BEYOND BINARY OPTIONS:
EFFECTS OF TWO LANGUAGES ON THE BILINGUAL MIND

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1. Introduction

For psychologists, the fascination with bilingualism is to understand how the landscape of the mind is different for people who know two languages than it is for people who know only one. How does the mind accommodate two linguistic systems? Do they share space and resources or divide the territory? What are the implications for the rest of cognition? The interesting perspective on all these questions is from the point of view of the developing mind of children. How does development change the organization of the mind?

In examining these questions, researchers have traditionally construed the possible answers in terms of dichotomous choices. This has been necessary to make any progress with problems that are otherwise intractable because they are intrinsically multifaceted. But the simple options do not represent the possibilities – two languages are not a doubling of one, they are not acquired twice as slowly, and their potential impact on cognition is complex at best. Nonetheless, most research proceeds without sufficient acknowledgement of the morass of complexity inherent in the issues. For example, we routinely compare monolingual and bilingual children, but such comparison presupposes some identifiable dimension of contrast. Theories developed to describe a cognitive phenomenon based on a single language may not simply be expanded and offered as an explanation when two languages reside in the mind of the same speaker.

Simplifying assumptions such as these lead to the familiar dichotomous options, neither of which recognizes the complexity of the problem and both of which are ultimately unsatisfying. This situation has been unavoidable until now because research energy needed to be placed in developing descriptive

models of bilingual development. But we are now in a relatively advanced state of knowledge and it is now possible to build on this research and take it in new directions. We must re-examine old assumptions and find more creative solutions to traditional explanations.

The limitations of confining explanations to binary options will be illustrated by examining two issues in bilingual development. The first is representation: How are two languages represented? What is the relation between the languages and the connection between the languages and thought? Second, what are the implications of bilingualism for cognition and cognitive development? It will be argued that dichotomous choices omit alternatives that may offer more realistic and complete solutions. Although no solutions are proposed, it is clear that bilinguals can no longer be described in the same terms that make sense for monolinguals.

2. Representing two languages

When young children are exposed to two languages from an early age, there is an inevitable period during which their utterances are comprised of words selected with apparent disregard for the language they belong to. Examples of these mixed language utterances have been well documented for errors in syntax (e.g., Lanza 1992), vocabulary (e.g., Vihman 1985), and phonology (e.g., Schnitzer – Krasinski 1994). Volterra and Taeschner (1978) offered an early explanation for these observations by proposing a three-stage model of language consolidation. In the first stage, the child has only one lexical system comprising words and structures from both languages. The second stage is characterized by two distinct lexicons that are governed by a single syntactic system. Finally, the child achieves proper differentiation of the two languages, distinguishing both lexical and syntactic structures for each. This model elicited considerable following at first (Arnberg 1987; Grosjean 1982; Redlinger – Park 1980; Swain – Wesche 1975; Vihman 1985). Moreover, it was consistent with the position espoused by Leopold in his influential work: "infants exposed to two languages from the beginning do not learn bilingually at first, but weld the double presentation into one unified speech system" (Leopold 1954: 24).

Other studies were critical of the explanation, claiming that children were indeed aware (at some level) that they were combining languages but that it was an efficient strategic device to enhance communication (de Houwer 1990; Genesee 1989; Goodz 1989; Lanza 1992; Lindholm – Padilla 1978; Meisel 1989; Pye 1986). According to these views, children's mental representations of the two languages were distinct but their use of them was motivated by an effort to facilitate the expression of meanings. Just as monolingual children overextend words to refer to similar objects, such as using "doggie" to label squirrels, bilingual children's infusion of their speech with the other language is more likely evidence of strategic resourcefulness than of conceptual confusion.

The alternatives to represent knowledge of two languages in a combined repository or as discrete systems offer only starkly opposed possibilities and illustrate the problem with dichotomies. Genesee (1989) explains these positions and names them the unitary language system hypothesis and differentiated language systems hypothesis, respectively. In his and other studies, the weight of evidence favours the differentiated view, but the case is never simple to make. Indeed, even Genesee and his colleagues acknowledge a preliminary period in which a differentiated representation is simply not supported by the data (Nicoladis – Genesee 1996).

