



CHAPTER 7

LIFE WITH MORE THAN ONE LANGUAGE

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SUMMARY AND THEORETICAL IMPLICATIONS

In some parts of the world, such as the United States, there is the misperception that knowing only one language, or monolingualism, is the norm. In fact, it is common to know more than one language. Approximately half of the world's population use more than one language in their daily life. Even in the United States, 55% of those surveyed for the 2000 census reported being proficient in English and using a language other than English at home (U.S. Census Bureau,



▲ **Photo 7.1** A bilingual infant lies between Mom and Dad. Would learning two languages in childhood be appealing to you?

one official language. Many countries, including those in the table, recognize regional languages. The table includes only those languages that have been recognized at the national level. There are many more countries in the world where communities, cities, and provinces are unofficially multilingual. In this chapter, you will learn about how bilingual children differ from **monolingual** children in terms of their language development as well as how they differ in terms of other aspects of their cognitive processing. Regardless of the social or political environment where children are born, they will learn whatever languages are spoken regularly in their environments. This chapter will also review the different ways in which children and adults acquire second and third languages and what is known about how bilinguals store knowledge of multiple languages in memory and access the knowledge during language processing.

2000). In the United States, it is expected that the number of **bilinguals** will continue to rise in the coming decades.

The term *bilingualism* is used to describe cases in which one knows more than one language. The term *multilingualism* is used to describe cases in which one knows more than two languages. In numerous regions of the world, residents must be **trilingual** to be successful, mastering the language of the home, which may be a tribal or regional language, and also mastering official languages of the local and national government. Table 7.1 displays a list of countries with populations over 30 million in which there is more than

Table 7.1 Countries With Populations Over Thirty Million With More Than One Official Language

Country	Population	Official Languages
India	1.2 billion	2 (Hindi and English)
Pakistan	197 million	2 (Urdu and English)
Philippines	94 million	2 (Filipino and English)
Democratic Republic of the Congo	66 million	5 (French and four others)
South Africa	50 million	11 (Afrikaans, English, and nine others)
Spain	46 million	5 (Spanish and four others)
Tanzania	43 million	2 (Swahili and English)
Kenya	39 million	2 (Swahili and English)

Country	Population	Official Languages
Algeria	36 million	2 (Arabic and Berber)
Canada	35 million	2 (English and French)
Morocco	32 million	2 (Arabic and Amazigh)
Uganda	32 million	2 (Swahili and English)
Iraq	32 million	2 (Arabic and Kurdish)
Afghanistan	31 million	2 (Dari and Pashto)
Sudan	31 million	2 (Arabic and English)

Source: Adapted from The World Factbook (2009).

Bilingual Children

How Do Bilingual Children Differ From Monolingual Children?

A common way in which infants become bilingual is that they are born to parents who speak different languages. When both languages are used regularly in the home, the infant is usually able to acquire both languages simultaneously. The term *simultaneous bilingualism* (or simultaneous multilingualism) is used to describe circumstances in which multiple languages are learned from birth. In contrast, when a **second language (L2)** or third language (L3) is learned after a **first language (L1)**, then the term *sequential bilingualism* (or sequential multilingualism) applies.

A long-standing empirical question has been whether bilingual infants experience delays in language development as compared with infants who are learning just one language. Delays for bilingual infants might be expected because they are doing twice the work of the monolingual infant. Often, there is the concern among monolingual family members or family friends that the infant will be confused by being exposed to two languages. Some may have been so concerned about the possibility that a child might be adversely affected by learning two languages that the infant was prevented from being exposed to more than one language. The remainder of this section will review the differences between bilingual and monolingual children in terms of the reaching of language milestones, the development of perceptual abilities, and vocabulary development as well as the research on the extent to which bilingual children inappropriately mix their languages.

Language Milestones

Decades of research on childhood bilingualism indicates that there is no need for concern. Bilingual and monolingual children reach the language development milestones at roughly the same times. Research suggests that the age at which first words are produced (i.e., around 12 months) does not differ for bilingual and monolingual children (Genesee, 2003; Patterson & Pearson, 2004). A study by Petitto and colleagues (2001) compared the

language development of bilingual children raised in a home in which both French and English were used and children raised in a home in which French and a signed language used in Quebec were used. They found that both groups of bilingual children began speaking/signing around the same time as is normally observed for monolingual children (i.e., 12 months). The bilingual children began using two-word utterances around the age observed for monolinguals (i.e., 18 months).

Perceptual Abilities

Between birth and 12 months, bilingual and monolingual children may differ in their ability to distinguish phonemes; however, studies have produced conflicting results on this issue. Research has shown that there are differences in the perceptual abilities of bilingual and monolingual infants. Bosch and Sebastián-Gallés (2003) compared the perceptual abilities of monolingual and bilingual infants. One group of monolingual infants was reared in Spanish-speaking homes. Another group of monolingual infants was reared in homes speaking Catalan, a Romance language that is distinct from Spanish. A third group of bilingual infants was reared in homes in which both Spanish and Catalan were spoken. They tested how well infants perceived a vowel contrast that involved two distinct vowels in Catalan but involved a single phoneme in Spanish. They found that all infants could perceive the vowel contrast at 4 months. Infants reared in homes where Catalan was spoken were able to perceive the contrast when they were retested at 8 and 12 months. They found that monolingual infants reared in Spanish-speaking homes became less and less able to perceive the contrast when they were retested at 8 and 12 months. The bilingual infants showed a U-shaped pattern of performance. Their ability to perceive the contrast declined at 8 months as compared with their original performance, but when tested at 12 months, their performance increased back to the level observed at 4 months. The results suggested that the perceptual development of bilingual and monolingual infants may proceed somewhat differently.

