 are higher than those of their counterparts in grade 2 (94.40 for first graders and 84.30 for second graders). Children in grade 2 have lower standard deviations compared to children in grade 1. This indicates that children in grade 2 represent a more homogeneous group since there is lower variability in the distribution of their scores on the test.

A t-test showed no significant difference between the two grades in terms of scores on either the PPVT-A ($t = 1.470$, $p = .159$) or the PPVT-E ($t = -.043$, $p = .967$).

Using a one way ANOVA, the effect of children's age was not significant in terms of the PPVT-A (F= .329, p= < .724) and the PPVT-E (F= 1.747, p=.204).

Metalinguistic awareness tasks (analysis)

Table 3 summarizes the children's performance in the two grades with relation to the metalinguistic tasks that measure the children's ability to analyze their linguistic knowledge. Two children were not able to answer the question items in the symbol substitution task (analysis). Despite the training session they received before the actual test, these two children were confused and unable to process what they were hearing. Their responses were assigned the value of 0 which was used in this study to mean that the children either failed to supply the correct answer or to process what they were hearing. Moreover, the experimenter provided two children in grade 2 with the correct response by mistake for two items in the grammaticality judgment task (analysis). These two items were not counted in the total scores of these two children. With regard to the word order correction task, all children responded to all the items.

Table 3. Proportion of correct responses on metalinguistic tasks of analysis for Arabic-English bilingual children in grades 1 and 2.

Task (Analysis)	1st Grade (n=10)		2nd Grade (n=10)	
	Mean Proportion	Standard deviation	Mean Proportion	Standard deviation
Word Order Correction (n=8)	.62	.35	.92	.08
Symbol Substitution (n=8)	.47	.39	.65	.31
Grammaticality Judgment (n=29)	.55	.28	.69	.14

Moreover, children in grade 2 have lower variability in their performance in the three metalinguistic tasks as indicated by their low standard deviations on the three tasks as compared to those of the children in grade 1. The mean proportions of the children in grade 2 are higher all the three tasks than those of the children in grade 1.

A t-test showed a significant difference between the two grades in terms of the word order correction task (t= -2.605, p< .05), but not for the symbol substitution task (t= -1.095, p=.288) or for the grammaticality judgment task (t = -1.388, p=.182).

Metalinguistic awareness tasks (control)

Table 4 reports the performance of Arabic-English bilinguals in grades 1 and 2 on the three metalinguistic tasks that require high control of linguistic knowledge. One child (one of the two children who failed to respond to the items in symbol substitution task that required high analysis of linguistic knowledge) failed to answers the question items in the symbol substitution (control). The inability to respond to this task was considered 'incorrect response' and was therefore assigned the value of

0. However, the analysis of the results showed that all Arabic-English bilingual children found difficulty in answering the items in symbol substitution (control). This is consistent with the Bialystok's (1988) claim that children find difficulty in solving this type of task.

Table 4. Proportion of correct responses on metalinguistic tasks of control for Arabic-English bilingual children in grades 1 and 2

Task (Control)	1st Grade (n=10)		2nd Grade (n=10)	
	Mean Proportion	Standard deviation	Mean Proportion	Standard deviation
Language Arbitrariness (n=12)	.55	.25	.72	.18
Symbol Substitution (n=8)	.28	.30	.32	.17
Grammaticality Judgment (n=18)	.13	.16	.07	.13

Children in the second grade performed better than their counterparts in grade 1 on the language arbitrariness task. However, the children in the two grades performed similarly on the symbol substitution and grammaticality judgment tasks. Once again, children's standard deviations in grade 2 in each task are lower than those for children in grade 1, implying that the children in grade 2 behave more homogenously on the three tasks.

A t-test showed no significant difference between the two grades for any of the three metalinguistic tasks that required high control of linguistic processing (t=-1.757, p= .096 for language arbitrariness, t= -.339, p=.739 for symbol substitution, and t=.811, p=.428 for grammaticality judgment).

The results in this section support the hypothesis that Arabic-English speaking children in grades 1 and 2 will show no significant difference on the metalinguistic tasks that require high control of attention and analysis of linguistic knowledge. However, the hypothesis is not completely supported since there was a significant difference between the two grades on the word order correction task.