The restriction to these two options follows from three common premises regarding language and its representation. The first is that language is a coherent entity, the second is that its representation can be located in (mental) space, and third that the representation has a discernible structure. All three may well be false, but even if only one of them is, the choice between the two options for mental representation of two languages is invalidated. Each of the three assumptions can be challenged, and the alternatives presented by those challenges change the nature of the possibilities for the bilingual representation of language.

2.1. Assumption of homogeneity of language

It is axiomatic to say that language is defined differently by competing theoretical perspectives, but one aspect of that definition becomes relevant to the assumption that "language" consists of a coherent body or domain whose representation can be examined and discussed. It is the problem of what is included in the centrality of linguistic knowledge. In broad terms, formal theories of language (e.g., Chomsky 1981, 1995; Pinker 1994) include only aspects of syntax and morphology, the abstract rules of UG, as the defining core of language. Wasow (1989: 163) states that for generativists, the definition of grammar is "a finite system of rules for characterizing the membership of some language – that is, for specifying all and only the sentences of the language." This allows language to be infinitely productive and enables children to command the vast range of acceptable permutations of linguistic strings without ever having heard the specific instantiation. Conversely, functional grammars allow structures to consist simultaneously of grammatical, semantic, and pragmatic patterns (e.g., Goldberg 1995; Langacker 1986). As Van Valin (1991) explains, the functionalist view is that language is a set of relations between forms and functions, conferring no special status on syntax. The variety of information that enters these relations and converges on language and language use, including nonlinguistic information, is treated as equally relevant

to the formal study of language. Some additional options offer hybrid solutions. For example, Locke (1993) proposes what he calls a "biolinguistic" explanation of language acquisition that depends on two components of human information processing: a grammatical analysis module (GAM) and a specialization in social cognition (SSC). Language itself is defined by the GAM, and that component essentially governs phonetic processing and generative morphology.

These diverging views of language virtually obviate the possibility of asking how language is represented because there is not even consensus on what language *is*. The assumption that language is a coherent entity is simply not sustainable given these competing theoretical perspectives. Moreover, the dichotomy regarding the combined or distinct representation for whatever domain is included as language applies to only a small portion of the broader spectrum of linguistic knowledge in formal views and makes little sense in functionalist views.

Another way of considering the homogeneity of language is in terms of its division in representational space. It is generally assumed that the representational form, whatever it is, applies to all aspects of the language, but there is no forceful argument that should make this so. We know that language representation is divided to some extent, even across cerebral hemispheres. The right hemisphere involvement in language may not monitor such fundamentals as syntax, but it is no less crucial to normal language functioning than are the more linguistically central processes that reside in the familiar left hemisphere. Even here, some of the earliest insights into how language is represented in the mind concern basic divisions of responsibility. The earliest progress in this area was to isolate the comprehension functions in Wernicke's area and the distinct production functions in Broca's area. Although these descriptions are now considered to be oversimplifications (see for example, Kimura 1993), it remains the case that different aspects of language processing are housed in these cerebrally distinct locations. Recent proposals for distinctions in linguistic representation are subtler. Neville (1992), for example, has used evidence from event-related potentials (ERP) to claim that open class words (reflecting semantic knowledge) and closed class words (reflecting syntactic structure) are represented separately and are differentially affected by such factors as age of acquisition.

2.2. Assumption of located representations

Different assumptions about the nature of mental representation radically alter the representational possibilities. A prominent example is the connectionist Competition Model of Bates and MacWhinney (Bates – MacWhinney 1989; MacWhinney 1997). On this view, language representation is distributed, making a demarcation between languages in mental space logically impossible.

Instead, language processing and language learning is a procedural interaction of mental processes and contingencies in the linguistic environment. The primary mechanism is cue validity, a statistical relation between a stimulus cue and an outcome. The strength of the cue is determined by such factors as its reliability. Language learners build up response patterns based on these cues, and these patterns are the working grammar of the language. For example, word order is a reliable cue to meaning in English but not Italian, so English speakers pay attention to word order but Italian speakers do not. Therefore, a language is defined by a set of cues that lead to certain processing outcomes and not by a representational space. For learners with two languages, there would be two sets of cues competing for their priority in processing.

