

Evaluating Attributions of Delay and Confusion in Young Bilinguals: Special Insights from Infants Acquiring a Signed and a Spoken Language

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*Janus stood at the end of the year waiting to open the gate;
He looks back over the year that just passed and shakes his head in distaste.
“These humans are strange” he says to himself—“they never do learn their
lessons. The same old mistakes year after year—for centuries—the same
situation . . .”*

Patricia Andersen, “Roman God of Gates and Doors”

THE STRIKING image of Janus, the Roman god, seizes our imagination, as he is depicted with two faces, each gazing in opposite directions. With one set of eyes cast toward a rising sun and the other toward a setting sun, he was the god of beginnings but one who could also ensure good endings. For nearly a century, parents, educators, and scientists have, like Janus, been of two minds about the bilingual child, a phenomenon that is so pervasive that we have come to call it “the bilingual paradox” in our laboratory (Petitto et al.

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2001). As if with eyes cast toward the positive light of a rising sun, we freely marvel at the seemingly effortless ways that young children can acquire two or more languages simultaneously if exposed to them in early life. At the same time, with eyes cast toward the darker light of a setting sun, we view early simultaneous bilingual exposure suspiciously, fearing that exposing a young child to two languages too early may cause language delay and, worse, language confusion. Indeed, the general perspective that young children are somehow harmed by early bilingual exposure is reflected both in educational settings and in comments made by the many parents raising bilingual children who visit our laboratory. For example, the fear that exposing a child to another language too early may interrupt “normal” language development is reflected in contemporary educational practice, whereby children in many countries around the world receive their first formal schooling in the other majority language well after the developmentally crucial toddler years. As support for this practice, many have invoked the dreaded notion of “language contamination” that ostensibly results from early exposure to another language (e.g., Crawford 1999). Following this general spirit, parents visiting our laboratory often opt to “hold back” one of the family’s two languages in their child’s early life. They believe that it may be better to establish one language firmly before exposing their child to the family’s other language so as to avoid confusing the child. They also worry that very early bilingual language exposure may put their child in danger of never being as competent in either of the two languages as monolingual children are in one.

In an attempt to shed light on such issues and by using a variety of techniques, researchers have examined the impact on the young child of acquiring two languages simultaneously from a very early age. Despite recent, growing scientific evidence that early simultaneous bilingual language exposure is *not* developmentally detrimental to children, debate among researchers about the nature of early bilingual language acquisition persists. In this article we review the empirical findings and theoretical implications of contemporary studies of young children acquiring two languages simultaneously at a very young age, and we review new findings from our own laboratory relevant to the question at hand: Does early simultaneous bilingual

language exposure *cause* children to be language delayed and confused? We evaluate this question in young children acquiring two spoken languages and, crucially, in young children acquiring a signed and a spoken language because signing-speaking children provide a powerful new lens into all childhood bilingualism that is not available from the study of young bilinguals acquiring two spoken languages. Our overarching goal in examining these two populations is to shed new light on all childhood bilingualism. A specific goal is to broaden our understanding of whether bilingual children are delayed and confused from the *onset* of language production, especially involving their first words across each of their languages. To better understand whether very early bilingual language exposure *causes* children to be language “confused,” we ask the following: Can very young children differentiate between their two input languages (especially their early dual lexicons) and, if so, from what age? We also explain how young signing-speaking bilinguals provide us with an exciting and entirely new way to understand why the paradoxical views about simultaneous bilingual language exposure have endured in society at large. By doing so, we show that a resolution to the bilingual paradox is both attainable and something that we must strive to achieve, especially in light of the multilinguistic and multicultural world in which we live. Finally, in a spirit similar to those expressed in other recent important analyses of childhood bilingualism (c.f. Grosjean 2001), we conclude that the scientific findings now compel us to provide young children with the earliest possible bilingual language exposure—because research evidence shows that this is the most optimal environment for the developing child—be it two spoken languages or a signed and a spoken language.

A long-standing debate among researchers in the field of childhood bilingualism is whether bilingual babies “know” that they are acquiring two distinct language systems. Two general classes of hypotheses have dominated the field in this regard, each echoing one aspect of the bilingual paradox. Genesee (1989) first termed these hypotheses the *unitary* and *differentiated* language system hypotheses. Researchers holding views subsumed under the “unitary language system” hypothesis assert that children exposed to two languages initially have a single “fused” linguistic representation and that they

begin to differentiate their two native languages only by age 3;0 (e.g., Redlinger and Park 1980; Vihman 1985; Volterra and Taeschner 1978). The assertion that these children's initial linguistic knowledge is fused implies that they undergo protracted (or delayed) language development until they sort out their two input languages over the course of early life. For example, in their important, classic study, Volterra and Taeschner (1978) show that very young bilinguals in the one-word stage have few semantically corresponding words, presently called "translation equivalents" (or TEs), across their two languages. Specifically, if a young bilingual child has the word for her toy ball in one of her languages, say English ("ball"), the claim is that she ostensibly will *not* at the same time have a word for this identical toy ball in her other language, say French ("balle"). This is presumably because young bilinguals do not initially differentiate between their two input vocabularies, tacitly assuming instead that they are acquiring only one (fused) language. For nearly two decades, then, one prevailing hypothesis in the scientific literature that spread into educational policy was that bilingual babies do not initially differentiate between their two input languages, especially regarding their early lexicons, possibly resulting in somewhat confused knowledge; further, this situation continues in early development until they sort out the word meanings (and later the grammars) of their two input languages.

