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10. METALINGUISTIC ASPECTS OF BILINGUAL PROCESSING

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This chapter examines differences in metalinguistic development between monolingual and bilingual children in terms of three subcategories: word awareness, syntactic awareness, and phonological awareness. In each case, some studies have reported advantages for bilingual children, but equally, other studies have found either no difference between the groups, or, in some cases, monolingual advantages. In the discussion of each of these areas, the kinds of tasks for which bilingual and monolingual children perform differently are identified. In none of these three subcategories of metalinguistic awareness do bilingual children exhibit a uniform and consistent advantage over monolinguals. An alternate conception of metalinguistic ability is proposed in which two cognitive processes, analysis and control, are directly responsible for task performance. These processes are involved in all metalinguistic tasks but to different degrees. Re-examining the results in this way reveals that bilingual advantages occur reliably on tasks that make high demands on control but are not evident in tasks that make high demands on analysis. The implications of this pattern for metalinguistic ability are considered.

One of the earliest claims that dealt a blow to the emotional paranoia claiming that bilingualism was a cognitively debilitating experience for children was that there might be metalinguistic advantages for children doomed to live in this benighted state. Research in the 1970s by Ianco-Worrall (1972), Ben-Zeev (1977), and Cummins (1978) set the stage for an exploration of how bilingualism influences children s developing conceptions of language. These studies, along with the seminal work of such researchers as Peal and Lambert (1962), led to a reconsideration of the role that bilingualism plays in the cognitive life of young children. Subsequently, the most careful studies of the cognitive skills that were considered to be influenced by early bilingualism are still

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those concerned with aspects of metalinguistic functioning.

Once we overcome the fears surrounding the possibility of negative consequences of bilingualism for young children s intellectual development, it is reasonable to consider ways that the experience of bilingualism might alter children s developing conceptions of language. It is not logically imperative, however, that the differences between monolingual and bilingual children in their mastery of these conceptions favor the bilingual children. For example, it might be that learning two languages leads to uncertainty about linguistic structure because contradictory rules are encountered in the two languages.

The question about possible bilingual differences in metalinguistic development presupposes that metalinguistic ability is a unified developmental construct. However, there is little consensus on what demarcates metalinguistic skill from linguistic competence and even less agreement on what appropriate tests of this achievement should be. Evidence for metalinguistic functioning has varied from simple speech repairs executed by 2-year-olds to sophisticated reflections on structure entertained by 8-year-olds. The first problem, therefore, is in deciding what constitutes metalinguistic ability.

One kind of evidence for the coherence of metalinguistic ability would be its differential acquisition by bilingual and monolingual children. In other words, if metalinguistic ability is a unitary achievement, then it could be traced developmentally in specific groups. However, a cursory examination of the research reveals a diversity in the results, sometimes indicating a bilingual superiority, sometimes a disadvantage, and sometimes no difference between the groups. The majority of studies report a bilingual advantage, but the snapshot of results to which we have access through typical publication channels is undoubtedly skewed in favor of bilingual advantages. Although it is possible to publish research results that show a monolingual superiority (that is, a bilingual disadvantage), it is difficult to publish results that show no difference between groups. Journals prefer significant *p* values and dramatic conclusions.

This chapter reviews some research that has explored developmental differences in the metalinguistic ability of monolingual and bilingual children and attempts to integrate the results into an explanation of cognitive processing. Metalinguistic abilities will be examined in terms of the subcategories of linguistic competence from which they arise. Any linguistic skill is a candidate for a metalinguistic counterpart in development. The categories surveyed here are word awareness, syntax, and phonology. Finally, a discussion of the construct metalinguistic attempts to establish the essential features that distinguish this ability and account for the pattern of development observed in bilingual children.

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Word Awareness

Two related insights are required for children to appreciate the symbolic function of words. The first is awareness of the segmentational process that isolates words in utterances. Tasks assessing this aspect of word awareness typically ask children to count the number of words in a sentence or to define the concept word. The second is awareness of the arbitrary relation between words and their designated meanings. Early on, Leopold (1961) identified the ability to recognize and appreciate this arbitrary basis of meaning in language as a direct benefit of bilingualism.