What are the effects of two languages in this model? Neither the unitary nor differentiated hypothesis applies. Hernandez, Bates, and Avila (1994) used a sentence interpretation task with Spanish-English bilinguals and comparable monolinguals to determine what "in-between" could mean for on-line processing. When processing sentences such as, "The dog is chasing the cows", monolingual English speakers first evaluate word order, then agreement, then animacy, while monolingual Spanish speakers begin with agreement, then examine animacy, and finally word order. Using the options presented by the standard assumptions, the counterpart of combined representations would be that bilinguals would apply the processing strategies of one of the languages, presumably the dominant one, onto the other. Following the options of distinct representation, bilingual speakers would be expected to use the procedures appropriate to each language uniquely with that language. The results showed neither of these outcomes. Instead, bilinguals were half-way between in both languages, using an amalgam of strategies. Bilinguals were neither the same as each monolingual speaker nor a simple additive conjunction of two.

2.3. Assumption of representational structure

One aspect of structure that has repercussions for a bilingual representation of language is the way in which lexicon is connected to a conceptual system of meanings. The problem of how word meanings are connected to the appropriate lexical entries has been so complex as to baffle psycholinguists whose models were carefully purged of any possible intrusion from a second language. The arrangement that would be necessary to accommodate two languages is vastly more difficult to uncover and to understand.

Research that has addressed the issue of two languages and their relation to a meaning system has found, not surprisingly, that many of the simple models developed for a monolingual situation are inadequate. One important model for bilingual representation is that developed by Kroll and her colleagues (Kroll 1993; Kroll – de Groot 1997; Kroll – Sholl 1992). In their framework, the

lexical representations for the two languages are represented independently of each other but they share a single conceptual representation. Moreover, the nature of the relation between words and their meanings changes as a function of fluency in each language. As language proficiency increases the connection between a word and its meaning becomes more direct, relying less on a mediating connection through the L1 lexicon. In this sense, the rather mechanical models developed to account for representation in a single language could never capture the dynamic necessary to model the structural relation between two languages and a meaning system.

The description is more complex, however, when one considers the structural relation *between* the two languages. Although the languages appear to be represented separately (Durgunoglu – Roediger 1987; Kirsner et al. 1984), they are nonetheless simultaneously activated during processing (Grainger – Dijkstra 1992; Grainger 1993; Guttentag et al. 1984). Here, the assumption that identifying the structural representation of the languages, in this case, the distinctness of that representation, turns out not to predict the consequence. Separate representation, in other words, does not translate into separate processing.

Another source of evidence for the complex structure that weaves two languages and a meaning system can be extracted from studies of how children learn two vocabularies in the early stages of language acquisition. Pearson and her colleagues (Pearson – Fernández – Oller 1993; Pearson – Fernández 1994) studied Spanish-English bilingual children and developed computations that allowed them to determine the nature and function of each of the languages and their relation to each other. Do children, for example, use the second language to echo the dominant one or is each language used in a distinct context and for individual functions? The most striking aspect of the results was the individual variability among the children. Not only were the children acquiring vocabulary at different rates and at different levels, but also were they different from each other in terms of their language environment and the balance between their developing languages. Clearly, a general statement describing the structural relation between the two languages and between each language and the meaning system would be unduly simplistic.

In summary, these examples illustrate how our imagination of the possibilities of the mental state of bilinguals is constrained by our tacit acceptance of certain assumptions. The question about the independence of the linguistic representation for the two languages presupposes adherence to a particular model of linguistic knowledge. Specifically, it presumes that language is exhaustively defined through particular aspects, such as morphology, or phonology, that linguistic representations occupy a coherent and identifiable mental space, and that there is a fixed and structured relationship that connects language, particularly lexicon, to a conceptual system of meanings. But none of these assumptions may be valid, so the two choices that follow from this set of assumptions may well (and probably do) under-determine the range of options and may omit entirely the correct description. Under different interpretations of the nature of language and its mental representation, the dichotomy between combined or distinct representations for the two languages is overruled by a continuum of intermediate possibilities.

3. Bilingualism and cognition

If learning two languages is a significant experience for children's development, then we would expect to see influences of bilingualism on specific aspects of children's cognition. Again, the question has typically been posed in a manner that leads to a simple dichotomous choice: either bilingualism has an enhancing effect on children's cognition or it has a negative one. There is a less interesting third possibility, namely, that bilingualism is without effect on cognition, but this option is rarely discussed. Research, of course, has been less than decisive in crowning a victor from among these options, especially since the favoured solution varies with the social and cultural climate (Gould 1981; Hakuta 1986).

