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Bilingualism

Consequences for Language, Cognition, Development, and the Brain

by Viorica Marian, Yasmeen Faroqi-Shah, Margarita Kaushanskaya, Henrike K. Blumenfeld & Li Sheng

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Every year, thousands of middle- and upper-class American children study a foreign language for enrichment. These children, their parents, and their teachers are guided by the belief that knowing another language "is good for you." At the same time (and sometimes in the same schools) thousands of other children—usually from immigrant and lower-class backgrounds—are discouraged from and sometimes forbidden to speak their native language. Their families are told that communication in their native languages will prevent them from mastering English and that raising children with more than one language will "confuse" them and have long-lasting, detrimental effects.

Given these two contradictory perspectives, what does research say about the consequences of bilingualism?

Cognitive Development

Empirical evidence suggests that bilingualism in children is associated with increased meta-cognitive skills and superior divergent thinking ability (a type of cognitive flexibility), as well as with better performance on some perceptual tasks (such as recognizing a perceptual object "embedded" in a visual background) and classification tasks (for reviews, see Bialystok, 2001; Cummins, 1976; Diaz, 1983, 1985).

Other studies report that bilingualism has a negative impact on language development and is associated with delays in lexical acquisition (e.g., Pearson, Fernandez, & Oller, 1993; Umbel & Oller, 1995) and a smaller vocabulary than that of monolingual children (Verhallen & Schoonen, 1993; Vermeer, 1992). Bilingual children score on par with their monolingual counterparts on tests of verbal ability by middle school, and well-controlled studies provide no evidence for lower intellectual abilities of bilingual children compared to monolinguals (Baker & Jones, 1998; Cook, 1997; Hakuta, 1986).

The early differences in linguistic performance of bilingual children can be attributed to a somewhat different language development pattern. Bilingual children learn earlier than their monolingual counterparts that objects and their names are not the same and that one object can have more than one name. Understanding that language is a symbolic reference system is advantageous for metacognitive development; it does not, however, necessarily translate to improved performance on early vocabulary development tests.

Those vocabulary test results are due, in part, to the way language assessment usually takes place. If a monolingual child has three lexical labels for three semantic items ("milk," "grandma," and "dog"), and a bilingual child has two lexical labels in English ("milk" and "grandma") and two in Spanish ("leche" and "abuela," the Spanish words for "milk" and "grandma"), the monolingual child's vocabulary will be counted as three words and the bilingual child's vocabulary will be counted as two words—because vocabulary size is counted not as the number of lexical items known, but as the number of conceptual representations that have lexical labels. Therefore, even though the bilingual child has four words, they map onto two conceptual representations, compared with the three conceptual representations of the monolingual child. This assessment technique frequently places bilingual children at a disadvantage.

Bilinguals often are assessed in only one language, providing an inaccurate assessment of the child's actual level of linguistic and cognitive development. A child assessed in only one language, typically that of the country in which he or she is being tested (i.e., English in the United States, often the second and less-proficient language), may be placed erroneously at a lower level of cognitive development than his or her true level. This placement can have adverse academic consequences, such as inappropriate lower-grade placement, being held back a year, enrollment in inappropriate remedial programs, and other placement decisions. (For more comprehensive discussions of first/second language knowledge and cognitive processing in bilingual children, see work by Cummins).

Comparisons of children's performance in the first and second language indicate that performance in one language, even the dominant language, is not an accurate reflection of the child's level of development. Instead, assessment is most accurate with "best performance" measures that assess the highest level of development attained by a bilingual child across both languages. Therefore, whenever possible, "best performance" measures across the two languages should be the technique of choice during bilingual assessments.

Most school districts and speech-language pathology clinics lack the bilingual staff and financial resources to test individuals in the dozens of native languages of their client populations. The result is both over-identification (the client does not have an impairment, but just needs more time to learn the language) and under-identification (the client is assessed only in English, and the assessor inaccurately concludes that the client's difficulties are related to learning a new language) of bilinguals. This state of affairs can be improved only if changes are made both at the systemic level—by increasing funding for services to linguistically diverse populations—and at the individual level—by raising clinicians' understanding of bilingualism and its consequences. With regard to the latter, clinicians should be aware of the most recent findings in four areas: lexical organization, word-learning, cognitive control, and neural organization.