The segmentational ability that is part of word awareness has not been studied extensively in bilinguals. One study, however, has compared English and French monolingual and bilingual French-English children in this skill (Bialystok, 1986a). The children had to count the number of words in a sentence when the sentence appeared in its normal form or when the words in the sentence were scrambled to produce a meaningless string. Additionally, the sentence could consist of monosyllabic words or more complex words containing several syllables or several morphemes. The problems were relatively easy when the words were scrambled, although monosyllabic constructions were easier than the others. In contrast, the problems were very difficult when the sentences were left intact; on these items, there was a significant bilingual advantage for all word types. The presence of the meaning in the intact sentences interfered with children s ability to enumerate the units in the sentence, but monolinguals were disrupted more than the bilinguals.

Ben-Zeev (1977) developed a creative task to assess children s awareness of referential arbitrariness. In this task, called a symbol substitution task, children were asked to substitute random words for a common word in a sentence, creating nonsense. For example, children would be told to substitute *we* with the word *spaghetti*. Defying all sense, children had to produce such sentences as, Spaghetti are good children. She found that Hebrew-English bilingual children were significantly more reliable in making this substitution than were Hebrew monolinguals. The monolingual children were more wedded to the familiar meanings of words than were their bilingual peers. It is as though the meaning is inherent in the word, an immutable property of it. In contrast, bilingual children were more willing to accept that the meaning of word was more convention than necessity; more agreement than truth, and felt free to break the agreement if they so chose. This is the same analysis that applies to children s performance of Piaget s (1929) famous sun-moon problem. Here, too, bilingual children were better than monolinguals in understanding that changing the names for the sun and moon did not change the condition of the sky during the day or at night (Bialystok, 1988; Cummins, 1978; Ricciardelli, 1992).

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Children s understanding of the nature of reference has been investigated in other ways as well. Feldman and Shen (1971) taught groups of monolingual and Spanish-English bilingual children new names for things, where the new names were either the real names for other objects or nonsense words. Both groups of children learned the new names equally well, but only the bilinguals were successful in using the new or nonsense names in sentences. In other words, only the bilinguals accepted that the new names *could* be used arbitrarily in a real linguistic context. Similarly, Ianco-Worrall (1972) asked monolinguals and Afrikaans-English bilinguals about the viability of changing the names for known objects and only the bilinguals agreed names for things could be changed.

Cummins (1978) administered four types of metalinguistic tasks to bilinguals and monolinguals dealing with various aspects of word awareness. There were performance differences between the two groups on only some of the tasks, or on some parts of the tasks. For example, one task tested whether a child considered the meaning of a word to be stable even when the referenced object had ceased to exist, such as the continued existence of the word giraffe if there were no giraffes left in the world. This task showed a bilingual advantage, especially by the older children. In another task, children were asked whether particular words had the physical properties of the objects they represented, for example, Is the word *book* made of paper? Here there were no differences in performance between bilinguals and monolinguals. Cummins concluded that bilinguals had a greater linguistic flexibility but not a greater reasoning ability for problems that extended beyond the domain of language.

Ricciardelli (1992) compared the performance of first grade children who were either English monolinguals or Italian-English bilinguals on a battery of cognitive and metalinguistic tasks. There were five metalinguistic tasks assessing word awareness, syntactic awareness, and concepts of print. Although there were some weaknesses in aspects of the design and analyses, the results showed a bilingual advantage on the syntactic awareness task and one of the word awareness tasks.

The results of these studies do not always favor bilinguals. Rosenblum and Pinker (1983) found no differences between Hebrew-English bilinguals and English and Hebrew monolinguals in their ability to substitute a nonsense word for an actual word, but there were differences in their explanations. Monolingual children focused on the attributes of objects and explained that the name of an object, such as a table, could be changed to *shig* because it still had four legs. Bilingual children justified their answers in more abstract and general terms,

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explaining that the name of an object was arbitrary and could be changed under certain conditions.

A study by Edwards and Christophersen (1988) added an important dimension to these investigations by including the effects of literacy level. Bilingualism and literacy affected performance on the tasks in different ways. In a word segmentation task, higher levels of literacy were associated with higher task performance. Conversely, performance on two tasks assessing referential arbitrariness was significantly related to level of bilingualism. These tasks involved the familiar attempt to have children change the names for the sun and moon (and cats and dogs as well in this case) and to answer questions about the tangible properties of words, such as Does the word *bird* fly in the sky? At the same time, neither literacy nor bilingualism was related to children s ability to make simple grammaticality judgments.

