

Typical Phonological Acquisition in Bilinguals

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Differentially diagnosing phonological disorders in bilingual children is difficult for a variety of reasons. Chief among them is the lack of widespread knowledge of typical phonological development. This lack of knowledge often results in either over-diagnosis (i.e., marking expected or typical patterns as disordered) or under-diagnosis (i.e., marking disordered patterns as expected or typical).

This situation places bilingual children at risk for not receiving the valid services they require. That is, if they are over-diagnosed, then they will be receiving services for a disorder that they truly do not have. On the other hand, if they are under-diagnosed, then they will not be receiving needed services for a true phonological disorder. In order to decrease the possibility of either over-diagnosis or under-diagnosis, we present information on typical phonological acquisition in bilingual speakers. In doing so, we will briefly describe a model of bilingual phonological representation, data on phonological acquisition in bilinguals, and implications for phonological disorders.

Phonological Representation in Bilinguals

Three models are purported for language (including phonological) representation in bilinguals. The Unitary System Model (USM) posits that bilinguals begin with one

amalgamated system that separates over time. That is, there is a single storage system for both languages where links between elements within the same language become stronger with increased use (Vogel, 1975; Volterra & Taeschner, 1978; Walpole, 1999).

Conversely, advocates of a Dual Systems Model (DSM) suggest that separate systems for each language are maintained, with separate sets of phonemes, rules, words, etc. (e.g., Genesee, 1989; Paradis, 2001). Currently, the most widely accepted model for bilingual phonological acquisition is Paradis' (2001) Interactional Dual Systems Model (IDSM). This model purports that simultaneous bilingual children develop separate phonological systems for each language from birth; however, the two separate phonological systems exert mutual influence on each other such that there is interdependence across the two systems.

To support the IDSM, Paradis (2001) compared the phoneme and syllable productions of 17 simultaneous bilingual French-English speaking children, ages 23 to 35 months, to 18 French monolingual and 18 English monolingual speakers. She found that the stress patterns in French influenced stress patterns in English.

She concluded from these results that the children were functioning with two separate phonological systems, but that those sys-

tems exhibited minimal overlap. In a recent study of 24 three-year-olds (8 Spanish-English simultaneous bilingual, 8 monolingual Spanish, 8 monolingual English), Fabiano (2006) found that the children's systems showed interaction in that they showed differential accuracy between phonemes "shared" (i.e., those with overlapping features like /p/) and those "unshared" (i.e., those without overlapping features like the English pre-vocalic "r" and the Spanish trill). The children also exhibited some cross-linguistic effects (i.e., use of non-ambient sounds in the other language).

Taken together, these studies support the IDSM in that bilingual children are able to differentiate the phonological systems of each language, but also demonstrate some systematic interdependence between the systems.

Although the IDSM is a generally accepted model of bilingual phonological acquisition, it has not been validated with a variety of bilingual speakers. Bilinguals typically are split into two groups: simultaneous and sequential. Simultaneous learners are those who acquire both languages from birth; sequential learners are those who acquire the second language some time after the introduction of the first language.

Researchers do not agree on how to define "some time after." Some researchers believe simultaneous learners to be those who ac-

quire both languages before age 3 (e.g., McLaughlin, 1978). Others, however, disagree and believe “simultaneous” should be restricted to those who acquire both languages from birth (e.g., Padilla & Lindholm, 1984). What seems important, however, from the standpoint of research and clinical practice, is to describe in detail the language history and language environment of the bilingual child and his/her family.

Moreover, it is important to consider how that environment changes over time. Thus, regular information from the family on sociolinguistic information (e.g., frequency and type of input and output) is critical. Future research will determine if phonological acquisition differs for bilingual children in a variety of language-learning contexts.

Phonological Development in Typically Developing Bilingual Children

Typically developing bilingual children eventually grow up to be bilingual adults, acquiring speech sound accuracy in both languages, just as the monolingual child does in one language. While our knowledge of phonological development in bilinguals is not deep, recent studies aid us in understanding the paths different types of bilinguals take to adult-like bilingual competence in their two languages.

Research suggests that language acquisition in bilingual children is similar in rate and achievement of developmental milestones to their monolingual peers (Junker & Stockman, 2002; Pearson, Fernandez, Lewedeg & Oller, 1997). While the information for phonological development is less conclusive, it also appears that, overall, progression towards a complete phonetic inventory and segmental- and syllable level accuracy occurs

at approximately the same rate as they do for monolinguals.