More recent studies have found similar perceptual development for bilingual and monolingual infants (Burns, Yoshida, Hill, & Werker, 2007; Sundara, Polka, & Molnar, 2008). They compared monolingual English, monolingual French, and bilingual (English/French) infants' ability to perceive a consonant contrast (i.e., the French /d/, which differs in terms of place of articulation from the English /d/). The phonemes are not perceived as distinct by either English or French speakers but are perceived as distinct by speakers of other languages. When they tested infants who were between 6 and 8 months old, both the monolingual and bilingual infants were able to distinguish the sounds. When they were retested at 10 to 12 months, the English monolingual infants and the bilingual infants were able to distinguish the sounds, but French monolingual infants could not. The authors pointed out that French-speaking adults do not reliably distinguish the two sounds (Sundara & Polka, 2008).

In a similar study, Burns and colleagues (2007) compared the perceptual abilities of monolingual infants reared in English-speaking homes with those of bilingual infants reared in homes where both English and French were spoken. The contrast involved a pair of consonants that differed in voice-onset time. As you learned in Chapter 3, some consonants vary

only in terms of the duration of silence between the beginning of the sound and when voicing begins (e.g., /p/ and /b/ in English). Both groups of infants distinguished English/French when tested at 6 to 8 months. When retested at 10 to 12 months and also at 14 to 20 months, bilingual infants performed as well as they had when tested at 6 to 8 months, but monolingual infants were able to perceive only the consonant that was a phoneme in English.

Werker, Weikum, and Yoshida (2006) suggested that bilingual infants may vary in terms of whether the two languages spoken in the home are equally dominant or whether one language is used more often or viewed as more important than the other. In their study, they tested infants reared in homes where both French and English were spoken. They tested their ability to perceive sounds found only in French and sounds found only in English. When they tested infants between 14 and 17 months, they found that some of the bilingual infants could discriminate both types of sounds, while other bilingual infants could discriminate just the sounds found in English or could discriminate just the sounds found in French.

Vocabulary Size

Studies focusing on vocabulary size for bilingual and monolingual children have observed differences (Pearson & Fernández, 1994; Pearson, Fernández, & Oller, 1993; Rescorla & Achenbach, 2002). Bilinguals appear to have slightly smaller vocabularies than monolinguals. In an early study, Pearson and colleagues (Pearson & Fernández, 1994; Pearson et al., 1993) compared the vocabulary knowledge of Spanish–English bilingual children with that of monolingual children. They found that the vocabulary knowledge and the occurrence of the word spurts were similar for both groups of children. Rescorla and Achenbach (2002) analyzed data from a national language development survey (Rescorla, 1989) and found that bilingual children had smaller vocabularies than monolingual children. The authors pointed out that the methodology might have contributed to the different results for bilingual and monolingual children, because vocabulary size was reported by parents. The task for parents of bilingual children was likely more complex and more prone to error than for parents of monolingual children.

Critics point out methodological weaknesses of the study, such as a smaller sample size for the bilingual group than the monolingual group (Patterson, 2004). A point that was not made by Rescorla and Achenbach (2002) or Patterson (2004) was that a comparison of a bilingual child's vocabulary in one of that child's languages with a monolingual child's vocabulary may be the wrong comparison. The bilingual child is likely to know two words for each concept, one word from each language. Assessing the bilingual child's vocabulary size in both languages and comparing it with the monolingual child's vocabulary in one language is likely to reveal that the bilingual child knows more words overall—even that child knows fewer words than the monolingual children in L2. However, recent research has found that bilingual school-age children have smaller productive vocabularies when vocabulary in both languages is taken into account (Yan & Nicoladis, 2009). Similar results have been obtained in studies in which the productive vocabularies of children under 3 years of age were compared (Junker & Stockman, 2002; Oller & Eilers, 2002; Pearson et al., 1993, 1995; Petitto & Kovelman, 2003).



▲ **Photo 7.2** Two girls are talking on their way to school; one of the girls is bilingual. Do you know how many children in the United States speak a language other than English at home?

Studies of children's receptive vocabulary development (i.e., ability to comprehend words when spoken to them) have also been conducted with bilingual and monolingual children. Some studies have shown that bilingual children have smaller receptive vocabularies in each of their languages than do monolingual children (Bialystok, Barac, Blaye, & Poulin-Dubois, 2010; Bialystok, Luk, Peets, & Yang, 2010; Mahon & Crutchley, 2006). Other studies have found that bilingual and monolingual children have similar receptive vocabularies (Cromdal, 1999; Yan & Nicoladis, 2009). Recent research suggests that the differences in vocabulary size for bilinguals and monolinguals

is also observed for young adults (Portocarrero, Burright, & Donovanick, 2007); however, other studies have failed to observe differences (Bialystok, Craik, Klein, & Viswanathan, 2004).

When researchers investigated the composition of bilingual children's vocabularies, they found that many words were **translation equivalents** (i.e., words from the bilingual's two languages that mean the same thing, such as *apple* and *manzana*). Genesee and Nicoladis (2007) studied the vocabularies of children between 8 and 30 months reared in homes in which both Spanish and English were used. They found that 30% of the children's vocabulary involved translation equivalents (e.g., *apple*–*manzana*). Petitto and colleagues (2001) observed similar results in a study of children who spoke French and used a signed language. Between 36% and 50% of children's vocabularies were translation equivalents.

There are likely many factors, in addition to whether a child is a bilingual or monolingual, that can influence vocabulary size. Among those are being raised in a low-income home (Hart & Risley, 1995) and speaking a minority language (i.e., not the **dominant language** of a country or region) (August & Shanahan, 2006). A recent study by Vagh, Pan, and Mancilla-Martinez (2009) investigated the vocabularies of children between the ages of 24 and 36 months who were being raised in low-income homes. They relied on both parent and teacher reports of children's vocabulary knowledge. They found that vocabulary size increased more slowly for Spanish–English bilingual children than for monolingual children. Among bilingual children, those for whom English was the dominant language had larger vocabularies than those for whom Spanish was the dominant language.