Although many studies reported bilingual superiority in tasks assessing concept of word, there was no unconditional advantage for bilinguals on all tasks. The advantages were confined to certain tasks, and sometimes to certain parts of some tasks. It is not uncommon for studies employing a battery of tasks to report different results for each. Indeed, if one group consistently and uniformly outperformed the other irrespective of the task demands, it might signal an inherent difference between the groups, for example, differences in intelligence or language proficiency. The array of results requires us to examine the pattern closely to determine the conditions under which bilinguals express superiority.

Syntactic Awareness

The need to make a judgment about the grammatical acceptability of a sentence is probably the prototypical metalinguistic task. Nonetheless, there is some controversy about whether the standard version of this task (that is, judge the grammaticality of a simple sentence presented in one s native language) is metalinguistic at all. For Chomsky, at least, it is simply part of native speaker competence. Nonetheless, the paradigm is used frequently both as a measure of syntactic awareness and as an index of language proficiency.

These tasks have been used successfully with children. Galambos and Hakuta (1988) compared English-speaking monolinguals and Spanish-English bilinguals for their ability to solve two kinds of metalinguistic tasks. The first was a standard task in which children were asked to judge and then to correct the syntactic structure of sentences. The second asked children to determine the ambiguity in sentences and then to paraphrase the various interpretations. The research was conducted longitudinally and showed that bilingual children had a

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consistent advantage over monolinguals in the syntax task but only the older children (that is, the same children in the later testing session) were better than the monolinguals in the ambiguity task. They also report specific effects of the children s level of language proficiency and details of the task items. These are important constraints on the results bilingual effects are not simple and not pervasive.

A more extensive study based on the same principles was conducted by Galambos and Goldin-Meadow (1990). They presented Spanish and English monolinguals and Spanish-English bilinguals with a range of problems assessing syntactic awareness. In a series of sentences, children were asked to note any errors, correct the errors, and explain the errors. These questions were considered to be ordered in terms of their demands from lowest to highest levels of awareness. The researchers found that noting and correcting errors were systematically related but claimed that explaining the errors was a qualitatively different skill from these. This bifurcation between the explanation condition and the other two tasks was recapitulated through the effects of the bilingual experience on performance. When noting and correcting errors, the bilinguals progressed faster than monolinguals and showed significant advantages at all ages tested. When explaining the errors, however, there were no compelling advantages for the bilingual children. Galambos and Goldin-Meadow (1990) interpreted the developmental progression as moving from a content-based to a structure-based understanding of language, arguing that bilingualism alters the rate of development but not its course.

Grammaticality judgment tasks have been manipulated to create more precise tools for investigating children s linguistic (and metalinguistic) competence. The manipulations can involve altering the detail of examination required (Galambos & Goldin-Meadow, 1990; Galambos & Hakuta, 1988) or the length or complexity of sentences in an effort to elicit judgments from younger children (de Villiers & de Villiers, 1974; Smith & Tager-Flusberg, 1982). Another kind of manipulation alters the attention needed to make the judgment by introducing misleading material. This manipulation was first used by de Villiers and de Villiers (1972) and developed into an experimental task to identify differences between judgments made by monolinguals and bilinguals by Bialystok and colleagues (Bialystok & Ryan, 1985).

In standard judgment tasks, subjects must decide whether or not there are grammatical violations in sentences. If the sentence also contains incorrect semantic information, then it is difficult for young children to ignore these errors and attend only to the well-formedness criteria. For example, children trained to judge only grammaticality can be given a sentence like Apples grow on noses. This sentence is grammatically correct, but the semantic anomaly is highly distracting and

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children would like to say that the sentence is wrong. In repeated studies, it has been shown that bilingual children are better than monolinguals at ignoring this irrelevant information and identifying the sentence as correct (Bialystok, 1986b, 1988; Bialystok & Majumder, 1998; Cromdal, 1999). Again, there is a bilingual advantage on a specific metalinguistic task but not a global advantage over the paradigm.