Nevertheless, the direct comparison of bilinguals to monolinguals for clinical decision-making likely produces erroneous conclusions. While rate of development may be similar, it appears that exposure to two languages can result in a phonological system that has subtle differences from either of the monolingual language environments (Vihman, 2002; Deuchar & Clark, 1996; Johnson & Lancaster, 1998). Typically developing bilingual children have shown evidence of cross-linguistic effects and have produced errors that differ from those of monolingual children in the two languages in the bilingual child's environment (Fantini, 1979; Goldstein & Washington, 2001; de Houwer, 1995; Dodd, So, & Wei, 1996; Holm & Dodd, 1999a). Also, types of errors that are noted in bilinguals may be unlike those observed in monolinguals (further discussion of this follows).

Babbling and first words in bilingual children

The little existing research on bilingual infants and toddlers suggests that they produce similar sounds, syllable and utterance shapes, and frequency of utterances when compared to their monolingual peers (Maneva & Genesee, 2002; Yava^o, 1995). Despite the fact that the IDSM theory appears accurate in accounting for phonological representation, on the surface a bilingual infant or toddler may not clearly demonstrate language differentiation. Vocalizations of simultaneous bilingual children demonstrate similar sounds in both language environments, with only slight language-specific differences such as frequency of a specific type of sound produced (Boysson-Bardies & Vihman, 1991).

Regardless of the two languages heard, infants and toddlers primarily produce stops, nasals,

and glides accompanied by vowels produced anteriorly in the mouth. Utterance shapes are primarily consonant-vowel (CV), V, and CVCV (Zlatic, MacNeilage, Matyear & Davis, 1997). These sounds and syllable patterns are often considered universals during speech development, predominant in babbling and first words from monolingual children in a variety of languages and also apparent in bilingual children. Differences across languages have been noted in utterance length, with bilingual children producing utterances that more closely matched that of utterance lengths in each environment (Bhaya Nair, 1991; Maneva & Genesee, 2002).

While bilingual infants and toddlers do not sound that different in their two language environments, comparisons of bilingual to monolingual children have shown similar inventories with slight language-specific differences (Johnson & Lancaster, 1998). Potential differences in the babbling of the bilingual child have been suggested in syllable structures, with greater frequency of VCV shapes observed in English situations of children also learning Finnish (Vihman & Velleman, 2000) and Hindi (Bhaya Nair, 1991).

A possible developmental difference from monolinguals is vowel acquisition in bilinguals for children. Researchers have noted vowel variation and higher vowel error rate during bilingual development, a phenomenon not commented on for monolingual children (Holm & Dodd, 1999b; Johnson & Lancaster, 1998; Schnitzer & Krasinski, 1994). It appears that bilingual children experience difficulty acquiring vowel length contrast and display variability in vowel production, particularly in the vowel system with the greater number of phonemic contrasts, with vowel accuracy for the simpler system similar in developmental rate to monolingual children. For example, Kehoe (2002)

found that German-Spanish bilingual children experienced difficulty acquiring the more marked system of German vowels, but did not experience difficulty acquiring the unmarked system of Spanish vowels, comprised of cardinal vowels.

Overall, similarities or slight language-specific differences in the bilingual child's babbling and first word productions do not necessarily reflect a presence or absence of representational differentiation of the two languages. Instead, it is likely that a bilingual child is using a whole word learning strategy in which situational use in different language environments results in differing productions (Vihman, 2002).

Vihman suggests an interaction between the word templates used in first productions, not necessarily resulting from a unified phonological representation but more likely phonetic ability and lack of a phonological system, at least through the first 50 words.

Bilingual development in preschool-aged children

The typical bilingual 3- or 4-year-old is developing phonological skills that match his/her two languages in complexity and accuracy, thus demonstrating evidence of language-specific phonological representation. At this age, later-developing sounds (typically liquids, affricates, fricatives) are evident in monolingual (Shriberg & Kwiatkowski, 1994; Goldstein & Iglesias, 1996) as well in bilingual children's productions (Goldstein & Washington, 2001; Holm & Dodd, 1999). By age 3, the bilingual child is clearly differentiating the two phonologies and is learning precise articulatory skills to match the segmental and phonotactic patterns of their languages. His/her phonological representation is likely similar to, but different from, monolingual peers in each of their two languages. Also, it is likely that the ambient language

frequency and salience of a particular sound or syllable pattern will affect the timeline for speech sound production for a specific language in the bilingual child.