Differences in bilingual and monolingual children's vocabulary acquisition may be related to their using different strategies in word learning. As you learned in Chapter 3, research has shown that children exhibit the mutual exclusivity principle when learning new words. Children tend to assume that if an object is called something then it is unlikely to be called something else. Bilinguals generally know two words for each object—a word in each language. Houston-Price, Caloghris, and Raviglione (2010) compared how

monolingual and bilingual infants between the ages of 17 and 22 months interacted with novel objects in a task using the preferential looking paradigm. Infants were shown two objects—a novel object and one whose name was familiar. They were then asked to *look at the dax*. The results showed that monolingual infants looked more often at the novel object, demonstrating the mutual exclusivity principle. In contrast, bilingual infants did not. The authors concluded that infants raised with multiple languages do not develop the mutual exclusivity strategy. Older bilingual children appear to use the strategy. In a study with children between the ages of 3 and 6, Davidson, Jergovic, Imami, and Theodos (1997) found that bilingual children relied on the mutual exclusivity principle but to a lesser extent than did monolingual children.

Language Mixing

Another common concern among parents raising bilingual children is that the children will be confused learning two languages at the same time and will mix up the languages. Again, the fear appears to be that initially mixing up the languages and later figuring out that the two languages are separate entities could cause bilingual children to lag behind their monolingual peers in the long term. Meisel (1989) has referred to this possibility as the **fusion hypothesis**. Early in life, the bilingual children's two languages are fused. They do not differentiate their languages early in life but only do so at some point later in childhood. Observations of language mixing have been reported by parents as well as researchers in children between the ages of 2 and 3 (Köppe, 1996). The fear that language mixing may indicate that the child is experiencing a problematic form of language confusion appears to be unfounded. After the age of 3, the amount of language mixing observed in these children's speech decreases dramatically. Only about 2% of bilingual preschoolers produced utterances in which languages were mixed (Lindholm & Padilla, 1978).

Bilingual children's production of sentences containing words from both languages may be not be due to their language systems being fused early in life. Critics of the fusion hypothesis suggest that language mixing could occur because children are not pragmatically competent (De Houwer, 2005; Genesee, 1989; Köppe, 1996). They may not yet understand that the language used in an utterance must be tailored to the language(s) known by listener(s). Another possibility is that children are purposely mixing the words of their languages together as a form of play or linguistic creativity. As we learned in Chapter 3, children create idiosyncratic words or idiomorphs when learning new words. It is possible that they enjoy playing with sentences as well, creating novel combinations of words. Some children spontaneously create their own language games (Cumming, 2007). For example, every so often, my 3-year-old grandson Griffin finds it very amusing to produce a long string of nonsense syllables. His father told the group that he had been doing that for a while, and when someone asks him if that is his own language, he laughs and says, "Yes. Griffin's language!"

Code-Switching

The view that language mixing by bilingual children may reflect pragmatic development is supported by the observation that language mixing occurs in the speech of adult bilinguals.

As you learned in Chapter 4, adult bilinguals often will produce utterances containing words from both of the languages that they know when speaking with other bilinguals. This form of language use has been called **code-switching**. Poplack (1980) titled her article about code-switching with an example of code-switching: “Sometimes I’ll start a sentence in Spanish y termino en Espanol.” Examples of code-switching by a Spanish–English bilingual from Poplack (1980) are displayed in 1. The view of Poplack (1980) and other language researchers is that code-switching is not a form of unusual or deviant language behavior; rather, it is part of the normal language repertoire of a bilingual (Gumperz, 1971, 1976).

1. a. Me iban a lay off. They were going to lay me off.
- b. Leo un magazine. I read a magazine.

There are likely to be many reasons that adult bilinguals engage in code-switching. Heredia and Altarriba (2001) suggested that code-switching may occur when the speaker lacks proficiency in one language. When speaking in L2, bilinguals may find that they do not know or cannot remember at that moment the particular L2 word needed. An L1 word can be substituted. Heredia and Altarriba (2001) pointed out that some code-switching may be the result of word-finding difficulty. Monolingual and bilingual speakers alike sometimes experience difficulty coming up with a known word. These occurrences have been called tip-of-the-tongue states, or TOT states (James & Burke, 2000). The bilingual speaker may experience a TOT state in one language but be able to retrieve from memory the word in the other language.

Analyses of sentences containing code-switching have shown that speakers appear sensitive to syntactic structure when planning code-switched utterances. For example, speakers do not produce multimorphemic words in which some morphemes are in one language and the other morphemes are in another language. Poplack (1981) referred to this as the **free morpheme constraint**. The view that code-switching adheres to structural principles known to the speakers is supported by research showing that bilinguals show agreement about which code-switched sentences are grammatically acceptable and which are grammatically unacceptable (Aguirre, 1980; Gingras, 1974; Gumperz, 1976; Timm, 1975). For example, in Spanish, adjectives are placed after the nouns that they modify (e.g., *quiero un tomate verde*, which means I want a green tomato). Lederberg and Morales (1985) pointed out that the grammaticality of code-switched Spanish–English sentences containing adjectives depends on the rules of the language of the adjective. If the adjective appears in English, it is only grammatical when it precedes the noun as in 2a versus 2b. If the adjective appears in Spanish, it is only grammatical when it follows the noun, as in 2c versus 2d. (The asterisks indicate that the sentences are ungrammatical.)