Lexical Organization

In children learning a first language, a noticeable change takes place in the salience of various word-word relations during middle childhood. For example, a 6-year-old is quick to point out the thematic relationship between an iron and a shirt ("Because you can iron a shirt!") but has difficulties attributing the relationship between planes and buses to their shared taxonomy. They might say that "Planes and buses both have fumes" instead of recognizing that both are vehicles. By 8 years of age, most children readily acknowledge both thematic and taxonomic relationships (Hashimoto, McGregor, & Graham, 2007). Children learning two languages simultaneously or sequentially must store and retrieve a larger number of words, because vocabularies are distributed across two linguistic systems. Does access to different semantic relations arise in the same timeline for these children?

Sheng, McGregor, and Marian (2006) used a repeated word association task with 7-year-old Mandarin-English bilingual children. The children produced three associations to word prompts in both languages (e.g., in response to "chair," a child may produce "table," "sit," and "legs"). The bilingual children produced a similar number of taxonomic associations (e.g., chair-table) to the prompts in their two languages and in comparison to monolingual English-speaking peers (who were matched on performance IQ). The similarities in overall performance suggest that the emergence of taxonomic relations is largely determined by general cognitive abilities. Nevertheless, we found subtle differences—the bilingual children more frequently responded taxonomically than the monolingual children when the first associations and associations to verbs (e.g., jump-walk) were compared. This subtle bilingual advantage is interesting given that the bilingual children had a significantly smaller English receptive vocabulary than the monolinguals. The bilingual children's need to store and retrieve more words across two linguistic systems may have rendered taxonomic relations more salient.

More recently, Sheng, Bedore, and Peña (2008) compared word associations generated by Spanish-English bilingual children in their first and second languages. These children were considered relatively balanced bilinguals based on their linguistic input and output. The children showed overall comparable performance in the two languages, but there also was a subtle Spanish advantage over English in generating taxonomic associations to adjectives and verbs. We hypothesize that features of the Spanish language, such as the use of salient derivational endings (e.g., -oso, -ado, -ivo) to mark the adjective class and the use of verbs in more salient positions in an utterance may have led to an earlier appreciation of taxonomic relations for Spanish adjectives and verbs.

Sheng, Bedore, and Peña (2009) are extending this research to bilingual children who have language impairment. Monolingual English-speaking children with language impairment exhibit a significant deficit in the use of both taxonomic and thematic relations in comparison to typically developing peers (Sheng & McGregor, in press). Investigations of bilingual children with language impairment will provide insights regarding the interactions among bilingualism (an experiential factor), linguistic capacity (a learner-internal factor), and vocabulary organization.

Word-learning

Speech-language pathologists have long been aware that application of monolingual language norms to bilingual clients is inappropriate. What are the alternatives? One possibility is to use processing-based measures, such as word-learning, to index language ability in bilinguals (e.g., Peña, Iglesias, & Lidz, 2001) because these tasks reflect a child's general ability to process linguistic information but do not rely on extant linguistic knowledge. Therefore, bilinguals with poor language knowledge due to low proficiency should perform just as well on word-learning tasks as monolinguals, and better than bilinguals who experience language deficits. However, little is known about the effects of bilingualism on word-learning. How exactly does bilingualism influence word-learning ability? Our recent research comparing bilingual and monolingual adults on their ability to learn new words consistently suggests that bilingual adults tested in their native language outperform monolingual adults on word-learning tasks. For example, Kaushanskaya and Marian (2009a) examined word-learning performance in monolingual speakers, English-Spanish bilinguals, and English-Mandarin bilinguals, and found that both bilingual groups outperformed the monolingual group.

A related study (Kaushanskaya & Marian, 2009b) examined the effects of bilingualism on adults' ability to resolve cross-linguistic inconsistencies during novel word-learning. English monolinguals and English-Spanish bilinguals learned novel words that overlapped with English orthographically, but diverged from English phonologically. Native-language orthographic information presented during learning interfered with encoding of novel words in monolinguals, but not in bilinguals. These findings indicate that knowledge of two languages may shield bilinguals from native-language interference during novel word-learning.