Bilingual preschoolers from Spanish-English backgrounds have similar phonetic and phonotactic inventory to their monolingual peers (Gildersleeve-Neumann, Kester, Davis, & Peña, in revision; Goldstein & Washington, 2001), as well as those from Russian-English (Wright & Gildersleeve-Neumann; 2004) and Chinese-English backgrounds (Holm & Dodd, 1999b). However, differences between bilingual and monolingual children have been noted in the frequency of error patterns.

Goldstein and Washington found language-specific differences in single-word productions, with children demonstrating greater frequencies of cluster reduction and liquid simplification in Spanish, but greater rates of final consonant deletion, stopping, dentalization of /s/ and /z/ and lateralization of /s/ in English. Gildersleeve-Neumann et al. compared the English of simultaneous bilingual children to monolingual children; they found trends suggesting slightly greater rates of cluster reduction and final consonant deletion in the bilingual preschoolers, particularly those with less English exposure.

While bilingual development is often discussed from a "Does it cause delay?" perspective, it has been suggested that exposure to phonological features in one language can result in acceleration of these phonological features in the child's second language (Kesavarz & Ingram, 2002). For example, Kehoe and Lleó (2003) found that German-Spanish bilingual children learned German codas at the same rate as monolingual German children, but that Spanish codas were learned faster in the bilingual children than they were for monolingual Spanish children. Such "bilin-

gual bootstrapping" has been reported in other aspects of language as well (Gawlitsek-Maiwald & Tracy, 1996).

Simultaneous vs. Sequential Bilingualism

Until recently, research on speech sound acquisition has focused on simultaneous bilinguals, with the majority of those studies of children from advantaged economic and educational backgrounds. Yet, the population of sequential bilinguals has grown dramatically in the U.S., and it is important that the speech-language pathologist understand similarities and differences between these core types of bilingual children.

The differences in sequential and simultaneous bilingual language situations have been suggested to result in differing types of errors in speech sound development from bilinguals, suggesting separate phonological systems for each language (Holm & Dodd, 1999b).

Unlike the simultaneous bilingual, who acquires both phonological systems simultaneously, the sequential bilingual can use the phonology of his/her first language to learn the second language. It is possible that this results in a greater frequency of cross-linguistic effects. Anderson (2004) studied children from a variety of home language environments who were learning English as a second language in preschool. These children continued to progress in their first language phonological acquisition, as well as show evidence of mapping their first language phonology to their second language in the form of cross-linguistic effects. Holm and Dodd (1999b) found that preschool-aged Cantonese-English bilinguals developed the sound inventories appropriate for each language, also showing evidence of the carry over of developmental errors typical for their first language to English, re-

sulting in some atypical errors in English, including voicing errors.

It appears that for both simultaneous and sequential bilingual children, the greatest error rates are observed on unshared consonants (Goldstein & Washington, 2001). These higher error rates may result from differing phonological properties or from lack of articulatory experience necessary for these late acquired sounds (Sander, 1972). If a child is learning two languages, it is likely he/she will practice later-developing sounds and syllable shapes in the two languages less often than the monolingual child, possibly resulting in a slightly slower mastery of accurate production requirements.

Areas for Future Research

While the existing studies provide much-needed information on bilingual development, it is important to note the limitations of the current research. Case studies of individual children form the bulk of research data about bilingual speech sound development. These studies typically take place in the bilingual environments of status languages and highly educated individuals (Anderson, 2004; Fantini, 1979; Schnitzer & Krasinski, 1994, 1996; Vihman, 1982; Vihman, 1985).

Often, bilingual children are children of the researchers themselves. While some research has been conducted on children from disadvantaged economic and educational backgrounds, the number of studies with this population has been sparse (Goldstein & Washington, 2001; Gildersleeve-Neumann et al., in revision). It will be important for future research to compare economic and educational differences in bilinguals for their effect on speech sound development.

Research suggests that the specific languages to which a child is

exposed affect bilingual phonemic and phonotactic development. For example, the combination of shared and unshared phonemes across languages may affect the order and timeline of acquisition. The frequency of phonemes or phonotactic combinations in a particular language may also influence their earlier occurrence in child inventories.