2. a. Quiero un green tomate.
- *b. Quiero un tomate green.
- c. I want a tomato verde.
- *d. I want a verde tomato.

Code-switching is also more likely to be used in some situations than in others (Gumperz, 1976). Some of the factors that may be related to the frequency of code-switching include the topic being discussed, the social status of the individuals taking part in the conversation, the language proficiencies of those individuals, where the conversation is occurring (i.e., home, work, school, church), and the level of emotion involved in the conversation. There appears to be a particularly strong relationship between the emotionality of the topic being discussed and the likelihood that code-switching will be used.

Research has shown that when talking about stressful or traumatic past experiences, bilinguals tend to prefer to use their L2 rather than their L1. Since the 1980s, therapists working with bilingual clients have reported that bilinguals often show a preference of discussing embarrassing or upsetting topics in their L2 (Bond & Lai, 1986). Santiago-Rivera and Altarriba (2002) proposed that bilinguals use the L2 to discuss emotionally charged information because it serves to distance them from the upsetting content. Their explanation for this phenomenon is that bilinguals “represent emotional words differently in their two languages and typically associate these words with a broader range of emotions in their first language” (Santiago-Rivera & Altarriba, 2002, p. 33). They also suggested that memories for emotional events contain information about which language was used at the time of the event. When bilinguals recount memories, the language that was being used in the episode may have a privileged role in remembering and talking about the event (e.g., Javier, 1996; Rubin, Schrauf, Gulgoz, & Naka, 2007). In a recent study, Santiago-Rivera, Altarriba, Poll, Gonzalez-Miller, & Cargun (2009) interviewed nine bilingual therapists about the situations that led them to use L1 or L2 in sessions with clients and situations that led clients to use L1 or L2. They found that when clients wanted to discuss an emotionally charged topic (e.g., one involving anger), they usually used L1. At times in which they appeared to want to distance themselves from the event, they would switch to L2. In contrast, therapists reported switching from L1 to L2 as a strategy to redirect the conversation with the client. One therapist was quoted as saying, “I may challenge some beliefs, and if I feel I am not being successful in one language, I try to present it in another language” (Santiago-Rivera et al., 2009, p. 439).

The relationship between the language mixing produced by bilingual children and the code-switching behavior produced by adults is not well understood. Future research is needed to determine whether children’s utterances containing language mixing appear to show the same syntactic characteristics as adult utterances involving code-switching. Furthermore, language development researchers would be interested in knowing whether the amount of language mixing observed in bilingual children is related to the amount of adult code-switching that children hear in their environments. As we learned in Chapter 1, theories of language development differ with regard to the role that language experience plays in children’s acquisition, particularly in the acquisition of morphological and syntactic structures. The study of children’s language mixing (or code-switching) appears to be well suited for the testing of these theories.

There are situations in which an entire community may participate in language mixing, and, over time, the language mixing leads to the formation of a new language. Text Box 7.1 describes how this can happen when a pidgin leads to the formation of a creole.

Text Box 7.1 Diversity of Human Languages: Pidgins and Creoles

When speakers of different languages and cultures work and live together on a daily basis, they often devise ways of communicating, using a small number of words drawn from one or more of the represented languages. Over time, the speakers come to understand one another. The term *lingua franca* is used to refer to communication systems that develop to enable speakers of different languages to communicate. In some cases, a *lingua franca* may become a pidgin, when individuals who speak different languages work together over long periods. Around the world, pidgins have developed in busy seaports, where there is an abundance of international trade (Todd, 1990). For example, in the early 20th century, Hawaii was home to immigrants from Japan, Korea, and the Philippines who worked on sugar cane plantations for English-speaking landowners. Out of this unique situation developed Hawaiian Creole English (Bickerton, 1981, 1984). The communicative power of a pidgin is in its vocabulary rather than its grammar. Most pidgins have a highly simplified grammar and most lack complex clause structures. However, an interesting thing happens when children are exposed to a pidgin and acquire it as their L1; the language that the children end up speaking is grammatically more complex. The word *creole* is used to refer to a language that was once a pidgin but has subsequently become a native language for the next generation. Bickerton (1983) pointed out that creoles are grammatically more similar to one another, despite being located in distant parts of the world, than they are to the languages from which the pidgin predecessor languages were derived. He identified 12 characteristics that creoles around the world share, including an SVO word order, the verb-tense system, and the formation of questions and negative sentences. Bickerton proposed the grammars of creoles are similar because children who learn pidgins use aspects of innate universal grammar (UG) as they learn pidgins. In his language bioprogram hypothesis, he claimed that using their innate knowledge, children who acquire a pidgin as an L1 can add in grammar where it is missing. An alternative view to explain why creoles are so syntactically similar is that some of the grammatical consistencies observed in creoles may be due to similarities found in the languages that make up the pidgins. Most creoles in the world have come from pidgins that have at least one language from the Indo-European language family. Here are examples from pidgin and Hawaiian Creole English from Bickerton (1991).

Pidgin	Hawaiian Creole English
Now days, ah, house, ah, inside, washi . . .	Those days bin get [there were] . . .
. . . clothes machines get, no? Before time . . . ,	. . . no more washing machine . . . ,
. . . ah, no more, see? And then pipe no more . . . ,	. . . no more pipe water like get [there . . .
. . . water pipe no more.	. . . is] inside house nowadays, ah?

Are There Cognitive Benefits When Children Are Bilingual?