As with word awareness, performance differences do not always favor bilinguals. Gathercole (1997) used a grammaticality judgment task to determine whether Spanish-English bilingual children could use syntactic cues to distinguish mass nouns (e.g., water) from count nouns (e.g., cups). She found that older and more fluent bilinguals performed like monolinguals but that the younger and weaker bilinguals were less developed than monolinguals in solving these problems. In another study, Gathercole and Montes (1997) used a more traditional grammaticality judgment task to determine whether Spanish-English bilingual children could make appropriate decisions about sentences containing violations of *that*-trace. They found that monolinguals were better than bilinguals for both judging and correcting the sentences, but that the performance of the bilinguals was significantly influenced by the amount of English input they received at home. This research identifies some areas in which bilinguals do *as well* as monolinguals, but none in which they do better.

Phonological Awareness

Phonological awareness, the understanding of the sound units that make up words, is unique among metalinguistic skills in its consequence. Numerous studies have demonstrated a causal link between this metalinguistic achievement and progress in learning to read, at least for alphabetic scripts. Only a few studies, however, have examined the development of phonological awareness in bilingual children.

Rubin and Turner (1989) compared the phonological awareness of English-speaking first-grade children who were either in French immersion (giving them a modest command of French) or English programs and found an advantage for the French immersion children. A similar study by Bruck and Genesee (1995) using a larger test battery and more careful controls largely replicated the results for kindergarten children but found no advantage by grade one. Examining children whose bilingualism was even more limited, Yelland, Pollard, and Mercuri (1993) asked children to judge whether pictured objects had long names or short names. They also found an advantage for bilinguals in kindergarten that disappeared by end of grade one.

In a study by Campbell and Sais (1995), preschool (5-year-old) children who were monolingual or Italian-English bilinguals were

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compared on four tasks: detect a mismatch in initial sound of a set of words, detect a mismatch in meaning, delete morphemes from words, and identify letters. The bilingual children scored higher than the monolinguals on the first three tasks but the two groups were the same on the letter identification task, a pattern that Campbell and Sais interpreted as indicating an advantage in metalinguistic but not linguistic knowledge. However, these tasks are only questionably phonological and the children were only tested in preschool. In other studies, preschool advantages disappeared in first grade.

Phonological awareness is important because of its relation to the acquisition of literacy. Carlisle, Beeman, Davis, and Spharim (1999) gave Hispanic bilinguals in grades one to three two different tasks in both languages. One was a definition task and the other was a phonological awareness task. For this measure, children had to say parts of words, for example, Say *mean* without the /m/. Regression analyses showed that reading proficiency was related to vocabulary size in both languages and to level of phonological awareness. However, vocabulary size and phonological awareness were correlated only in the language in which children were learning to read, namely, English. Another factor influencing these relations is the script in which the language is written. Rickard Liow and Poon (1998) showed that bilingual children who could read both Chinese characters and an alphabetic language with a shallow orthography (that is, one with relatively regular sound-symbol correspondence), Indonesian, performed better in phonological awareness and spelling than did bilingual children who could read both Chinese characters and an alphabetic language with a deep orthography (one with less regular sound-symbol relationships), English. The regular sound-symbol correspondences in Indonesian helped these children to work out the nature of phonological structure, even for other languages.

We conducted a series of studies to explore the development of phonological awareness in monolingual and bilingual children across a range of age and tasks (Bialystok, Majumder, & Martin, 2000). In the first two studies, children were five, six, and seven years old (corresponding to kindergarten, first grade, and second grade). The bilingual children were (about equally) fluent in English and French. The task, called phoneme substitution, was a difficult problem in which children needed to replace the first sound in a target word with the first sound from another word to produce a new word. For example, cat can be converted to mat by substituting the first sound of mop. Children were told, Take away the first sound from cat and put in the first sound from mop. What is the new word? There were no differences between the monolinguals and the bilinguals in their ability to solve this problem.

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The third study included a wider range of groups and a larger selection of tasks. Children were again five, six, and seven years old and were monolingual or bilingual with either Spanish or Chinese as their other language. The three tasks were different in the demands they made on explicit phonological awareness and the involvement of other cognitive components in their solution. There were bilingual differences on only one task and for one group the Spanish-English bilinguals solved a phoneme segmentation task better than monolinguals or Chinese-English bilinguals did. Hence 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. Although reliable advantages for bilingual children can be established, they are heavily constrained by other factors.