Arabic-English bilinguals vs. English monolinguals

To gain a better understanding of the metalinguistic performance of the bilingual subjects as compared to the monolingual subjects, the Arabic-English children in both grades were combined to constitute one bilingual group and compared to the English monolingual group which was used as a baseline.

Language proficiency

Table 5 shows a comparison of the mean scores and the standard deviations of the English monolingual children and the Arabic-English speaking children in grades 1 and 2 combined.

Table 5. Mean scores and standard deviation on the PPVT-E for English proficiency

	Arabic-English bilinguals in the two grades (combined) (n=20)		*English monolinguals (n=5)*	
	m	sd	m	sd
PPVT-E	89.35	15.82	133	14.14

Clearly, the English monolingual children scored higher (m= 133, SD= 14.14) than the Arabic-English bilingual children in grades 1 and 2 combined (m=89.35, SD= 15.82). A t-test showed this difference to be significant (t=-5.617, p< .000).

Metalinguistic awareness tasks (analysis)

Table 6 summarizes the results for the Arabic-English bilingual children and the English monolingual children on the metalinguistic awareness tasks involving analysis.

Table 6. Proportion of correct responses on metalinguistic tasks of analysis for Arabic-English bilingual children and English monolingual children.

Task (Analysis)	Arabic-English bilingual children (n=20)		English monolingual children (n=5)	
	Mean Proportion	Standard deviation	Mean Proportion	Standard deviation
Word Order Correction (n=8)	.77	.29	.90	.05
Symbol Substitution (n=8)	.56	.35	.82	.20
Grammaticality Judgment (n=29)	.62	.23	.71	.14

As previously mentioned, two Arabic-English bilingual children did not answer the symbol substitution task (analysis). In contrast, all English monolingual children answered all tasks. The English monolingual children's standard deviations on the three tasks are lower than those of the bilingual children. This shows that monolingual children behaved more homogenously on the three tasks. A t-test showed no significant difference between the two groups- the Arabic-English

bilingual and the English monolingual children- for any of the three tasks: correction (t= -.932, p= .361), symbol substitution task (t= -.1.553, p=.134), and grammaticality judgment (t= -.799, p= .433).

The results obtained in Table 6 supported the hypothesis that bilingual children do not perform the same as or better than monolingual children on tasks that are high in their demands for analysis of linguistic knowledge (Bialystok, 2001a).

Metalinguistic awareness tasks (control)

Table 7 reports the results for the English monolingual children and the Arabic-English bilingual children on the metalinguistic awareness tasks that required high control of linguistic processing. As stated previously, one child did not answer the symbol substitution task (control). All monolingual children answered all items in all tasks.

Table 7. Proportion of correct responses on metalinguistic tasks involving control for Arabic-English bilingual children and English monolingual children.

Task (Control)	Arabic-English bilingual children (n=20)		English monolingual children (n=5)	
	Mean Proportion	Standard deviation	Mean Proportion	Standard deviation
Language Arbitrariness (n=12)	.63	.23	.70	.07
Symbol Substitution (n=8)	.30	.24	.70	.24
Grammaticality Judgment (n=18)	.10	.15	.35	.28

A t-test showed no significant difference between the two groups in terms of the language arbitrariness task (t= -.580, p= .567). However, the two groups differed significantly in the other two tasks: symbol substitution (t= -3.255, p< .01), and grammaticality judgment (t= -2.746, p< .05).

The results obtained from Table 7 did not support the hypothesis that bilingual children outperform monolingual children on tasks that are high in their demands for control of linguistic processing. On the contrary, the English monolingual children outperformed their bilingual counterparts on two of the tasks: symbol substitution and grammaticality judgment. The two groups showed equal performance on the test of arbitrariness.

Degree of bilingualism and metalinguistic awareness

In order to examine the relationship between degree of bilingualism and metalinguistic awareness, the subjects of this study were classified into three groups: English monolingual children, balanced Arabic-English bilingual children, and unbalanced Arabic-English bilingual children. As previously mentioned in the methodology, Arabic-English bilingual children were classified as either balanced or unbalanced using the difference in scores between the two language tests: PPVT-E and PPVT-A as the criterion. Children with a difference in scores of 10 or more scores were considered unbalanced bilinguals. Children with a difference less than 10 were considered balanced bilinguals.