Parents and caregivers of bilingual children are likely to be surprised to learn that there is ample evidence that there are concrete, measurable cognitive benefits when a child learns more than one language. The first of the studies suggesting the benefits of childhood bilingualism was reported in 1962 by Peal and Lambert. They showed that 10-year-old French–English bilingual children in Montreal performed better on verbal and nonverbal tasks than 10-year-old monolinguals from the same school. The authors concluded that the bilingual children were cognitively more flexible than monolingual children. Ricciardelli (1992) reported similar results in a study with a group of Italian–English bilingual children. Bilingual children who were proficient in both languages outperformed monolingual children on tests of creativity.

In a study with Hebrew–English bilingual children, Ben-Zeev (1977) found that they performed better than monolingual English-speaking children and monolingual Hebrew-speaking children on two cognitive tasks. The three groups of children were between the ages of 5 and 8. One task required children to study a display of nine cylinders of varying sizes arranged into three columns and three rows. They were then asked to describe the pattern of the cylinders and transpose it. In a second task, children played a language game with the interviewer. The interviewer told the child that an *airplane* was called a *turtle*. The interviewer then asked the children questions, such as *Can a turtle fly?* and *How does a turtle fly?* The author concluded that bilingual children are better than monolingual children at “seeking out rules and for determining which are required by the circumstances” (Ben-Zeev, 1977, pp. 1017–1018).

Hakuta and Diaz (1985) studied a large group of Spanish–English bilingual children in Puerto Rico. All children were from low socioeconomic backgrounds and were more proficient in Spanish than in English. Children who showed the highest degree of bilingualism performed better than other children on tests of nonverbal intelligence and metalinguistic awareness. The study was conducted longitudinally, enabling the researchers to test children multiple times. They found that those children who became more proficient in English over time also showed increased nonverbal intelligence and metalinguistic awareness.

Attentional Processing

Perhaps, the most convincing evidence of all has been obtained by Bialystok and colleagues (Bialystok, 1999, 2005; Bialystok & Majumder, 1998; Bialystok & Martin, 2004). They compared the attentional processing of 30 Chinese–English bilingual children and 30 monolingual English-speaking children. Children were between 3 and 7 years old. In one task, children were shown an object and a card on which the object’s name was written. Children were then distracted by two toy bunnies. The bunnies caused the card to be moved to a position under a different object. After the distraction and while the card was near the wrong object, children were asked what the card had said. The interviewer then pointed out the fact that the bunnies had disrupted things. The card was moved back to the original object, and children were asked again to report what the card said. In a second task, children were given a set of cards and asked to sort the cards into two piles. They were instructed to sort according to a characteristic displayed on the cards (e.g., color or shape).

When they completed the task, they were asked to sort the cards again using a different characteristic. Both tasks required children to exert attentional control during the tasks.

Carlson and Meltzoff (2008) found that bilingual children's advantage in attentional processing over monolingual children occurs in tasks in which there are conflicting attentional demands but not in tasks in which participants must control impulses—as when a response should be given after a short delay. Their study involved 6-year-old English–Spanish bilinguals. The bilingual advantage over monolinguals in attentional processing has been observed with infants as young as 7 months old (Kovács & Mehler, 2009) as well as in adults (Bialystok, Craik, & Luk, 2008; Costa, Hernández, & Sebastián-Gallés, 2008). The bilingual advantage over monolinguals that has been observed in healthy children and adults has also been observed among older adults with dementia. Bialystok, Craik, and Freedman (2007) compared the progression of symptoms in 93 bilinguals and 91 monolinguals. The results showed that bilinguals were diagnosed with dementia an average of 4 years later than monolinguals, suggesting that the bilingualism served as a protective factor.

Language Skills

Bilingual children also appear to be better judges of grammaticality than monolingual children. Galambos and colleagues (Galambos & Goldin-Meadow, 1990; Galambos & Hakuta, 1988) compared the ability to judge and to correct syntactically ungrammatical sentences in a group of Puerto-Rican Spanish–English bilinguals and English-speaking monolinguals. Both groups were from low-income families. Bialystok and colleagues (Bialystok, 1986, 1988; Bialystok & Majumder, 1998) pointed out that grammaticality judgments require the participant to simultaneously consider the structure and the meaning of the sentence. When the two aspects of the sentence are in conflict, as occurs when one is ungrammatical, the participants must resolve the conflict by directing attention to the appropriate aspect of the sentence. Following this reasoning, they view the task of one involving attentional processing. They compared the ability of bilingual and monolingual children between the ages of 5 and 9 to judge sentences that were anomalous in terms of either grammar or meaning. They found that bilingual and monolingual children performed similarly judging grammatically correct sentences with sensible meaning (i.e., they correctly labeled sentences such as *Apples grewed on trees* as ungrammatical); however, bilinguals were better than monolinguals at judging grammatically correct sentences that did not have sensible meaning (i.e., accepting sentences such as *Apples grow on noses* as grammatically correct). The results have been replicated with Italian–English bilinguals (Ricciardelli, 1992) and Swedish–English bilinguals (Cromdal, 1999).

Studies have also found that children who have learned another language show gains in their knowledge of English language structure and vocabulary (Curtain & Dahlberg, 2004; Dumas, 1999). Other studies found that bilingual children performed better than monolingual children in English as well as other subjects, such as social studies and math (Andrade, Kretschmer, & Kretschmer, 1989; Armstrong & Rogers, 1997; Masciantonio, 1977; Kretschmer & Kretschmer, 1989; Rafferty, 1986; Saunders, 1998). Armstrong and Rogers (1997) found benefits in math performance for children after they had studied an L2 for only 90 minutes per week for just one semester.

What Brain Changes Are Associated With Bilingualism?