Among the earliest reported benefits of bilingualism was an advantage in "mental flexibility, a superiority in concept formation, a more diversified set of mental abilities" (Peal – Lambert 1962: 20). These findings were a refreshing antidote to the tombs of despair that had been broadcast for years about the confusing and disrupting consequences of bilingualism for children's thinking. It was also an important direction for bilingual research because it was based on the premise that knowledge of language has cognitive consequences beyond the simple and restricted domain of language. Bilingualism, from this perspective, was a potentially significant factor in cognition and the development of thought. Nonetheless, the positive results for such measures as cognitive flexibility first reported by Peal and Lambert have rarely been replicated (but see Cummins – Gulutsan 1974). Most studies have focussed on metalinguistic rather than cognitive benefits of bilingualism, frequently reporting positive outcomes (e.g., Ben-Zeev 1977; Bialystok 1988; Duncan – De Avila 1979; Ianco-Worrall 1972). Although these are important results, it is less surprising and theoretically less interesting to discover that learning two languages influences children's *conceptions* of language. The more striking result would be an influence on children's thinking, especially if that influence were an enhancing one.

A study by Lemmon and Goggin (1989) attempted to replicate the effects reported by Peal and Lambert in a population of bilingual university students but failed to detect any bilingual advantages on such measures as object naming, fluency, flexibility, and nonverbal geometric tests. Still, evidence for the cognitive benefits of bilingualism continues to be reported, albeit infrequently. Even in the early research that was the basis for the arguments concerning the harmful

effects of childhood bilingualism, there were glimmers of a different story. Darcy (1946) found that Italian-English bilingual pre-schoolers performed better than monolinguals on the Atkins Object Fitting test, used as a non-verbal measure of intelligence, although they performed worse on the verbal measure. Hakuta (1987) examined both degree of bilingualism and cognitive abilities in a study of Hispanic children in American schools. The results showed that higher levels of bilingualism predicted performance on a series of nonverbal tasks.

Studies of specific cognitive domains have yielded more consistent results. Kessler and Quinn (1980), for example, looked at the effects of bilingualism on scientific problem-solving. They hypothesized that relevant aspects of a problem may become more salient to bilingual children than monolinguals because their experiences in two different languages and cultures would enable them to incorporate two perspectives. Children were shown a physical science problem and were required to rapidly generate as many hypotheses as possible. The bilingual children produced hypotheses that were more structurally complex and qualitatively sophisticated than those given by the monolingual children. The interpretation was that there is a common underlying ability for both hypothesis formulation and complex linguistic expression.

It is difficult to know how many studies fail to find enhancing effects of bilingualism on cognitive processing because such results are unlikely to be published. Nonetheless, from the range of reported findings, we can presume that many such outcomes occur, and that bilingualism is far from a general and assured predictor of advanced cognitive functioning. It is most likely, in other words, that bilingualism has an impact on cognitive development only some of the time, or only under some circumstances. Again, the dichotomy fails to capture the situation, allowing only for the presence or absence of such an effect. What is needed, then, is an account of bilingualism that goes beyond the range of options set out by two simple alternatives.

One way of organizing the effects of bilingualism is in terms of the specific cognitive processes involved in individual tasks. Elsewhere I have proposed that two such processes, analysis and control, can be used effectively to classify tasks according to two primary aspects of processing. The first, analysis, is the process of restructuring mental representations to become explicit and detailed, as required by increasingly complex tasks. The second, control, is the process of selective attention required to ignore misleading information and attend only to relevant features of a display. Previous research has shown that bilingual children demonstrate an advantage when solving problems requiring high levels of control but no advantage over monolinguals when solving problems requiring high levels of analysis (review in Bialystok 1992). More recent research has continued to support this explanation. Bialystok and Majumder (1998) presented monolingual and bilingual 8-year-olds with a set of nonverbal problem-solving

tasks. Some of the tasks were constructed to demand higher levels of analysis and others, higher levels of control. The Noelting Juice Task, for example, requires children to make judgments about proportions and ratios by stating which mixture of water and juice will provide a stronger flavour. To solve the problem, children need explicit representations of the two quantities and a procedure for comparing them. This kind of knowledge is very analytic. The Water Level Task, in contrast, requires children to decide where the water level will be in a tilted bottle. To solve the problem, children need to ignore the spatial information inherent in the bottle and draw a line parallel to the gravitational bottom, irrespective of the orientation of the bottle. This requires selective attention, or control. Using several such problems it was found that there was a bilingual advantage in problems requiring control but not for those requiring analysis.