Language proficiency

Table 8 reports the differences in scores between the Arabic and English versions of the PPVT. The information in this table forms the basis of classifying the Arabic-English speaking children as either balanced or unbalanced bilinguals.

Table 8. Distribution of children to balanced and unbalanced bilinguals according to the difference between their scores in the PPVT-A & PPVT-E

	Balanced bilinguals (n=11)	Unbalanced bilinguals (n=9)
	4 (A)* 8 (E) 8 (E) 2 (A) 8 (E) 7 (A) 3 (A) 5 (A) 6 (A) 3 (E) 6 (A)	26 (A) 19 (E) 21(A) 13 (A) 43 (E) 16 (E) 19 (A) 24 (A) 33 (A)
Mean difference	5.45	23.78

***The letter (A) stands for Arabic and (E) stands for English. The use of either "(A) or (E) in front of each number means that the child scored higher in that language.**

According to Table 8, the number of Arabic-English bilingual children who scored higher on the PPVT-A than the PPVT-E is 13 out of 20 which means that Arabic is the dominating language. While 7 out of 11 in the balanced group scored higher on the Arabic version of the PPVT, 6 out of 9 in the unbalanced group scored higher on the Arabic version. With regard to the effect of the amount of formal instruction in the two languages, the relatively small number (n=6) of Arabic-English bilingual children who only attended weekend Arabic classes made it difficult to compare their performance with their counterparts who attended full-time Arabic

school (n=14). Overall, there is no evidence in the results from which we may conclude that children from the weekend school differ significantly from their counterparts in the full-time school in terms of language proficiency.

With regard to language dominance, the two groups in table 8 were further classified into two groups: Arabic-dominant and English dominant. In order to see how this classification may affect the two groups' performance on the six metalinguistic tasks, a one way ANOVA test was administered. This test showed no significant differences between the two groups in terms of language arbitrariness (F=5.374, p=0.32), symbol substitution (analysis) (F=2.025, p=172), grammaticality judgment (analysis) (F=.407, p=.532), word order correction (F=4.075, p=0.59), symbol substitution (control) (F=.571, p=460), grammaticality judgment (F=.47, p=.830).

Table 9 reports the mean scores and standard deviations on the PPVTs for the three groups: the English monolinguals, the balanced Arabic-English bilinguals, and the unbalanced Arabic-English bilinguals. A one way ANOVA was used to examine the effect of group. A significant effect of group was found for the PPVT-E (F=15.15, P<.000). However, no significant effect for group was found for the PPVT-A (F=.367, P<.552).

Table 9. Mean scores on PPVT-A and PPVT-E for monolinguals, balanced bilinguals, & unbalanced bilinguals.

	Monolingual children		Balanced Arabic-English bilinguals (n=11)		Unbalanced Arabic-English bilinguals (n=9)	
	M	sd	m	sd	m	sd
PPVT-E	1.33	14.14	90	10	88.44	21.57
PPVT-A			90.64	9.49	94.89	20.87

However, Table 9 shows no significance difference (t =.201, p=.288) between the two groups in terms of English proficiency. This eliminated the need to compare the metalinguistic performance of the groups, the balanced and unbalanced Arabic-English bilingual children in terms of the level of bilingualism

Discussion

The primary purpose of this study was to cross-validate Bialystok's (1986, 1988, 1991, 1993, 2001a, 2001b) theory of analysis and control in a bilingual population who speak two typologically unrelated languages (Arabic and English). The findings of the present study generally do not support Bialystok's theory of analysis and control which postulates that bilingual children outperform monolingual and bilingual children on metalinguistic tasks that require high control of attention. The findings therefore are inconsistent with previous research findings (Bialystok, 1986a, 1986b, 1988a, 1988b; Cromdal, 1999) where evidence in support of Bialystok's theory was claimed.