There has been a great deal of interest among neuroimaging researchers regarding the organization and functioning of the bilingual brain. Several studies have suggested that early learned languages and late learned languages are handled somewhat differently by the brain; later learned languages involve more frontal and more bilateral activation than early learned languages (Dehaene et al., 1997; Hahne & Friederici, 2001; Hernandez, Martinez, & Kohnert, 2000; Kim, Relkin, Lee, & Hirsch, 1997; Marian, Spivey, & Hirsch, 2003; Weber-Fox & Neville, 1999, 2001). Certainly, because this area of research is so new, there are many more questions than there are answers at this point. The excitement comes in knowing that in the coming decades, there are likely to be important discoveries made that have the potential to change the way that we think about and also engage in L2 learning.

So far, multiple research studies have shown that there are brain-related differences related to proficiency. Some studies, but not all, have found brain-related differences related to the age at which the bilingual began using the L2. A study by Wartenburger and colleagues (2003) found that there were differences in bilingual brain organization related to both language proficiency and the age at which one was first exposed to the L2. Chee, Soon, Lee, and Pallier (2004) found brain differences related to language proficiency, which were unrelated to the **age of acquisition**. Kim and colleagues (1997) compared brain activations during language processing for bilinguals who learned their L2 early in childhood or later in life. They had participants use each of their languages while their brain activation was recorded. They found that there was an area of activation in the left inferior frontal gyrus that was observed during the use of each language. For early bilinguals, the areas of activation during use of L1 and L2 overlapped. For late bilinguals, the areas of activation during the use of L1 and L2 did not overlap. For both groups, there was a second region of activation that did overlap during the use of L1 and L2; the region was located in the superior temporal gyrus. Some have questioned these results because language proficiency was not assessed and the participant groups may have differed in ways other than when they learned L2 (Abutalebi, Cappa, & Perani, 2005).

One of the most intriguing studies is that by Mechelli and colleagues (2004) who compared the densities of gray and white matter in the brains of monolingual adults and two groups of bilingual adults. One group of bilinguals had acquired an L2 before the age of 5; the other group had acquired an L2 between the ages of 10 and 15. Both groups of bilinguals reported using their L2 regularly. They found that in the left parietal cortex, the density of the gray matter was greater for bilinguals than for monolinguals. The density of gray matter in this area was greater for bilinguals who had learned the L2 early in childhood versus later in childhood. Last, in correlational analyses, the density of gray matter increased as the participants' reported proficiency increased and increased as the participants' age of acquisition decreased. Past research has shown that the particular area in the left inferior parietal cortex is involved in verbal fluency (Poline, Vandenberghe, Holmes, Friston, & Frackowiak, 1996; Warburton et al., 1996). These results suggest that the differences observed between bilingual and monolingual speakers may one day be related to specific brain-related changes that occur when one begins to learn an L2.



▲ **Photo 7.3** High school students are studying in a typical L2 class. Did you take an L2 in high school?

A number of recent studies have found that specific brain regions are activated when a bilingual switches languages (Hernandez et al., 2000; Price et al., 1999; Quaresima, Ferrari, van der Sluijs, Menssen, & Colier, 2002; Rodriguez-Fornells, Rotte, Heinze, Nössel, & Münte, 2002; Rodriguez-Fornells et al., 2005). The regions include the dorsolateral prefrontal cortex, inferior frontal cortex, anterior cingulate, and supramarginal gyrus. In these studies, bilinguals carried out two language tasks (e.g., a word-reading task and a translation task). The language in which the words were presented was either kept the same or varied so that every other word appeared

in the other language. The results suggest that the differences in attentional processing that have been observed between bilingual and monolingual children may also be related to specific brain-related changes that occur when one begins to learn an L2.

Learning Second Languages

What Teaching Methods Are Used in Language Classes?

There are multiple ways for one to become bilingual. For many, learning an L2 involves some classroom instruction. Over the last 150 years, numerous methods of L2 teaching have been developed (Krause, 1916; Richards & Rodgers, 2001). Some methods have become brand names, sold to those who would like to learn a language at home (e.g., Berlitz and Rosetta Stone). Methods typically differ in the extent to which the L1 is used during L2 instruction and the extent to which grammar is explicitly taught. The **grammar-translation method** (also called the traditional method) utilizes the L1 and also explicitly teaches students the grammatical rules of L2. At the other extreme, there is the **direct method**, which involves students learning the L2 without the use of the L1. The grammar of L2 is learned inductively, through exposure to L2 sentences.

In most L2 classrooms in the United States, instructors use the grammar-translation method. Lessons are focused on having students memorize grammatical rules and vocabulary. They are also asked to translate from L1 into L2 and vice versa. Exercises involve students' practicing writing or speaking sentences containing verbs in their different tenses (e.g., present tense, past tense, future tense). In languages in which nouns must be marked with suffixes indicating gender and/or number, exercises will focus on students using the appropriate adjective–noun or subject noun–verb agreement.

There are numerous methods that place an emphasis on developing speaking and listening skills but involve varying degrees of grammar instruction. For example, the audio-lingual method (Richards & Rodgers, 1987) emphasizes the use of spoken language but also

includes grammar exercises. It is based on the principles of behaviorism. Students are instructed to avoid errors at all costs. The instructor, who is a native speaker, is viewed as the model to emulate. The communicative approach emphasizes the idea that language is primarily for communication and the expression of meaning. Students are encouraged to use language with others. The long-term goal for students is to achieve communicative competence. The immersion method involves having students use only the L2 to learn the vocabulary, grammar, and pragmatics of the L2. They aim to acquire the language through interactions with speakers of the language. Classes may be taught with complete immersion (i.e., 100% of instruction is conducted in L2) or partial immersion (i.e., 50% of instruction is conducted in L2).