Current work (Kaushanskaya, Yoo, Van Hecke, & Mirsberger, 2009) suggests that monolinguals' ability to learn new words depends on whether they learn new words silently or out loud. Conversely, bilinguals' performance does not depend on any particular learning strategy, and they can acquire new words efficiently under any learning conditions. Our findings indicate that bilingualism facilitates word-learning performance in adults, although the precise mechanisms of this advantage remain unknown. Whether similar word-learning advantages can be observed in children is still under investigation. It appears that word-learning performance in bilingual children may be less contingent on latent vocabulary knowledge than in monolingual children (e.g., Kan & Kohnert, 2008; Wilkinson & Mazzitelli, 2003). However, studies that contrast word learning in simultaneous bilingual children (exposed to two languages from birth), sequential bilingual children, and monolingual children are necessary to identify the timeline and the mechanisms that underlie the development of the bilingual advantage for word learning.

The finding that bilingualism facilitates word-learning performance has implications for the use of word-learning tasks to index language function in bilingual clients. If typically developing bilinguals perform at higher rates than typically developing monolinguals, then the expectations for bilingual clients with a suspected language difficulty may also need to be adjusted.

Cognitive Control

The consequences of bilingualism on cognition have implications for understanding the nature of linguistic-cognitive deficits. Linguistic and cognitive processes interact across the lifespan, with linguistic function tied to development of cognitive control throughout childhood and to its decline during aging (Comalli et al., 1962). For example, aging adults may have difficulty with language tasks that require inhibitory control, such as ignoring irrelevant language input when multiple speakers are present (Schrauf, 2008). Research suggests that the very processes that decline with normal aging also may be honed by lifelong bilingualism (Kavé et al., 2008). For example, aging bilinguals outperform monolingual peers at suppressing task-irrelevant information (Bialystok et al., 2004). Further, Bialystok, Craik, and Freedman (2007) showed that the onset of Alzheimer's dementia may be delayed by up to four years in bilinguals relative to monolinguals.

How does bilingual experience shape the cognitive system? In general, bilinguals face greater ambiguity during language processing because they consider similar-sounding words from two languages (instead of one) during comprehension and must choose between languages during production. For instance, a German-English bilingual who sees pictures of a bike and a leg while hearing "bike" may also look at the leg (Bein [baIn] in German) before identifying the bike (Blumenfeld & Marian, 2007). In our research, we aimed to identify a mechanism through which bilingual language processing may influence inhibitory control (Blumenfeld and Marian, in preparation). We measured the extent to which monolinguals and bilinguals activated similar-sounding words (e.g., "hamper" and "hammer"), and the extent to which they inhibited similar-sounding competitors as they identified the correct targets (e.g., a picture of a hammer). We found a correlation between how bilinguals (but not monolinguals) inhibited irrelevant words during comprehension and how well they performed on a non-linguistic task that required inhibition of irrelevant information. Bilinguals also showed higher accuracy rates on the non-linguistic inhibition task compared to monolingual peers.

These findings suggest that a central inhibition mechanism may be recruited and altered by bilingual language processing. Identifying a link between language experience and cognitive processes is important because it may provide insights into how treatment can generalize from the cognitive into the linguistic domain and vice versa. Moreover, because inhibitory control deficits are thought to underlie (at least in part) a number of disorders, including attention-deficit (hyperactivity) disorder and frontal lobe impairments, monolingual/bilingual differences in this domain may become clinically relevant, generating the need to create bilingual norms even on non-linguistic neuropsychological assessment tools. In general, monolingual/bilingual differences should be considered in populations with potentially weaker cognitive control, such as children or older adults. Aspects of cognitive development or aging may differ across monolingual and bilingual populations, with potential consequences for the nature and severity of cognitive/linguistic symptoms related to inhibitory control.