Studies such as these show that the choice between the options of either facilitating or inhibiting effects of bilingualism on children's cognition is too restrictive. The effect of bilingualism on the child's development appears to be complex, interacting with task conditions, levels of proficiency in both languages, and stage of development. Bilingualism as an abstraction neither helps nor hinders children's cognitive development in the broad sense. Instead, children who acquire two linguistic systems develop as well different ways of representing and accessing knowledge, both linguistic and nonlinguistic. These differences distinguish bilingual children from monolinguals but not in a simple quantitative dimension that could resolve the dichotomous options presented in the standard question about the cognitive development of bilingual children.

4. Beyond dichotomies

The two examples of issues in the study of bilingualism and the development of bilingual children have illustrated how an approach that considers bilingualism to be a simple additive condition onto monolingualism is misleading and nonproductive. Research addressing both the nature of mental representations for two languages and the effects of bilingualism on cognition indicates that the correct description in each case requires an answer of far greater complexity than was contained in the simple binary choice. Bilingualism, it turns out, is different from monolingualism in multiple ways. Bilingual children experience development differently from monolingual children, not just because they know two languages, but because the mental organization that underlies language and thought is different.

There is a corollary to this argument. Just as it is impossible to describe bilingual development in some simple terms with respect to monolingual development, it is also impossible to compare the development of bilingual children with each other in ways that assume an overriding generality of experience. There is no single solution to the question of mental representation, and multiple

arrangements can even co-exist in the mind of an individual speaker (e.g., de Groot 1993). Efforts to chose one of two possible arrangements, for example, one system or two, and then to declare that this is the configuration that defines language learning and bilingualism for children of that age (or even that proficiency level) are doomed to failure. Rather, it is more likely that languages and concepts are linked in dynamic ways and restructured as the needs change and fluency evolves. Weinreich (1953) recognized this in one of the first serious efforts to understand the bilingual mind. He acknowledged that his three possible configurations for linguistic representation, namely, compound, co-ordinate, and subordinate, change and evolve, and most likely simultaneously co-exist in the mind of a single learner.

There is another perspective on this issue that in an important sense may obviate the entire issue of comparing the representational structure of bilinguals to that of monolinguals. Grosjean (1989) calls the assumption that a bilingual possesses two distinct language systems the *monolingual view*. The bilingual is considered to behave the same as each monolingual. In the *bilingual view*, in contrast, the two languages are integrated into a unique whole. Bilinguals, he claims, function on a dimension of monolingual to bilingual modes of communication in which the combined linguistic resource is used selectively and appropriately for the given mode. In a bilingual mode, for example, language mixing and switching is normal and comprehensible. There is no assumption of confusion or absence of differentiation in the underlying representation but an identification of social conditions that elicit language use in different appropriate forms. Nonetheless, the underlying competence that permits this movement along the dimension from bilingual to monolingual modes is undoubtedly different in important ways from the underlying competence of monolingual speakers.

Grosjean's bilingual view is derived primarily from analyses of language use and demonstrates how language functioning is qualitatively different for bilinguals than for monolinguals. A similar point but waged more from the perspective of language representation than from language use is made by Cook (1997). He argues that *multilingual competence* is different from both that of a monolingual and from the combination of two monolingual systems that have been simply collated into one. He points out that the usual assumption is the monolingualist view in which one language is the norm and all else is deviant. Consequently, straying from the norm entails negative consequences. In the multilingualist view, the assumption is that it is normal for humans to know more than one language. From this perspective, it is the monolingual who is deprived.

Studies of mental structure have never been easy to conduct and descriptions of cognitive and linguistic development are always fraught with inference and uncertainty. These difficulties are compounded when two languages occupy the linguistic domain of mind. But progress is not made when hypotheses are generated from simplifying assumptions about the two languages. Construing complex problems as presentations of two mutually exclusive options forces one to adopt a position that is perhaps more radical than necessary because we necessarily discard one kind of description, even if it has some theoretical and empirical support. Researchers need to confront the complexity of bilingual development more directly, to recognize the qualitative differences that are introduced when another language is added, and to evaluate the contribution of competing alternatives to find their unique contribution to a more complete solution. Our research to date has brought us to the point that we are now ready to elaborate our models to accommodate the natural complexity of the phenomenon we are studying and go beyond the world of simple binary choices.

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