More recently, researchers adhering to this unitary view have turned their attention mostly to the two-word stage. Here they focus on the fact that bilingual toddlers around age 2;0 and beyond frequently mix words from both of their languages in their rudimentary two- or three-word sentences. As with the one-word stage mentioned earlier, such apparent language confusion as revealed in these bilingual children's language mixing is said to be due to their ostensible inability to differentiate between their two languages. That is, the confusion results from the internal fusion of their two linguistic systems (e.g., Redlinger and Park 1980; Vihman 1985).

Those researchers who advocate the differentiated language system hypothesis, on the other hand, question the preceding attributions (Deuchar and Quay 1999, 2000; Genesee 1989; Genesee, Nicoladis, and Paradis 1995; Holowka, Brosseau-Lapr e, and Petitto

2002; Lanza 1992; Meisel 1989; Petitto et al. 2001). Most of these researchers have focused on bilingual children's language mixing in the two-word stage and do not deny that bilingual children mix elements of their two languages in conversation. Instead they have discovered that the young bilinguals' language mixing exhibits highly regular grammatical patterns and is directly influenced by sociolinguistic and environmental factors (e.g., the child's sensitivity to the addressee's language, the amount of parental language mixing), which findings do not support the proposal that young bilingual children are linguistically confused. To be sure, these researchers argue that language mixing does not reflect confusion but instead demonstrates the bilingual children's distinct representations of their two input languages from an early age.

But herein lies the key lingering problem: Proponents of the differentiated view have not precisely defined this "early age" because they have tended to focus on bilingual children's multiword combinations. This is a problem because by the time children are producing multiword combinations, they have already achieved the important early language milestones (e.g., "first word," "first fifty words," "first two-word combinations"). But, as we will see, more recent studies have moved closer to pinning down precisely when language differentiation occurs (e.g., Holowka, Brosseau-Lapr e, and Petitto 2002; Petitto et al. 2001). In fact, the most recent scientific attention has turned to scrutinizing the two nascent lexicons of bilingual babies in the one-word stage, especially whether they produce translation equivalents.

Contemporary Data on the Impact of Early Bilingual Language Exposure

In order to understand the extent to which contemporary data support the two prevailing accounts, we first review the empirical findings concerning attributions of language delay in young bilinguals relative to established monolingual norms.

Attributions of Delay

Comparing the time course that a bilingual child's two languages follow to that of a monolingual child can provide insights into the

types of knowledge that underlies early bilingual language acquisition. Although we fully agree that adult bilinguals and monolinguals cannot be regarded as one and the same thing (Grosjean 1989), there has been recent excitement over the power of comparative analyses between these two groups of children on the condition that bilingual children's *two* languages are taken into account (Holowka, Brosseau-Lapr , and Petitto 2002; Nicoladis and Genesee 1997; Pearson 1998; Petitto et al. 2001). To better evaluate bilingual developmental language milestones, then, we present a brief review of monolingual milestones. In monolingual children the first-word milestone occurs between ages 0;9 and 1;2 (e.g., Capute et al. 1986; Vihman and McCune 1994), the first two-word combinations between ages 1;5 and 2;2 (e.g., Bloom 1975; Brown 1973; Petitto 1987), and the first fifty-word (types) at approximately 1;7 and/or for several months beyond (e.g., Charron and Petitto 1991; Nelson 1973; Petitto 1987); note that these milestones have also been observed in monolingual deaf babies acquiring signed languages (Bellugi and Klima 1982; Newport and Meier 1985; Petitto 1987, 1992; Petitto and Marentette 1991). Thus, for example, we now regard a young bilingual child who has, for example, fifteen words in French and thirty-five words in English to indeed have achieved the classic fifty-word milestone even if the child did so by using words from both languages (e.g., see Holowka, Brosseau-Lapr , and Petitto 2002 for a more detailed discussion of the literature that supports this conclusion).

Timing Milestones

As advanced by Petitto and students (2001), timing milestones in early language development provide critical data for evaluating prevailing hypotheses about the relative contribution of biology (such as claims about delay and confusion) and environmental and sociolinguistic factors (parental language input patterns and the language of the child's primary cohort group) that may be at work in the young bilingual's first year of life. These data in turn can help us evaluate the prevailing hypotheses in childhood bilingualism.

In early monolingual language development, for example, environmental input factors apparently have a robust impact on the raw number of young children's vocabulary items but not on the age

range within which the milestone typically occurs and not on the age at which children attain the universal grammatical milestones (including syntactic and morphological ones); one cannot force children to produce a particular grammatical construction that is beyond their developmental age until they are cognitively and linguistically ready to produce them. Thus, on the one hand, the raw number of children's vocabulary items is highly amenable to environmental variation in learning conditions and is therefore influenced by the nature of the linguistic input. On the other hand, the ages at which children attain the overall language production milestones are not modifiable to any great extent despite intensive instruction and drilling (see Gol-din-Meadow 1981 for a discussion of the fragile and resilient properties of language development). Despite the critical importance of this issue, to date very few studies have directly evaluated timing milestones in each of a young bilingual's two languages (Holowka, Brosseau-Lapr e, and Petitto 2002; Pearson, Fernandez, and Oller 1993; Petitto et al. 2001), but their findings are very telling regarding what young bilingual babies know about their two languages.

In her early studies on the timing of signed language milestones in profoundly deaf children receiving either one or two signed languages from birth, Petitto (1985, 1988; Petitto and Marentette 1991) noticed that her control groups (ages 0;8 through 2;0) did something remarkable. The control groups included (1) hearing babies acquiring spoken French and English from birth and (2) hearing babies acquiring a spoken and a signed language from birth, either English and American Sign Language or French and Langue des Signes Qu eb ecoise (LSQ). These earlier studies showed that all of the babies consistently achieved the classic early linguistic milestones (first-word, first fifty-word, and first two-word milestones) on a similar timetable in each of their two languages and on a timetable that was fundamentally similar to that of the monolingual babies. These findings were both surprising and puzzling in light of the public perception that young bilinguals are delayed relative to monolinguals and the fact that the prevailing scientific literature at the time was equivocal on this point.