Previous research findings (e.g., Abdurahman, 1997, Al-Dossari, 2005; Cromdal, 1999) reported that monolingual children have a larger vocabulary than bilingual children in the dominant language. The findings of the present study support this conclusion. English monolingual children scored higher than Arabic-English bilinguals on the PPVT-E (the English version). Having to share their language experiences between two unrelated typologically languages, bilingual children have less opportunity for experience with the vocabulary of either, such that they achieve lower scores compared to monolinguals in both their first and second language (Eviatar & Ibraham, 2000). This may account for the substantial difference in English proficiency between the Arabic-English speaking children and the English monolingual children in the present study.

Another potential contributing factor is that some Arabic-English speaking children who participated in this study do not receive an equal amount of instruction in the two languages: Arabic and English. Previous studies in bilingualism (e.g., Carlisle et al, 1999; Cummins, 1993) indicate that metalinguistic capabilities and the performance on the PPVT-E tend to develop very slowly among second language learners who have little or no schooling in their native countries or in their native language. Proficiency in the native language—Arabic in this context is the native language since it is spoken at home by parents and children—is a critical resource that children bring to their learning of a second language (Cummins, 1991). For both monolingual and bilingual children, metalinguistic development is parasitic on language development (Cromdal, 1999; Hake, 1982). Thus, it may be possible to argue that Arabic-English speaking children did not perform as well as the monolingual children on the metalinguistic tasks and vocabulary knowledge test because their home language was less emphasized than English.

With regard to the children's metalinguistic performance, the results support Bialystok's (1988b, 2000a), Bialystok and Majumder's (1998), and Al-Dossari's (2005) findings in that bilingual children and monolingual children may not necessarily differ from each other when solving metalinguistic tasks that require high analysis of linguistic knowledge. The English monolingual children and the Arabic-English bilingual children showed similar performance on the word order correction

task, the symbol substitution task, and the grammaticality judgment task which all required high analysis of linguistic knowledge.

However, the results did not support previous findings (Bialystok, 1986b, 198b8, 1999; Cromdal, 1999; Ricciardelli, 1993) that bilingual children outperform and monolingual children on metalinguistic tasks that require high control of attention. The results of this study showed that English monolingual children performed better than the Arabic-English bilingual children on the symbol substitution task and the grammaticality judgment task. No advantage was found for either the monolingual or bilingual children on the language arbitrariness task. This pattern of results is consistent with Al-Dossari's (2005) findings in which he found no support for Bialystok's second cognitive component: control of attention.

However, the findings of the present study are consistent with Yelland et al's (1993) findings that children with low proficiency in a second language can achieve some metalinguistic benefits. In this study, Arabic-English bilingual children demonstrated similar performance to the English monolingual children on the tasks that required high analysis of linguistic knowledge.

It is worth mentioning that the inconsistency of the findings of this study with the previous findings (Bialystok, 1986a, 1986b, 1988b, 1999; Cromdal, 1999; Ricciardelli, 1992) that bilinguals outperform monolinguals on metalinguistic tasks that require high control of attention should not be considered odd. In the literature, there were some studies (e.g., Al-Dossari, 2005; Diaz, 1985; Gathercole, 1997; Jarvis, Danks, & Merriman; 1995; Rosenblum & Pinker, 1983) that reported no advantage for bilingual children over monolingual children in a variety of metalinguistic tasks such as the arbitrary relationship between word and its referent and grammaticality judgments. However, the findings of this study are not conclusive. That is to say, other factors may have contributed to the inconsistency of the present study's findings with the previous studies, such as the typological differences between Arabic and English (the previous studies that supported Bialystok's theory were mainly obtained from studies that examined languages that were typologically related); the experimenter's administration of the tasks; the implementation of the tasks over a different period of times may have affected the consistency of procedures used in the testing of children; and the selection of a small number of English monolingual children who may have been elite.