Neural Organization

Investigations into the neural manifestations of bilingualism have included functional comparisons of a variety of linguistic and non-linguistic domains and studies of cortical anatomy. The earliest studies of the cortical correlates of bilingualism used behavioral approaches to examine hemispheric dominance differences between monolinguals and bilinguals, early- and late-acquired bilinguals, and high- and low-proficiency bilinguals. Hull and Vaid's (2007) meta-analyses of the data reveal that early bilinguals were the only group that showed consistent bilateral dominance for language. Late bilinguals and monolinguals showed left-hemisphere dominance. Second-language proficiency was found to be less relevant than age of acquisition in influencing language lateralization. The authors proposed that a period of early monolingual development establishes left-hemispheric dominance that is then preserved irrespective of future bilingual experience.

Interestingly, this decreased hemispheric dominance in early bilinguals also is observed for non-linguistic tasks. For example, Hausmann and colleagues (2004) used visual hemifield presentation to investigate face discrimination, a right-hemisphere-dominant task. Turkish-German bilinguals were more bilaterally dominant than both Turkish and German monolinguals.

However, neuroimaging studies have failed to find consistent laterality differences between monolingual and bilingual speakers (e.g., Hernandez et al., 2001; Kim et al., 1997). When neural activations for single words are meta-analyzed on the basis of the lexical processes involved (semantic access, phonological code retrieval, or articulation), bilinguals and monolinguals activate similar neural regions for individual lexical processes (Indefrey, 2006; Indefrey & Levelt, 2004). What is different, though, is that specific perisylvian regions may differentially activate for individual languages of the bilingual speaker. The left inferior frontal gyrus (LIFG) has been shown to respond differentially to L1 and L2, either with different foci for L1 versus L2 or with greater volume of activation for L2 (Kim et al., 1997). This differential activation is found only for late bilinguals and for specific linguistic tasks.

Marian and colleagues (2007), for example, found that the foci of LIFG activations differed across L1 and L2 for lexical and phonological processing, but not for orthographic processing. Others found L1 and L2 to activate the LIFG differentially for syntactic processing (Saur et al., 2009). The LIFG appears to make distinctions between L1 and L2 for linguistic processes for which it serves a unique role; further research is needed to elucidate these patterns.

Moreover, bilingualism may have ramifications on cortical morphology: Using high-resolution magnetic resonance imaging scans and an analysis procedure called voxel-based morphometry, Mechelli and colleagues (2004) found that individuals with higher proficiency in and/or earlier age of second-language acquisition had a higher gray matter density in the left inferior parietal cortex.

What Clinicians Should Know

Knowledge of bilingualism suggests the following linguistic, cognitive, and neurophysiological differences between bilingual and monolingual speakers:

Linguistic differences

- Bilingual children develop an earlier understanding of taxonomic relationships than their monolingual peers (e.g., car and bus are vehicles). This understanding is not dependent on vocabulary size, but could be influenced by the structural features of the speaker's language.
- Bilingual adults are better than monolingual adults at learning new words. Bilinguals use a variety of word-learning strategies with similar efficiency and are less susceptible to interference from conflicting orthographic information during word-learning.
- Linguistic input co-activates both languages in bilinguals; when bilinguals hear or read words in one language, partially overlapping linguistic structures in the other language also are activated.

Cognitive differences

- Bilinguals may be able to inhibit irrelevant verbal and nonverbal information with greater ease than monolinguals. Inhibitory control ability is slower to decline with age in bilinguals than in monolinguals.
- The average age of dementia onset is later in bilinguals than in monolinguals.
- Bilingual children have been found to exhibit superior performance in divergent thinking, figure-ground discrimination, and other related meta-cognitive skills.

Neural differences

- Bilateral processing of language (and other nonverbal tasks) is most likely to occur only in early bilinguals.
- Monolinguals and bilinguals use similar neural regions for language processing. However, late bilinguals are likely to activate the LIFG differentially for processes in which the LIFG plays a crucial role, such as phonological and syntactic processing.

- Bilinguals have greater gray matter density than monolinguals in certain left hemisphere regions.