Another group of researchers, Pearson and colleagues (1993), has corroborated the observation that young bilingual children may not

be delayed in their achievement of early linguistic milestones. In the first major examination of this specific topic, Pearson and her team studied 25 bilingual children acquiring English and Spanish simultaneously and 35 monolingual children. Parents were asked to fill out a vocabulary checklist (MacArthur Communicative Development Inventories (CDI); Fenson et al. 1991) of all words their children produced. To be clear, the children themselves were not actually studied. Instead Pearson et al. studied the parents' memory of what their children produced as reflected in their checked items on the questionnaire. The CDIs represent a significant improvement over diary studies in that they have been standardized across large groups of babies and young children and across multiple languages, but they nonetheless retain problems of reliability and possible parental misattributions of lexical forms their babies produced.

Pearson et al. (1993) found that English and Spanish bilingual children (ages 8–30 months) acquire their two languages on the same timetable as monolingual children. They progress at the same rate and exhibit the same vocabulary spurt as monolingual children. Although the young bilinguals' individual lexicons showed fewer words compared to the monolingual children's lexicons, measures of the bilingual children's two languages together revealed comparable total vocabulary sizes for bilingual and monolingual groups. Further, although a child's production in either one of his or her languages was less than that of a monolingual child, this was not a statistically significant difference. The researchers suggest that any differences in language production in the young bilingual can be directly attributed to differences in the child's language environment. The findings of Pearson and colleagues indicate that the combined production (taken from both of a bilingual child's languages) equaled that of the monolingual child's, thereby suggesting that bilingual children are not delayed in the acquisition of their two languages relative to monolingual children.

Although the claim of Pearson et al. regarding the absence of delay in bilingual children's simultaneous acquisition of two languages was generally commensurate with Petitto's earlier work, the findings of Pearson et al. were based solely on CDI data. Given the reliability problems associated with parental checklists as discussed

earlier, Petitto et al. (2001), and subsequently Holowka, Brosseau-Lapr e, and Petitto (2002), designed two independent studies that employed multiple sources of data collection as a more reliable means of establishing bilingual babies' timing milestones and their linguistic knowledge at the onset of the acquisition period.

As an important methodological note, both Petitto and Holowka et al. used three sources of data collection—videotapes (primary source data), CDIs (secondary source data), parental reports (secondary source data)—and experimenter notes (external validity measure of the primary and secondary sources of data). The advantage of videotaping babies is that a number of trained independent researchers can perform reliability checks on all lexical attributions, thereby greatly reducing the problems of over- or underattributing lexical status to early forms that babies produce. Note that the researchers (e.g., De Houwer 1990) who relied solely on audio recordings of babies' speech were also aware of the limitations of attributing lexical status to babies' forms in the absence of contextual information. Even though videotaping children removes parents' subjective interpretations inherent in diary studies, the problem here lies in the underrepresentation of linguistic knowledge since babies are given credit only for forms they produced on videotape. Thus, to provide the most representative depiction of babies' linguistic knowledge at any given time, researchers have turned to using a combination of sources of data collection (e.g., Deuchar and Quay 1999, 2000; Holowka, Brosseau-Lapr e, and Petitto 2002; Nicoladis 1998; Petitto et al. 2001; Quay 1995; Vihman 1985).

Petitto et al. (2001) examined six bilingual children, with the two youngest babies, examined from approximately ages 0;10 to 2;0, revealing a great deal about timing milestones. One baby girl was acquiring French and English simultaneously, and the other baby—a boy—was acquiring French and LSQ simultaneously. Both of these babies achieved the classic linguistic milestones and exhibited patterns of lexical growth that were consistent with monolingual norms: To reiterate, the first-word milestone is normally achieved within the age range 0;9 and 1;2, the first two-word combinations between ages 1;5 and 2;2, and the first fifty words (types) at approximately 1;7 and/or a few months beyond. The hearing child who had been acquiring

two spoken languages from birth, French and English, acquired her first French word at 1;0 and her first English word at 1;2. She first combined two French words at 1;5 and two English words at 1;8. She reached the first fifty-word milestone at 1;8 in French and at 1;9 in English. The results for the hearing child who had been acquiring a spoken and a signed language from birth, French and LSQ, were similar to those of the French and English child. He acquired his first LSQ sign and first French word milestone at 0;10. He first combined two LSQ signs at 1;5, and he first combined two French words at 1;8. By age 1;5, this child had acquired fifty words in both LSQ and French.

Petitto et al. (2001) further examined the two babies' rate and growth of their early lexical productions in each of their two languages in order to determine whether dual-language exposure disrupts other indices (relative to those of monolinguals) of the normal timetable of language acquisition. Both babies demonstrated a general trend of increasing vocabulary types in both of their respective languages over time, with the rate and growth of vocabulary types in one of their languages being generally commensurate with the other. Differences between the two babies occurred in terms of the raw number of word types produced in each language (which we suggest later is due to environmental and sociolinguistic factors): The French-English child produced more French word types than English word types, whereas the LSQ-French child's number of word types in French and LSQ was equivalent throughout acquisition. But the most striking difference was that the French-English child produced a class of lexical items called *neutrals* whereas the LSQ-French child did not. Neutrals are productions that are indeed lexical but that cannot be attributed to either of a child's two languages because of the child's immature phonology (e.g., the 12-month-old's production of [Ba], which could be the English word "ball" or the French word "balle"). Modality differences between LSQ and French made the identification of language source in this bilingual straightforward, which has fascinating importance (see later discussion).