In addition, to understand bilingual speech sound development in children, it is important to note at what point in development and the frequency with which an individual is exposed to each language. Research has suggested that amount of exposure to a second language may affect acquisition in 3- and 4-year olds, with research suggesting that Spanish-English bilingual children with less exposure to English had higher rates of error and greater effects of Spanish phonological structure on their English words (Gildersleeve-Neumann et al., in revision). However, by age 5 these differences do not appear to be in effect (Goldstein, Fabiano, & Washington, 2005).

Research has not directly explored the effect of dialect on speech sound development in the bilingual. Nevertheless, the dialect of each of the bilingual child's languages must be considered in understanding their speech development. One must be aware of the dialects of each language spoken by people in the child's environment to determine if a child is developing typically or atypically for their particular dialect and bilingual community (Goldstein & Iglesias, 2001).

Implications for Phonological Disorders

SLPs often mistakenly believe that language development in bilinguals is always slower than that of monolinguals. Although there are few studies in this area, those that do exist seem to show the contrary. That is, the skills of

bilinguals are commensurate with, although not identical to, those of their monolingual peers. This case appears to be stronger as children get older.

The erroneous assumption of expected "slower" development may translate into clinical practices that are not evidence-based. For example, SLPs might think they should speak (or advise parents to speak) in a less complex manner because bilinguals do not develop at the same rate as monolinguals. Moreover, parents might be (mis)advised to limit their output to only one language. Neither of these suggestions is supported by the available research.

For example, even bilingual children with language disorders develop at the same rate as their monolingual counterparts who also exhibit disorders (Paradis, 2005). Results of studies such as this indicate that bilinguals are not at increased risk for language disorders compared with monolinguals simply because they are acquiring more than one language. Although SLPs should be mindful not to over-diagnose phonological disorders in bilingual children, they also must be cognizant of not under-identifying them either. Unfortunately, there are few studies of bilingual children with phonological disorders.

Goldstein (2000) examined the phonological skills of ten 4- and 5-year-old simultaneous Spanish-English bilingual children with a mean age of 4;8. In all cases, families used both languages at home, and instruction in school took place in both languages. For all participants, parents and teachers expressed concern about the children's speech production skills. Vowel and consonant accuracy and percentage-of-occurrence for phonological patterns were measured and then compared retrospectively with monolingual Spanish and English speakers with phonological disorders.

Results from these retrospective comparisons indicated that the children displayed commensurate skills with monolinguals. Results were similar for bilingual and monolingual children relative to vowel accuracy and the use of common phonological patterns (stopping, cluster reduction, and liquid simplification). The results between groups, however, were not identical. For example, consonant accuracy was commensurate in the Spanish of the bilingual children in comparison to monolingual Spanish norms (Goldstein & Iglesias, 1996). However, consonant accuracy was higher in the English of bilingual children than compared to monolingual English norms (Shriberg & Kwiatkowski, 1994). One possible reason for the difference between studies might have been methodological in nature. Goldstein (2000) elicited productions using single words versus the collection of connected speech samples by Shriberg and Kwiatkowski.

Given the relatively few studies examining the phonological skills of bilingual children (typically developing and those with phonological disorders), SLPs must use a variety of approaches in assessing and treating bilingual children with phonological disorders (these approaches are detailed in the next two articles in this issue).

Clinicians need to broaden the types of phonological analyses they complete on children's speech sound productions. Deriving standardized scores for bilingual children largely will not be possible because of the lack of norm-referenced assessment tools. Thus, SLPs will need to examine these children's skills broadly (e.g., examining segmental accuracy, syllable structure accuracy, phonological patterns, prosody, etc.) and deeply (e.g., examining not only number of errors but also consonant accuracy, vowel

accuracy, accuracy of sound classes, and so on). During intervention, phonological change will need to be monitored regularly using a dynamic approach by determining how quickly the children change and how much effort the SLP has to work to get them to change (Bain, 1994).

Understanding the literature on bilingualism, knowing the phonological skills in typically developing bilingual children and those with phonological disorders, assessing broadly and deeply, and monitoring change during intervention will allow for the valid identification of and appropriate intervention for bilingual children with phonological disorders.

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