Viorica Marian, PhD, is associate professor of communication sciences and disorders, psychology, and cognitive science at Northwestern University and director of the Northwestern Bilingualism and Psycholinguistics Laboratory. She uses cognitive, behavioral, and neurological measures to study the human linguistic capacity and the brain's ability to accommodate multiple languages simultaneously. Contact her at v-marian@northwestern.edu.

Yasmeen Faroqi-Shah, PhD, CCC-SLP, is assistant professor in the Department of Hearing and Speech Sciences, faculty member of the Program in Neuroscience and Cognitive Science, and director of the Aphasia Research Center at the University of Maryland (College Park). Her research focuses on aphasia, neurolinguistics, neuroimaging, and bi/multilingualism. Contact her at yshah@hesp.umd.edu.

Margarita Kaushanskaya, PhD, is assistant professor in the Department of Communicative Disorders and director of the Language Acquisition and Bilingualism Laboratory at the University of Wisconsin-Madison. Her research examines the nature and the developmental trajectory of cognitive mechanisms that underlie language learning and focuses on second-language acquisition and bilingualism in children and adults. Contact her at kaushanskaya@wisc.edu.

Henrike K. Blumenfeld, PhD, is assistant professor in the School of Speech, Language, and Hearing Sciences and director of the Bilingualism and Cognition Laboratory at San Diego State University. Her research focuses on the relationship between linguistic and cognitive processes in young adult and aging bilinguals. Contact her at henrike.blumenfeld@sdsu.edu.

Li Sheng, PhD, is assistant professor in the Department of Communication Sciences and Disorders at the University of Texas at Austin. Her research focuses on child language development and disorders, lexical-semantic processing and organization, and bilingualism. Contact her at li.sheng@mail.utexas.edu.

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References

Baker, C., & Jones, S. (1998). *Encyclopedia of Bilingualism and Bilingual Education.* Clevedon, UK: Multilingual Matters Ltd.

Bialistok, E. (2001). *Bilingualism in Development: Language, Literacy, and Cognition.* New York: Cambridge University Press.

Bialystok, E., Craik, F.I.M., Klein, R., & Viswanathan, M. (2004). Bilingualism, aging, and cognitive control: Evidence from the Simon task. *Psychology and Aging, 19*, 290–303.

Blumenfeld, H.K., & Marian, V. (2007). Constraints on parallel activation in bilingual spoken language processing: Examining proficiency and lexical status using eye-tracking. *Language and Cognitive Processes, 22*(5), 633–660.

Blumenfeld, H.K., & Marian, V. (in preparation). Bilingualism influences inhibitory control in auditory comprehension.

Blumenfeld, H.K., & Marian, V. (2009). Language-cognition interactions during bilingual language development in children. In B. Kuzmanovic & A. Cuevas (Eds.), *Recent Trends in Education.* Hauppauge, NY: Nova Science Publishers, Inc.

Blumenfeld, H.K., Schroeder, S.R., Ali, Z., & Marian, V. (2009). Inhibition and facilitation in auditory comprehension across the lifespan. In N. A. Taatgen & H. van Rijn (Eds.), *Proceedings of the Thirty-First Annual Conference of the Cognitive Science Society* (pp. 267–272). Austin, TX: Cognitive Science Society.

Comalli, P.E., Wapner, S., & Werner, H. (1962). Interference effects of Stroop color-word test in childhood, adulthood, and aging. *The Journal of Genetic Psychology, 100*, 47–53.

Cook, V. (1997). The consequences of bilingualism for cognitive processing. In A.M.B. de Groot & J. F. Kroll. (Eds.), Tutorials in *Bilingualism: Psycholinguistic Perspectives* (pp. 279–299). Mahwah, NJ: Lawrence Erlbaum.

Cummins, J. (1976). The influence of bilingualism on cognitive growth: A synthesis of research findings and explanatory hypotheses. *Working Papers on Bilingualism, 9*, 1–43.

Diaz, R. M. (1983). The impact of bilingualism on cognitive development. In E.W. Gordon (Ed.), *Review of Research in Education,* Vol. 10, pp. 23–54. Washington, DC: American Educational Research Association.

Diaz, R.M. (1985). Bilingual cognitive development: Addressing three gaps in current research. *Child Development, 56*, 1376–1388.