Of greatest importance with regard to the question of language delay in very early bilingual language exposure, however, is the fact that the age at which the two children produced their first lexical

items in each language, as well as the number of new words they produced in each language, was well within the norms reported for monolinguals in the MacArthur CDI (Fenson et al. 1991). Furthermore, their norms in each language fell within those of the largest number of CDI bilingual babies studied (Pearson et al. 1993). This was also true of the children's norms if their new word types were combined across their two languages over time and compared with those reported in the CDI.

Following from the study of Petitto et al. (2001), Holowka, Brosseau-Lapr e, and Petitto (2002) replicated these findings in a larger sample of babies. Using methods and procedures similar to those used by Petitto et al. (i.e., three sources of data collection, with a fourth reliability check), Holowka and team examined six babies between the ages of 0;7 and 2;2. Three babies were acquiring English and French, and three were acquiring LSQ and French.

Even with this new and larger sample of bilingual babies, the Holowka team (2002) found that the babies' development of their two languages was yoked; in fact, they strongly paralleled each other. As in the Petitto et al. (2001) study, the Holowka team observed that the English-French babies produced neutral lexical forms, which clearly affected the actual number of new word types credited to them with regard to each of their two spoken languages. All of the bilingual babies attained the classic linguistic milestones in each of their native languages along a similar maturational timetable (regarding first-word, first two-word, first fifty-word milestones) that was comparable to that seen in monolinguals. The lexical growth in each of the bilingual babies' two lexicons over time also mirrored that of monolingual babies.

Taken together, the preceding studies show that young bilinguals are not delayed in the achievement of the early language milestones in either of their respective native languages. The babies achieved the classic language milestones in each of their languages on a similar time course relative to their other language and, crucially, on a similar time course relative to the established norms for monolingual children. Note that dramatic delays or asynchronies in the timing of the bilingual children's achievement of the linguistic milestones across either the spoken or signed modalities were not observed; interestingly, there was no bias or preference for speech in these hearing

babies, as both languages (LSQ and French) in both modalities (signed and spoken, respectively) were learned *equally*. To be sure, the timing milestone findings do not support the hypothesis that early bilingual language exposure per se causes babies to be language delayed in either of their two native languages.

Neutrals and the Special Insights from Signing-Speaking Babies

Having observed that the timing of young signing-speaking bilinguals' achievement of all classic milestones is entirely normal (on the same overall timetable both across their dual languages and as monolinguals), does the study of these particular babies teach us anything new? The answer is most certainly "yes."

In light of the similarities between signed and spoken languages, researchers have examined the differences between them to shed new light on how humans acquire language. Following the pioneering work of Prinz and Prinz (1979) and of Holmes and Holmes (1980), Petitto et al. (2001) used the modality differences between signed and spoken languages to illuminate contemporary issues in bilingualism. One prevailing problem in early childhood bilingual research, for example, is determining to which language particular lexical forms belong. As noted earlier, the baby's [Ba], for example, could be either the French word "balle" or the English form "ball." In the bilingual child acquiring two spoken languages, researchers in the past have coded these forms as neutrals since it is impossible to determine to which language they belong. These neutral forms account for the large "neutral" counts found in most early bilingual research, and, because researchers cannot confidently attribute these forms to either of the bilingual child's languages, their existence fundamentally obscures the totality of what the child knows about his or her two languages (c.f. Petitto et al. 2001; see also Holowka, Brosseau-Lapr e, and Petitto 2002; Pearson et al. 1995; Volterra and Taeschner 1978); worse, it also renders the appearance that their lexical development in each language is underdeveloped and hence delayed.

Given the modality differences between sign and speech, however, Petitto et al. (2001), as well as Holowka and team (2002), found that these forms were easily recognized in the signing-speaking bilingual child; that is, modality differences make it relatively straightforward to identify to which language a particular lexical production

belongs. As such, these researchers found that there was *no* class of neutrals in their young signing-speaking bilinguals. This finding provides a striking new perspective on very early bilingualism: The perception of delay that the class of neutrals renders in the young bilingual acquiring two spoken languages is only apparent and is not caused by any inherent language confusion that results from early bilingual language exposure per se. Instead, the absence of such forms in the signing-speaking baby demonstrates that the phenomenon of neutrals noted in all bilingual babies acquiring two spoken languages is a peripheral production problem that results from having to produce two phonologies competing for the same oral space (c.f. Petitto et al. 2001); thus, young signing-speaking bilinguals have a distinct advantage in this respect! This example is but one of the many ways that studies of signing-speaking bilinguals have provided new answers to prevailing puzzles in the literature on childhood bilingualism, and it shows how signing-speaking bilinguals have helped us test hypotheses about the nature of early bilingual development. The signing-speaking babies teach us that when they are not required to build two different phonological inventories in the identical oral cavity, they can and do keep their languages apart from their very *first* lexical productions; they are not confused.

Attributions of Confusion

A second type of study that has cast new light on the linguistic knowledge of young bilinguals involves close examination of their first words in each of their two languages and provides unique insight into their early semantic and conceptual knowledge. The protracted process of neurological differentiation implied by the unitary language system hypothesis also predicts other higher cognitive disruptions in the form of young bilinguals' inability to differentiate between their two early lexicons. Conversely, an ability to differentiate between the words in their first lexicons (from each language) would support the proposal that young bilinguals possess dual language representations from their earliest productions of first words. The following section reviews contemporary studies from the literature as well as our own laboratory on the topic of the semantic and conceptual underpinnings of bilinguals' first words, which suggest that young bilinguals have differentiated systems from the start.