Extracting the Pattern

The group comparisons provided little ground for claiming a consistent core to the tasks described as metalinguistic. Bilingual and monolingual children acquired aspects of these concepts on different schedules, even undermining any consistency in the subcategories of linguistic competence. Therefore, instead of defining metalinguistic in structural terms by pointing to a set of tasks that indicate the ability, it will be considered in processing terms, identifying the cognitive components that are implicated in the solution to specific metalinguistic tasks.

The processing description, elaborated elsewhere (Bialystok, 1993, in press), is based on two cognitive processes that are implicated in language acquisition and other cognitive developments. These processes are called analysis of representational structures and control of selective attention. Greater involvement of each makes tasks more difficult, and this difficulty results in behavior appearing to be increasingly metalinguistic. However, no specific boundary in the development of either process signals a category shift into metalinguistic performance; it is a gradual transition into a continuously evolving domain.

The first process, analysis of representational structures, is children s ability to construct mental representations with more detail and structure than was part of their initially implicit knowledge. Representations that are more explicit are more amenable to conscious access and to intentional manipulation. Karmiloff-Smith (1992) articulates a theory in which representational redescription is the central mechanism for cognitive development. Although not identical to the process of analysis, there is much common ground in the two descriptions. This processing component captures the need for metalinguistic behavior

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to be based on knowledge that is more explicit or more formal than that needed for more ordinary linguistic performance.

The second process, control of attention, is responsible for directing attention to specific aspects of either a stimulus field or a mental representation as problems are solved in real time. The need for control is most apparent when a problem contains conflict or ambiguity and the correct solution requires attending to one of two plausible representations and inhibiting or resisting attention to the other. Tipper and McLaren (1990) have identified this development of inhibition as one of the crucial advances in attention. Problems that present greater degrees of conflict require higher levels of control of attention. These problems also elicit performance that is more metalinguistic.

Defined in terms of underlying processes, any task that places high demands on these processes is metalinguistic. This processing criterion allows different metalinguistic tasks to be compared in more detail. A selection of some metalinguistic tasks with their processing demands is illustrated in Figure 1.

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Figure 1: Some metalinguistic tasks with an estimate of their demands for analysis and control.

This processing framework provides a means for re-interpreting the results of monolingual and bilingual comparisons of metalinguistic development. Simply put, tasks that are high in their demands for control of attention are solved better by bilinguals than monolinguals; tasks that are high in their demands for analysis of representations are not necessarily solved better by either group. The bilingual advantage, therefore, is in the ability to control attention when there is misleading information.

Consider some of the tasks used in the research described in this review. The following tasks produced an advantage for bilingual children: count words in sentences, symbol substitution, sun-moon problem, use novel names in sentences, word-referent problem (giraffes), judge grammaticality of anomalous sentences, and phoneme segmentation. The following tasks did not produce a bilingual advantage: count words in strings, describe attributes of words, determine ambiguity, explain grammatical errors, judge grammaticality of incorrect (but meaningful) sentences, understand count-mass distinction, and phoneme substitution. The difference is in the primary demands imposed by each set of tasks.

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The tasks in the former group include misleading information, making them high in their demand for control of attention. The tasks in the latter group require detailed knowledge, making them high in their demand for analysis of representations. The effect of bilingualism on children s development is that it enhances their ability to attend to relevant information in the presence of misleading distractions. There is no domain description that defines this bilingual advantage: some metalinguistic tasks are solved better by bilinguals and others are not. Even the subcategories of word awareness, syntactic awareness, and phonological awareness do not capture what is unique about the access to these problems by bilingual children. It is only at the level of underlying processing that the pattern becomes clear.

The conclusion from this interpretation is that bilingual children do not have different control over a domain of knowledge than monolinguals. Specifically, there is no evidence that metalinguistic ability *per se* is developed more easily or more quickly in bilingual children. It is the case, nonetheless, that bilingual children consistently outperform monolinguals on some metalinguistic tasks. Rather than attributing this advantage to privileged access to a domain of knowledge, however, the benefit is traced to a specific cognitive process that develops more readily in bilingual children. This process, control of attention, is central to certain metalinguistic problems, and it is in solving these problems that bilingual children excel. Although this analysis leaves little ground for claiming a bilingual superiority in an important developmental ability, it isolates nonetheless a formidable advantage in cognitive processing. The potential impact of this cognitive process goes well beyond the domain of metalinguistic, or even linguistic competence.

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