Hakuta, K. (1986). *Mirror of language: The debate on bilingualism.* New York: Basic Books.

Hasher, L., & Zacks, R.T. (1988). Working memory, comprehension and aging: A review and a new view. In G.H. Bower (Ed.), *The Psychology of Learning and Motivation* (Vol. 22, pp. 193–225). San Diego, CA: Academic Press.

Hashimoto, N., McGregor, K.K., & Graham, A. (2007). Conceptual organization at six and eight: Evidence from the semantic priming of object decisions. *Journal of Speech, Language, and Hearing Research, 50*, 161–176.

Hausamann, M., Durmusoglu, G., Yazgan, Y., & Gunturkun, O. (2004). Evidence for reduced hemispheric asymmetries in non-verbal functions in bilinguals. *Journal of Neurolinguistics, 17*, 285–299.

Hernandez, A.E., Dapretto, M., Mazziotta, J., & Bookheimer, S. (2001). Language switching and language representation in Spanish-English bilinguals: An fMRI study. *NeuroImage, 14*, 510–520.

Hull, R., & Vaid, J. (2007). Bilingual language lateralization: A meta-analytic tale of two hemispheres. *Neuropsychologia, 45*, 1987–2008.

Indefrey, P. (2006). A meta-analysis of hemodynamic studies on first and second language processing:

Which suggested differences can we trust and what do they mean? *Language Learning, 56*, 279–297.

Indefrey, P., & Levelt, W.J.M. (2004). The spatial and temporal signatures of word production components. *Cognition, 92*, 101.

Kan, P. & Kohnert, K. (2008). Fast mapping by developing bilinguals in L1 and L2. *Journal of Child Language, 35*, 495–514.

Kaushanskaya, M., & Marian, V. (2009a). The bilingual advantage in novel word learning. *Psychonomic Bulletin and Review, 16*(4), 705–710.

Kaushanskaya, M., & Marian, V. (2009b). Bilingualism reduces native-language interference in novel word learning. *Journal of Experimental Psychology: Learning, Memory, & Cognition, 35*(3), 829–835.

Kaushanskaya, M., Yoo, J., Van Hecke, S., & Mirsberger, J. (2009, March). *Learning new words silently vs. vocally: Differences between monolinguals and bilinguals.* Paper presented at the Georgetown University Round Table: Implicit and Explicit Conditions, Processes, and Knowledge in SLA and Bilingualism, Washington, DC.

Kavé, G., Eyal, N., Shorek, A., & Cohen-Mansfield, J. (2008). Multilingualism and cognitive state in the oldest old. *Psychology and Aging, 23*(1), 70–78.

Kim, K., Relkin, N.R., Lee, K.-M., & Hirsch, J. (1997). Distinct cortical areas associated with native and second languages. *Nature, 388*(10), 171–174.

Marian, V., Shildkrot, Y., Blumenfeld, H.K., Kaushanskaya, M., Faroqi-Shah, Y., & Hirsch, J. (2007). Cortical activation during word processing in late bilinguals: Similarities and differences as revealed by functional magnetic resonance imaging. *Journal of Clinical and Experimental Neuropsychology, 29*, 247–265.

Mechelli, A., Crinion, J.T., Noppeney, U., O'Dohetry, J., Ashburner, J., Frackowaik, R., et al. (2004). Structural plasticity in the bilingual brain. *Nature, 431*, 757.

Pearson, B.Z., Fernandez, S.C., & Oller, D.K. (1993). Lexical development in bilingual infants and toddlers: Comparison to monolingual norms. *Language Learning, 43*, 93–120.

Peña, E., Iglesias, A., & Lidz, C.S. (2001). Reducing test bias through dynamic assessment. *American Journal of Speech-Language Pathology, 10*, 138–154.

Saur, D., Baumgaertner, A., Moehring, A., Büchel, C., Bonnesen, M., Rose, M., et al. (2009). Word order processing in the bilingual brain. *Neuropsychologia, 47*(1), 158–168.