Translation Equivalents (TEs)

One question that has fascinated researchers for decades is whether a young bilingual can produce a word for a specific object such as a toy doll in one of her native languages and also produce the word for this identical doll in her other language during the same time in development. In the Volterra and Taeschner (1978) study noted earlier, these forms (called translation equivalents [TEs]) were largely absent, and thus for nearly two decades the prevailing view was that young bilinguals do not produce them, presumably because they initially possess a single, fused linguistic knowledge with all the concomitant semantic and underlying conceptual confusions that this would imply. However, if young bilinguals do possess two lexical items for an identical referent in each lexicon at the same time, then this would provide evidence that they are *not* semantically and conceptually confused. TEs in the vocabulary of young bilinguals would imply that these children know on some level that they are acquiring two distinct languages and that two words (one from each language) may refer to the same underlying semantic concept. This is precisely what we and several other recent researchers have argued after having discovered TEs in the vocabularies of our young bilingual subjects (e.g., Pearson et al. 1995; Petitto et al. 2001; see also Nicoladis 1998 and Quay 1995, who report the existence of TEs in a Portuguese-English child and in a Spanish-English child, respectively). Nicoladis (1998) further proposed that children's understanding of appropriate pragmatic use of their two languages may be linked to their knowledge that their TEs belong to two distinct linguistic systems.

Pearson and colleagues (1995) examined the presence or absence of TEs in the vocabularies of young bilinguals. In their twenty-seven Spanish-English bilingual children, they found that on average approximately 30 percent of an individual bilingual child's early vocabulary was judged to be semantic TEs. To explain the apparent paradox as to why young bilinguals could learn two different lexical forms for the same item in the first place, the researchers considered several possible explanations, especially one involving Clark's (1988) well-known "principle of contrast." In this principle Clark states that monolingual children will reject the acquisition of synonyms due to their initial bias toward acquiring a single label for each item in the

world. Extending this logic, Pearson and colleagues reasoned that this principle must apply *within* one of a young bilingual's two languages, thereby blocking synonyms *within* language but not *across* their two languages and thus permitting cross-language synonyms or semantically related TEs.

Most recently, TEs have even been discovered to exist cross-modally, that is, in young bilinguals acquiring both a spoken and a signed language from birth. Based on age and vocabulary achievement, Petitto et al. (2001) matched their bilingual child acquiring French and LSQ and their bilingual child acquiring French and English with two of Pearson's subjects acquiring Spanish and English. Petitto et al. observed that their subjects produced TEs and at a rate comparably higher than those observed in Pearson's study. In addition, following Pearson and Petitto, Holowka et al. (2002) calculated the percentages of TEs present at the fifty-word stage in six bilingual babies (remember that three were acquiring English and French and three were acquiring LSQ and French) and found that the average percentage of TEs present in the babies' total fifty-word lexicons was remarkably similar at 27 percent and 29 percent for the English-French and LSQ-French groups, respectively.

Are young bilinguals initially confused in sorting out the semantic concepts underlying early words across their two languages? The crosslinguistic and cross-modal studies showing the robust existence of semantically related TEs provide compelling support for the claim that young bilinguals know they are acquiring two languages from the start.

Early Constraints that Underlie a Young Bilingual's First Words in Each Language

Until recently, virtually nothing was known about how young bilinguals' word meanings were semantically categorized across each of their two lexicons, and we had little insight into the conceptual underpinnings of their two lexicons. As with timing milestones, we first review the studies of monolinguals to gain insight into how researchers in bilingualism might study the semantic and conceptual knowledge that underlies early bilingual language acquisition.

A common assumption emerges from the monolingual literature

for inferring the knowledge that babies possess of their earliest word meanings (e.g., Carey 1982; Huttenlocher and Smiley 1987; Mandler 1981; Petitto 1988, 1992). These researchers propose that both contextual information and systematic patterns of language use may be suggestive of babies' underlying semantic knowledge and its conceptual organization. Mandler (1981), for example, argues that researchers can infer children's word meanings only by examining their systematic patterns of word use. Following this basic reasoning, two independent laboratories have developed a common methodology for studying the semantic and conceptual underpinnings of young monolinguals' first words (Huttenlocher and Smiley 1987; Petitto 1988). Both of these researchers recorded exhaustive aspects of the contexts surrounding each utterance produced by monolingual babies, including indicative gestures, eye contact, and communicative purposes (whether the child was making a request, naming, and the like). Petitto (1988), for example, then inferred the meaning of babies' first words by examining each lexical item and the range of referents over which it was applied, as well as the reverse (examining all referents and each lexical item used with them). Taken together, these methods enabled Huttenlocher and Smiley and Petitto to conduct crosslinguistic comparisons of the nature of early word meanings across multiple contexts and across all of the monolingual babies they studied.

Recently, Petitto (1992) investigated whether children's overextensions (e.g., referring inappropriately to a dog with the word "cat" because both are four-legged animals) were patterned and systematic and whether overextensions reflected constraints on a child's emerging conceptual organization. Specifically, she asked whether some overextensions were possible but never produced. As before, Petitto examined each lexical item and its associated range of referents (and vice versa). Her findings reveal that word meanings are constrained along "kind" boundaries (e.g., kinds of objects, kinds of events, kinds of locations, kinds of possessions, and so forth) and tend not to violate these boundaries (see also Clark 1973; Huttenlocher and Smiley 1987; Leopold 1939–1949; Rescorla 1980; Volterra and Taeschner 1978; Markman 1992); only 3/577 tokens constituted possible violations. Petitto's study is noteworthy in that these constraints held

across young monolingual deaf children who were acquiring signed languages (either ASL or LSQ) and hearing children who were acquiring spoken languages (either French or English).