There are few empirical studies comparing the effectiveness of the various teaching methods. The research that has been done has been conducted in Canada, where English–French bilingualism has been a priority since the 1960s and the immersion method became popular. Numerous studies comparing students' performance in classrooms using the direct method versus the immersion method have been conducted in Canada (Baker, 1993). In the 1960s, Canada implemented immersion language programs in schools to address perceived inequities between French and English speakers in Quebec (Genesee, 1987). Programs were classified as early, middle, or late immersion. Early immersion classes began when children were 5 or 6 years old. Middle **immersion programs** began when children were 9 or 10 years old. Late immersion programs began when children were 11 or 12 years old. Studies showed that students in early immersion programs performed less well on literacy skills, such as spelling and punctuation, in L2 compared with students in classrooms in which the L2 is taught using the direct method. Differences diminished over time. The evidence suggests that children can learn an L2 comparably well in either type of classroom. Following the ruling, there have been a number of changes to the law, most of them allowing schools flexibility in meeting the needs of their students.

Do All Countries Have Bilingual Education?

The extent to which L2s are used in educational settings is often determined by the law of the land. In the United States, the Bilingual Education Act was established in 1968 (Stewner-Manzanares, 1988). Originally introduced as a bill by Texas senator Ralph Yarborough, its aim was to fund programs for students entering school without adequate English language skills. The concern in Texas was schools servicing Spanish-speaking students. The Bilingual Education Act of 1968 focused generally on the needs of schools educating bilingual students. Financially, the act was a tremendous help to school districts, as it provided \$7.5 million for programs, teacher training, and curriculum development. Those programs that could demonstrate success were funded for 5 years.

In 1974, the Supreme Court ruling in *Lau v. Nichol* mandated **bilingual education**. The case was a class action suit that began because an attorney had heard about a client's son who was performing poorly in school because he could not speak English. The attorney filed the suit against the San Francisco Unified School District, claiming that the Chinese students in the district (approximately 1,800) were not being provided with equal education because of the lack of bilingual education in the school. The case was lost at the lower court level but was taken all the way to the U.S. Supreme Court, where the attorney prevailed.

Canada's Official Languages Act became law in 1969 (Office of the Commissioner of Official Language, n.d.). The law established English and French as official languages for government and education and affirmed the equality of the two languages in all venues. It also affirmed the right of the individual to receive services in either English or French. Canada has supported immersion programs for students learning French. Students without prior experience with French usually can begin immersion classes in kindergarten or first grade and complete their secondary education completely in French. The availability of the program depends on the province. Some regions provide French courses starting in the fifth grade. Other regions offer French-immersion from kindergarten through ninth grade. In regions in which French is the dominant language (e.g., Quebec), students may enter similar English immersion programs. The indigenous languages of Canada have also been part of Canada's bilingual education efforts. Programs have been developed for Blackfoot, Cree, Mohawk, Ojibwe, Mi'kmaq, Inuinnaqtun, Inuktitut, and the Pacific Coast Salish languages. The development of bilingual programs for the indigenous languages was particularly important because of historical oppression of indigenous Canada. In the 20th century, many were forced into residential schools in which they were treated poorly and forbidden from using their native language. Similar residential schools were operated in the United States for Native Americans (Child, 2000).

Around the world, children's access to bilingual education varies widely. In Europe, children typically have the opportunity to learn an L2 earlier than children in the United States. For example, in Belgium, there are three official languages: (1) Dutch, (2) German, and (3) French. By law, children have the right to be educated in one of these three languages. The language of instruction varies by geographic region. In the Flanders region, the language of instruction is Dutch. In the Waloonia region, the language of instruction is French. Throughout the country, English is frequently taught and may be required. In Belgium, as in most of Europe, children begin their study of an L2 (i.e., a language different from that in which general instruction is provided) in the elementary school grades (Eurydice, 2005).

How Does First Language Influence Second Language Acquisition?

Regardless of the method used to learn an L2, one can expect to make errors. One may find that characteristics of one's L1 influence how one learns and/or uses one's L2. The term *language transfer* has been used to describe circumstances in which one carries over a language rule or structure from L1 to L2. **Positive language transfer** occurs when the rules in L1 are the same as in L2. Transfer helps the speaker to generate a correct usage in L2. **Negative language transfer** occurs when the rules of L1 are different from those in L2 and typically results in speakers making errors when using L2. The most common form of negative language transfer is speaking with an accent that reflects the phonological rules of the L1. For example, native speakers of Japanese who learn English typically have great difficulty pronouncing the sounds /r/ and /l/, because in Japanese these sounds are not distinct phonemes. Similarly, native speakers of English have great difficulty pronouncing many vowels in French, which are distinct phonemes in French but are not in English.

Language transfer may also be observed in vocabulary. When a bilingual's two languages share vocabulary words, one can benefit from the positive language transfer. Translation equivalents that are similar in pronunciation and in written form are called **cognates**. Some L2 words may appear similar to L1 words in sound and written form but differ in meaning, such as the Spanish word *embarazada*, which means pregnant instead of embarrassed, and the Spanish word *balde*, which means bucket. Such words are called false friends or **false cognates**. Another example of how vocabulary can be involved in language transfer comes from an interaction with a friend of mine whose L1 was not English. He once walked up to me holding his arm. He had clearly injured it somehow. Before I could ask him, "What's happened to your arm?" he said, "I hurt my hand." I was very confused. "Hand?" I asked. "Don't you mean your arm?" He paused and then realized his error. "In my language, the word for arm and hand is the same word. I make that mistake a lot." He once also said, "Something's wrong with my finger," while he was holding his thumb. On that occasion, I was able to infer that in his native language, the word for thumb is the same word as for the other fingers.