Overall, the findings of this study must be taken with caution. There are several limitations of the present study need to be addressed in further research. First, the English monolingual sample was very small. Further research should endeavor to use a larger sample of monolingual children so that the findings can be generalized to similar samples. Second, the sample in this study was limited to children in grade 1 and 2. They were chosen because they were at a stage of metalinguistic development (Chaney, 1989; Homer, 2000) in which it was expected that interesting difference might occur. Further research needs to extend this sample to include children from different ages and grades. Third, this study did not include measures that test the

children's metalinguistic development in Arabic. Further research needs to explore the possible ways through which similar Arabic metalinguistic tasks can be developed and used to investigate the metalinguistic development of Arabic-English speaking children.

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APPENDIX I

Questionnaires

A

ARAB PARENTS' SURVEY: BACKGROUND INFORMATION

Child's name: _____ . Age _____.

Child's Grade: 1st Grade _____. 2nd Grade _____.

1. What is your educational level?

The mother: High school ___, Bachelor ___, Master____, Doctorate ____, None of these____

The father: High school ____, Bachelor ___, Master____, Doctorate ____, None of these_____.

2. What is your occupation? The mother _____. The father _____.

3. How long has your child been in the United States? _____ (months) _____ (years)

4. Was your child born in the United States? Yes ____ No ____

5. What language do you use in speaking to your child?

The mother: English ____ Arabic____ Both of them ____ Other language (Specify)_____

The father: English ____ Arabic____ Both of them ____ Other language (Specify)_____

6. Does your child attend both Arabic school and American-English school?

Yes _____ No, only Arabic school _____ / only American-English school_____.

7. How many days per week does your child go to the Arabic school?

_____.

9. When your child plays with his/her Arab peers, which language (Arabic or English) do you think your child use more in his/her conversation?

Arabic _____, English _____, Equal use _____, I don't know _____

10. How would you rate your child's Arabic?

Very good ____, Good ____, Very weak ____, Weak_____, I don't know___

11. How would you rate your child's English?

Very good ____, Good ____, Very weak ____, Weak____, I don't know____

12. Based on your daily contact with your child, do you think that your child has achieved balanced performance in the two languages (Arabic and English)?

Yes _____, No _____, I do not know _____.

13. If your answer to question 12 is 'NO', then which language do you think is the

more dominating?

Arabic _____, English _____, I don't know _____.

B

ENGLISH PARENTS'/GUARDIANS' SURVEY: BACKGROUND INFORMATION

Child's name :
_____.

1. What is your educational level?

The mother: High school ___, Bachelor ___, Master____, Doctorate ____, None of these____

The father: High school ____, Bachelor ___, Master____, Doctorate ____, None of these___

2. What is your occupation? The mother _____. The father _____.

3. Does your child or has your child ever attended classes in a language other than

English? Name this language? Yes_____. No_____ .The language is _____

4. Do you think your child speak a language other than English?

Yes _____. No _____. The language is _____

Appendix II

Cognitive Development Tests

1. Language Arbitrariness (control)

Introduction

Now we are going to play a game where we switch one word for another. I will ask you questions, and you will answer after you have switched the words. For example, now we will call the sun the moon and the moon the sun. And now I ask: when you go to sleep at night, what do you seen in the sky? The answer is _____. Another example is to tell the child that we will call a monkey a man and a man a monkey. [The child is shown a picture of a monkey]. What would you call this? _____. Can a man speak? _____.

The test (Total 12 items)

A.

Now we will call a boat a plane and a plane a boat.
1. What flies in the air? _____.
Now we will call a cat a mouse and a mouse a cat.
2. Who chases whom? _____.
Now we will call the bus station school and school a bus station.
3. Where do you go every morning? _____.
Now we will call clean dirty and dirty clean.
4. After I fell in the mud my clothes became _____.
Now we will call a hat a towel and a towel a hat.
5. When I go for a hike in the sun I wear a _____.
Now we will call cats dogs and dogs cats.
6. [Child is shown a picture of a cat] What would you call this animal? _____.
7. What noise would it make? _____.
Now we will call fish people and people fish.
8. [Child is shown a picture of fish] What would you call these? _____.
9. Would people have arms or fins? _____.
10. Would people live in houses or water? _____.

Now we will call trucks tables and tables trucks.

11. [Child is shown a table] What would you call this? _____.
12. Does a truck have wheels or legs? _____.