The findings presented thus far suggest that monolingual babies appear to have conceptual knowledge that is bound by internal taxonomic constraints at a very early age. The intriguing question asked for the first time by Holowka, Brosseau-Lapr e, and Petitto (2002) was whether this was also so for a young bilingual's two languages. Based on previously established methods as discussed earlier, Holowka and team examined over time six babies' early lexical-referent pairings across each of their two lexicons. Each lexical item and referent pairing was then coded as either appropriate or inappropriate. This analysis provided insight into whether the babies' earliest lexical forms were constrained along kind boundaries. Thus, if a child used the word "cup" for an object that can contain liquid, that we can lift to our lips and from which we can drink, it was coded as appropriate. If the word "cup" was used in relation to a plate, it was coded as inappropriate. All inappropriate instances were then scrutinized. Those that were not used along particular boundaries were counted as violations of kind boundaries.

Over the course of Holowka et al.'s examination of the babies, only 259/7381 (3.5 percent) inappropriate tokens in total were observed, and of the 259 inappropriate tokens produced, only 15 did not respect kind boundary. The most common types of inappropriate productions were overextended forms (e.g., the babies would overextend the word "dog" to refer to cows, horses, cats, etc.), and no significant differences were found between the French-English or LSQ-French babies. Moreover, the inappropriate forms were constrained along kind boundaries 94 percent of the time, which led Holowka and team to conclude that, like monolingual children, *each* of a bilingual child's two lexicons are constrained along kind boundaries—and similarly so.

The Holowka team's finding that bilingual babies' "mistakes" in both languages were patterned and constrained in ways highly similar to monolingual babies' early words provides the field with important information regarding the conceptual underpinnings of early lexical meanings. But how bilingual babies categorize their earliest meanings

was still unknown. Because the Holowka et al. study was the first to provide clues to bilinguals in this regard, we again review the classic studies that outline how monolingual babies categorize their basic word meanings and concepts.

*The Semantic and Conceptual Categorization of Young Bilinguals'
Dual Lexicons*

Nelson (1973) suggests that children's first words are organized according to a set of basic concept domains and that children differentiate these conceptual categories from the onset of language production. Nelson studied how eight monolingual babies' first fifty words were categorized and subcategorized in her now-classic study, which we remember for its organization of children's word meanings into "semantic trees." Nelson acknowledges that the categories represented in her semantic trees do not follow strict objective rules but rather are based on her intuitions and the situational cues surrounding a child's production of a word. Nonetheless, Nelson's classification procedure is useful because it provides a relative base for comparisons of young monolingual children's categories of early word meanings. In addition, several researchers propose that the meanings of babies' first words are governed by their personal interests, such as their favorite toys, friends, and foods (Dromi 1987; MacWhinney 1998; Mervis 1984; Nelson 1973; Ninio and Snow 1988; Slobin 1985).

Compelled by the preceding observations, the Holowka team (2002) used a classification procedure similar to Nelson's (1973) to study both the semantic nature and the implied underlying conceptual organization of early lexical meanings in six bilingual babies. Broadly speaking, Nelson had categorized monolingual babies' words into four conceptual domains: objects (animate and inanimate) and nonobjects (person-related and object-related). By categorizing the babies' words and signs separately in Nelson's hierarchical arrangement at three different time intervals (10-, 30-, and 50-word stages), the Holowka team also established that bilingual babies had semantic lexical meanings and conceptual organization that were highly similar to those of monolingual babies. It was determined, for example, that both the signing-speaking and the speaking-speaking babies first acquired words (and signs) that connote animate objects (e.g., people:

papa, baby) and that are person-related (e.g., expressive: yes, hello). At the 10-word stage, these types of words constituted approximately 85 percent of the bilingual babies' words (and signs) as well as those of the monolingual babies Nelson observed. As the bilingual babies studied by Holowka et al. matured, the percentage of words connoting inanimate objects (e.g., personal: ball, hat) increased together with their production of object-related words (e.g., action: meow, beep).

Given the similarities they observed across both monolingual and bilingual babies, Holowka and team (2002) endeavored to determine whether, as some researchers have suggested for monolingual babies, these first words reflected things of personal interest to the babies (Dromi 1987; MacWhinney 1998; Mervis 1984; Slobin 1985). To do this, Holowka et al. examined the third level of classification Nelson specified (1973), which further subdivided the categories of objects and nonobjects. From these classifications the Holowka team formed two new categories by combining all of the babies' words (and signs) into either person-related or non-person-related categories as a means of determining whether babies acquire meanings for things that are related to them and whether this changes over time. As predicted, Holowka et al. found that, like monolingual babies, bilingual babies first acquire meanings for words (and signs) that are of personal interest. Thus, Holowka et al. conclude that given the similar conceptual domains by which babies' early forms may be organized, bilingual babies' underlying concepts are fundamentally similar across each of their two languages, are fundamentally similar to those of monolinguals, reflect the babies' personal interests, and are articulated in identical ways across the signed and spoken modalities.

Conclusions

We began our article with this fundamental question: Does early simultaneous bilingual language exposure cause children to be language delayed and confused? To answer this question we provided a careful examination of the findings, methods, and implications of current early childhood bilingual research, including a discussion of key novel findings from our own laboratory. The most powerful and clear conclusion to emerge from all of the preceding is that very early