Schrauf, R.W. (2008). Bilingualism and aging. In J. Altarriba & R.R. Heredia (Eds.), *An Introduction to Bilingualism: Principles and Processes*, pp. 105–123. New York, NY: Lawrence Erlbaum Associates.

Sheng, L., & McGregor, K.K. (in press). Lexical-semantic organization in children with specific language impairment. *Journal of Speech, Language, and Hearing Research.*

Sheng, L., McGregor, K.K., & Marian, V. (2006). Lexical-semantic organization in bilingual children:

Evidence from a repeated word association task. *Journal of Speech, Language, and Hearing Research, 49*, 572–587.

Sheng, L., Bedore, L., & Peña, E.D. (2008). Lexical-semantic organization in Spanish-English bilingual children. *Abstracts of the Conference on Bilingual Acquisition in Early Childhood*, Hong Kong, China.

Sheng, L., Bedore, L., & Peña, E.D. (2009, June). Depth of semantic knowledge in Spanish-English bilingual children with specific language impairment. *Abstracts of the 29th Annual Symposium on Research in Child Language Disorders*, Madison, WI.

Sommers, M.S., & Danielson, S.M. (1999). Inhibitory processes and spoken word recognition in young and older adults: The interaction of lexical competition and semantic context. *Psychology and Aging, 14*(3), 458–472.

Taylor, J.L., O'Hara, R., Mumenthaler, M.S., Rosen, A.C., & Yesavage, J.A. (2005). Cognitive ability, expertise, and age differences in following air-traffic control instructions. *Psychology and Aging, 20*(1), 117–133.

Umbel, V.M., & Oller, D.K. (1995). Developmental changes in receptive vocabulary in Hispanic bilingual school children. In B. Harley (Ed.), *Lexical Issues in Language Learning* (pp. 59–80). Amsterdam: John Benjamins.

Verhallen, M., & Schoonen, R. (1993). Lexical knowledge of monolingual and bilingual children. *Applied Linguistics 14*(4), 344–363.

Vermeer, A. (2001). Breadth and depth of vocabulary in relation to L1/L2 acquisition and frequency of input. *Applied Psycholinguistics, 22*, 217–234.

Wilkinson, K.M., & Mazzitelli, K. (2003). The effect of 'missing' information on children's retention of fast mapped labels. *Journal of Child Language, 30*, 47–73.

Zied, M.K., Phillipe, A., Karine, P., et al. (2004). Bilingualism and adult differences in inhibitory mechanisms: Evidence from a bilingual stroop task. *Brain and Cognition, 54*(3), 254–256.

Did You Know?

- According to the 2000 U.S. Census, a language other than English was spoken in approximately 18% of all American households.
- According to the U.S. Census, the Hispanic population in 2007 was 45.5 million, a number expected to grow to 47.7 million by 2010 and 59.7 million in 2020.
- Approximately 7.5 million bilingual children were enrolled in U.S. schools in 2002.
- U.S. Census information on language use and the incidence of bilingualism (based on the 2000 Census) can be found on the U.S. Census Bureau Web site.
- ASHA and the National Institute on Deafness and Other Communication Disorders estimate that 10–15% of the U.S. population has a speech-language or hearing disorder. These estimates are

higher among persons from socially and economically disadvantaged groups, including recent immigrants.

- 3.5% of ASHA members have reported to be bilingual speech-language pathologists or audiologists (ASHA, 2009).
- Professionals can exchange questions and ideas about bilingualism on the 2 Languages 2 Worlds blog.
- Bilingual families can connect through support groups such as Bilingual Families Connect and Multilingual Family in the UK Web site.
- A map of languages spoken across the U.S. can be found on the Modern Language Association Web site.
- The World Atlas of Language Structures shows language profiles and maps of where these languages are spoken.
- Information about the National Association for Bilingual Education (NABE) can be found on the NABE Web site.
- The Systematic Analysis of Language Transcript software (SALT), a widely used tool among SLPs, has a Spanish-English bilingual version.

Find Out More

- Reading Comprehension, Bilingualism, and Instructional Strategies
- Second Language Acquisition: Success Factors in Sequential Bilingualism
- A Review of the Effects of Bilingualism on Speech Recognition Performance