2. Symbol Substitution (Control)

Introduction

This is a naming game, and each time we are going to swap words without changing anything else. Sometimes things may sound wrong or funny, but that is alright. Listen carefully so you will find out how to play. Let us do some practice.

- The way we will say 'apple' is to say 'dog'. So the way we say 'The apple is under the tree' is to say 'The dog is under the tree". OK. Now you try it. If the way we say 'apple is 'dog', how do we say 'The apple is under the tree?'

The test (Total: 8 items)

(For each item the child is asked to substitute the second word for the first word in a given sentence, as in the practice items).

1. I/ice	I am cold.
2. she/fish	She likes swimming.
3. they/he	They were running.
4. summer/I	Summer is hot.
5. birds/plane	The birds are flying.
6. cats/he	Cats play with wool.
7. People/she	People drive to work.
8. frogs/she	Frogs are in the water.

3. Symbol Substitution (Analysis)

Introduction

This is another naming game a bit like the one we did before, but this time when I ask you to swap words, I also want you to change things so that it does not sound wrong. Let us have some practice first.

- The way we say 'mum' is to say 'they'. So how do we say 'Mum is home?'

The test

(For each item the child is asked to substitute the second word for the first word in a given sentence, as in the practice items).

1. they/water	They are cold.
2. she/I	She is running.
3. he/we	He likes walking.
4. winter/they	Winter is cold.
5. dog/sheep	The dog is resting.
6. she/mice	She likes eating cheese.
7. they/he	They are having lunch.
8.Anne/they	Anne is waiting outside

4. Word order correction (Analysis)

Introduction

This next game is different. This time I want you to fix up what I say. I will keep saying everything with a mistake in it. Then I want you to say them the way I should have said them. If you do not hear me, ask me to say it again. Let us have some practice.

- I chocolate like.
- Mum late is.

The test (Total: 8 items)

1. Dad the car washes.
2. I like days hot.
3. She the story wrote.
4. The teacher has a coat long.
5. The bird in the tree is.
6. He an apple ate.
7. Mum has a dress new.
8. sometimes children not do eat dinner.

5. Grammaticality Judgments Test (analysis)

Introduction

In this game I am going to say something, and then I want you to tell me if it is right or wrong. I also want you to tell me what is wrong with it, and then say it right. Let us have some practice first.

1. I have toys three.
2. My sister have two cars.

The test (Total:29 items)

1. The teacher a book reads.
2. We go to school in Monday.
3. The sky not is green.
4. She answered the question.
5. The birds is flying.
6. Many door are completely broken.
7. William puts milks in his cereal.
8. Leslie's birthday is on December.
9. You washed himself this morning.
10. Richard danced very well tomorrow.
11. My mother car is parked outside.
12. We saw the game last night.
13. The fat cow and the horse eats a lot.
14. My father bringed me a black dog.
15. Him eats a lot of candies and cookies.
16. visited my uncle yesterday.
17. Richard are tall.
18. Laura is the prettier girl in school.
19. We went to the movies yesterday.
20. Peter gave this me new car.
21. It are a hot day.
22. People like books funny.
23. Teachers on the blackboard write.
24. She not is reading.
25. The boy has hair curly.
26. Rabbits not can sing songs.
27. They is sitting down.
28. Rebecca to school run.
29. He dressed myself everyday.

6. Grammaticality Judgments Test (control)

Introduction

In this game I am going to say something, and then I want you to tell me if it is right or wrong. I might say something that sounds funny, but you have to tell me each time if it is right or wrong not if it is funny. I also want you to tell me what is wrong with it, and then say it right. Let us have some practice first.

- Apples grow on noses.
- A chicken can fly.

The test (Total: 18 items)

1. Winter is not hot.
2. The dogs are flying.
3. The sky is not blue.
4. Simon is eating bike.
5. She has a green car.
6. Paul drives a tree.
7. He likes to draw.
8. The children are playing cards.
9. People live in large fridges.
10. He is eating grass.
11. They are drinking apples.
12. The fish are walking.
13. She is driving a chair.
14. Cows ride in buses.
15. There are three purple oranges.
16. It is a tall day.
17. These shoes were great for writing.
18. I never wear computers on Sundays.