simultaneous bilingual language exposure does *not* cause a young child to be delayed with respect to achievement of the classic linguistic milestones, and it does *not* cause a child to be confused with respect to the semantic and conceptual underpinnings at the heart of all natural language, and this is true regarding *each* of the young bilingual's two native languages. In fact, the present studies suggest the opposite view from that which has been advanced, whereby one of two available natural languages is withheld from a young child on the premise that exposing a child to two languages too early may cause language delay, confusion, and "language contamination" and might prevent the child from being fully competent in either language. Instead the findings clearly show that entirely normal and parallel linguistic development occurs in *each language* in young children who have been simultaneously exposed to two languages in early life and that young bilingual children's dual language developments are surprisingly similar to monolingual language acquisition. These observations are fundamentally commensurate with the "differentiated language system hypothesis" discussed earlier (Deuchar and Quay 1999, 2000; Genesee 1989; Genesee, Nicoladis, and Paradis 1995; Holowka, Brosseau-Lapr e, and Petitto 2002; Lanza 1992; Meisel 1989; Petitto et al. 2001), as they convincingly demonstrate that bilingual babies have the remarkable capacity to differentiate their two input languages from the *onset* of language production. Recently, fascinating evidence has emerged from brain-scanning studies of adult bilingual brains that corroborates the extraordinarily "normal" developmental pattern witnessed here in children who have had early bilingual language exposure. For example, Klein et al. (1995) and others have demonstrated that the neural pathways for a bilingual's two languages are the same—and that there are *equal* language-processing capacities in both of their languages—but only if the adults had early bilingual language exposure. Further, the neural pathways used in the bilingual brains have areas similar to those areas seen in monolinguals (e.g., Pouratian et al. 2000), but again the proficiency of the bilinguals may depend on early bilingual language exposure (e.g., Klein et al. 1995). Taken together, we are justified in concluding that the earliest possible bilingual and bicultural exposure a young child receives, the better it is for the child, and the better it will be

to ensure that the child achieves the fullest competence and mastery in each of the two languages. The scientific findings further suggest that early bilingual and bicultural language exposure is the optimal goal for which bilingual educational programs should strive.

It is indeed one of life's ironies that the several decades of research summarized here suggest that our failure to expose young children to their two native languages early in life can potentially "harm" them, rather than the reverse popular view that advocates holding back one of the child's native languages so as not to delay, confuse, or contaminate the youngster's developing language abilities. The "harm" here is not only that holding back has an impact on the child's ability to become fully competent in both languages and that holding back can potentially alter the neural circuitry in the brains of bilinguals in less than optimal ways. Instead the harm can also potentially spread to the social and cultural foundations upon which both our sense of self and our group affiliations rest.

To take but one example of how holding back can have an impact on an individual's social and cultural foundations, English is not introduced in French Quebec schools until the fourth grade (when children are approximately 10 years old). Although French is introduced earlier in English Quebec schools (first grade, when children are approximately 7 years old), it is still introduced well after the important toddler years. Both school boards claim that this practice prevents the language contamination that ostensibly results from early exposure to another language. Crucially, such formal segregation of language instruction in the schools, in turn, can have far-reaching social and cultural consequences. For example, it can foster isolation and intolerance between these two groups, as well as stigmatize socio-cultural groups that use languages other than these two majority languages. However, as we have witnessed, the idea that early bilingual language exposure causes language contamination is scientifically unfounded. Given this, we are left with the perplexing mystery as to why the bilingual paradox has prevailed or the perception still exists that early bilingual language exposure is both good and bad for a child.

First, one answer involves the fact that differences between vocabularies are highly vulnerable to external environmental factors

such as direct vocabulary instruction, drilling, and frequency of exposure. It is well known that such factors can yield increases in the number of vocabulary items that a given child produces in one language versus the other. Yet, it is also well known that such environmental input factors cannot significantly change the biologically controlled maturational age range within which a normally developing child will achieve a particular language milestone (e.g., for an excellent review of this issue, as well as a discussion of such fragile and resilient properties of human language, see Goldin-Meadow 1981).

Following from this, in this article we saw that although the age range within which babies achieved their classic linguistic milestones remained fixed across all babies (a fact that is set by our human biology), variation was observed in the number of vocabulary items the bilingual babies produced in one language versus the other (e.g., Hollowka, Brosseau-Lapr e, and Petitto 2002; Pearson et al. 1995; Petitto et al. 2001); this latter fact is due to variation in the baby's home and sociolinguistic environments. Petitto et al. (2001) propose that such vocabulary differences between a young bilingual's two languages may in fact account for why parents think that their children are language delayed. Without a doubt, a baby that is at home all day with her LSQ mother (and who sees her French-speaking dad only at night and on weekends) may indeed produce more LSQ signs in early life than words in French. But the key observation here is that this child hit all of the classic linguistic milestones in LSQ and French within the same age range; *this* is the truest biological index of "normal" language development as opposed to the raw number of vocabulary items susceptible to environmental vagaries. Nonetheless, it is entirely understandable why this child's parents may worry that their young daughter, who should be at the "50-word stage," has, for example, 40 different signs in LSQ and only 10 different words in French; it is equally understandable why these parents may conclude that their child is delayed in spoken French. Instead, what is again most important is that the child hit the classic linguistic milestones in each language at the same time (irrespective of the fact that the numbers differ in terms of raw vocabulary size in each language). Moreover, by combining this girl's 40 different signs with her 10 different

words, we see that she has indeed acquired her two languages without delay relative to the well-established monolingual norms. Finally, if we turn to children who are acquiring two spoken languages, we find yet another factor that can add significantly to parents' apprehension: Under similar family circumstances described earlier with the LSQ-French child, young children acquiring two spoken languages (e.g., English and French) would show similar variance in their vocabularies, but in this case they would also have produced neutrals (which we discuss momentarily).

A second reason that the perception that early bilingual exposure may cause a child to be language delayed is typified by a parent who exclaims that her child "does not speak the father's language" even though both parents claim to use the "one parent, one language" rule in the home. How can we explain such variability? We see such variability in the young bilingual's two lexicons in part because of the environmental factors explained earlier; as was implied in the example of the baby who stays at home all day with the LSQ mother (seeing Dad only at nights and on weekends), no child receives absolute, 50/50 bilingual input (Sebastián-Gallés and Soto-Faraco 1999). But even more than this, we see variability in a bilingual child's use of the two native languages due to the child's own emerging "language preference" (see Petitto et al. 2001 for data and discussion of this important concept). Briefly, this is a fluid construct that can change over time and whose constitution could change from child to child. In practice, it is the child's primary sociolinguistic cohort group—the person or group with whom the child has the strongest bond. It could be the language of the mother if the child is at home all day with Mom, or the language of the children in the child's day care (which may be different from Mom's; the primary language of a child's peers is an extremely powerful influence), and so forth. A bilingual child's preferred language is thus the default setting (the language that the child falls back on) and the language that the child will at times continue to use even with an adult who does not know the language. Therefore, rather than the child being confused, one can in most cases predict a young bilingual's persistence in using an adult's nonprimary language from the child's sociolinguistic background.

A third reason that the contradictory views expressed in the bilingual paradox have persisted involves the class of neutrals. This class of words provides yet another clue as to why a perception has remained that young bilinguals do poorly in their language development relative to monolinguals. In this article we saw that young bilinguals acquiring two spoken languages produced a class of neutral words, or words that were difficult to assign for certain to one of their two languages, which occurred, often to the despair of their parents, who frequently exclaimed that their bilingual children were confused. In striking contrast to this, the parents of the signing-speaking bilinguals *never* told us that they thought their babies and young children were confused. And, as it happens, neutrals were not observed in the signing-speaking children because the clear modality differences between signing and speaking made identification of the source language straightforward. In this respect, the young signing-speaking baby provides us with the clearest window possible into questions about whether young bilinguals are burdened by underlying semantic confusion. Remarkably, and through the unique lens that our examination of this extraordinary population of signing-speaking children affords us, we have learned that young babies are fully capable of different but parallel acquisition of two languages from the onset of their language production; indeed we observed babies as young as 11 months turn to their deaf mother and sign in LSQ, for example, ENCORE ('again,' as in 'recurrence') and then turn to an unfamiliar French experimenter and say "encore" (albeit both with the immature phonetic articulation typical of this age). And we learned this in a manner that would not have been possible through the exclusive examination of young bilinguals acquiring two spoken languages. Here we saw that the neutrals observed in children acquiring two spoken languages are largely a peripheral artifact of the production demands of forming words across two languages with shared sounds in the identical speech modality and using the identical speech apparatus. Crucially, the absence of neutrals in signing-speaking babies taught us that the presence of neutrals in the other speaking-speaking bilingual babies was *not* a product of central underlying semantic confusion because (again) neutrals are due primarily to peripheral phonetic and pronunciation factors. Given that most

bilingual parents do not have access to this information, it is understandable how they might find it upsetting to hear their children produce partial words of an ambiguous language origin. It is further understandable how this might then lead them to conclude that their baby is confused—when it is not.

Bilingual researchers studying babies exposed to two spoken languages have used the presence or absence of translation equivalents (TEs) in their dual lexicons as a key index of whether a baby is semantically confused. Because babies acquiring two spoken languages produced a large number of neutral forms, the number of TEs that were present in their early lexicons may not be apparent. An examination of TEs in the babies acquiring a signed and a spoken language, however, again provided us with the clearest understanding of whether young bilinguals are language confused. To determine this, we analyzed the presence of TEs in our signing-speaking bilinguals' early lexicons. Because this group did not possess neutrals (for the reasons discussed earlier), we were able to discover the precise age at which young bilinguals can begin to differentiate their two languages, and, to the best of our knowledge, this was the first time that such a clear view has been provided in the literature. As we mentioned earlier, the remarkable finding here is that these young signing-speaking bilinguals differentiate their two languages from the onset of acquisition. Moreover, we determined that all of the bilingual babies' early word (sign) meanings were constrained along kind boundaries and were similarly constrained across each of their two languages. Further, their basic meanings and concepts were organized similarly across their two languages in ways that transcended differences in modality and that were similar to those of monolingual babies. Thus, given the overall similarities between signed and spoken languages and in light of our argument that neutrals stem from surface phonological competition that results from two languages being expressed through a single modality (mouth), we conclude that babies acquiring two spoken languages simultaneously also know in some sense that they are acquiring two distinct languages; alas, for this group the clarity of this fact has been hitherto obscured by the existence of neutrals.

Taken together, these studies provide insight into why parents and educators think that young bilingual children are delayed or confused in one or both languages; it also explains why there remains considerable debate about the nature of early childhood bilingual language acquisition among scientific researchers. However, based on the studies presented here, it is clear that when methods employ a variety of sources and populations and when bilingual babies' two languages are taken into consideration, we see that babies *know* that they are acquiring two distinct languages from the onset of language production and that they acquire each of their languages without fundamental language delay or language confusion.

The study of childhood bilingual language acquisition has important social, educational, and political implications, and there is no question that additional research is warranted to understand the multitude of factors that contribute to successful simultaneous bilingual language acquisition in young children. It is also clear that much more research is needed regarding the fascinating case of bilingual language acquisition in children exposed to a signed and a spoken language from an early age. However, one resounding and tangible fact emerges from the studies summarized here: Early simultaneous bilingual (and bicultural) language exposure does *not* cause language delay and confusion and is actually best for the developing child (see Saunders 1988 for a comprehensive account of the multiple cognitive, social, and developmental benefits of bilingualism). Thus, even though more research is needed, we hope that investigations of the kind we have summarized can help us understand what is at the root of prevailing paradoxical views about childhood bilingualism and, crucially, to understand that they are wholly solvable. As was heard in the sigh of this article's opening poem, we also hope we have shown that there are enough facts for us to begin solving them now instead of making "[t]he same old mistakes year after year. . . ." Recall that while Janus was the Roman god of beginnings, he was also the god to ensure good endings. Armed with these insights, we may now begin to design educational policies that can best ensure good endings for young children, especially policies that optimize a young child's chances of success in our multilingual and multicultural world.

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