The use of pronouns can often be influenced by language transfer. If one's L1 uses the same word to refer to *he* and *she* but one's L2 has different words to refer to *he* and *she*, one may find that one comes to rely on one of the L2 words for both pronouns. In Finnish, the word *hän* is used to refer to males and females. When Finnish native speakers learn English, they sometimes may use the pronoun *he* in English to refer to female antecedents, as in **I met Mary; he is nice* (the asterisk indicates that the sentence is ungrammatical). In Chinese, the pronouns for *he* and *she* are pronounced the same but spelled differently. For native speakers of Chinese acquiring English (or other languages in which there are different words for *he* and *she*), pronoun errors in L2 tend to occur.

Language transfer may also be observed in the syntactic and morphological rules that speakers apply. Native speakers of English frequently transfer the word order of English when producing German clauses. An example of an English sentence containing two clauses is provided in 3a. An example of a grammatically correct German sentence is provided in 3b. In 3b, the adverb *heute*, which means *today*, is ordered before the verb in German, because in German, the main verb usually appears in clause-final position. The relative clause in 3c is the grammatically incorrect German form sometimes produced by English native speakers (the asterisk indicates that the sentence is ungrammatical). The positioning of the adverb in the relative clause follows the verb rather than preceding it.

- | | | |
|-------|----------------------------------|------------------|
| 3. a. | I know when she arrives today. | English |
| b. | Ich weiß, wann er heute ankommt. | Correct German |
| *c. | Ich weiß, wann er ankommt heute. | Incorrect German |

L2 learners may also transfer morphological rules from L1 to L2. For example, in English, one forms a comparative adjective by adding *-er* if the adjective is one syllable or ends in *-y*, as in *taller* and *happier*. For longer words, the word *more* is placed in front of the adjective, as in *more important* and *more intelligent*. Superlative adjectives in English are formed similarly, by adding *-est* to an adjective or preceding the adjective by the word

most, as in *tallest*, *happiest*, *most important*, and *most intelligent*. Some languages, such as Spanish, form comparative and superlative adjectives using one rule. The word *mas* is placed before an adjective to form the comparative and the words *le mas* (or *la mas*) are placed before the adjective to form the superlative. When Spanish native speakers learn English, they often overuse the words *more* and *most* when forming comparative and superlative adjectives in English. In recent research, Kennison and Bowers (2011) found that the overuse of *more* and *most* in comparative and superlative adjectives in English by Spanish native speakers was negatively correlated with how long participants had resided in the United States, suggesting that exposure to the L2 in everyday life was related to fewer errors in L2 resulting from language transfer.

The prior research on language transfer explains why language learners face greater difficulty in mastering an L2 when the rules of the language differ a great deal from the rule of their native language. Conversely, L2 acquisition may be easier when one's L1 and L2 share many of the same grammatical distinctions and rules. For example, learning Italian when one's L1 is Spanish may be easier than learning Chinese when one's L1 is Spanish. As you learned in Chapter 1, languages belonging to the same language family are more similar in grammatical rules than languages belonging to different language families.

While many students in the United States struggle to learn an L2 in high school and/or in college, there are some individuals who appear to have a knack for languages. Those who have mastered three, four, or five languages usually are regarded as being particularly gifted in learning languages. The term *polyglot* is used to refer to individuals who speak many languages. They are able to learn multiple languages rapidly and with apparent ease. It is difficult to estimate the percentage of the population who possess above average language-learning abilities. Text Box 7.2 describes a particularly prolific polyglot: the German Emil Krebs.

Life With Two or More Languages

Those who use more than one language in daily life may be described as **balanced bilinguals**, which means that they are equally proficient in both of their languages. Most often, bilinguals report having a dominant language or a language that they feel most proficient in and use more often. The dominant language is not always L1. Some individuals may reach a high level of proficiency in two languages and end up living in a setting in which L2 is used predominantly. For example, someone raised in Canada becomes proficient in both English and French. After college, the person gets a job in France and works there for several decades, using mostly French in daily life. English is used only to speak to family or friends, which occurs only several times a month.

What Factors Predict Proficiency?

Bilinguals certainly differ from one another in terms of proficiency. Some bilinguals become proficient in speaking, reading, listening, and writing L2; however, others may not master all aspects of L2 usage. In research with bilinguals, researchers mostly rely on

Text Box 7.2 Extraordinary Individuals: Emil Krebs: An Extraordinary Polyglot

Emil Krebs (1867–1930) was born in Germany, the son of a carpenter. By the end of his life, he had become proficient in speaking and writing 60 languages (Matzat, 2000). He had studied 120 others. He is aptly described as a polyglot, which is a term used to refer to someone who knows many languages. In one written account, Krebs was described as learning languages rapidly. For example, when he studied Armenian, he mastered it in about 9 weeks (von Hentig, 1962). He spent 2 weeks learning the grammar. He studied Old Armenian for 3 weeks and focused on the spoken version of the language for the remaining 4 weeks. Between the ages of 13 and 17, he attended gymnasium (roughly equivalent to a college preparatory high school) and studied Latin, Hebrew, French, and classical Greek. By the time he completed his gymnasium studies in 1887, he spoke 12 languages, including Modern Greek, English, Italian, Spanish, Russian, Polish, Arabic, and Turkish. In that year, he entered the Berlin School of Law, where he continued studying languages. In 1890, he passed a translator's exam for Chinese. In 1913, he went to China, where he worked as a translator for the government until 1917, when diplomatic relations between Germany and China dissolved. One can find Krebs's personal library of approximately 3,500 books and his writings in over 120 languages at the National Archives in Washington, D.C. Among the other languages that he knew were Egyptian, Ainu, Albanian, Armenian, Burmese, Georgian, Hebrew, Japanese, Javanese, Korean, Manchurian, Mongolian, Nivkh, Persian, Sanskrit, Syrian, Tibetan, and Urdu. In his life, he achieved notoriety for his success with languages. As a result, following his death, his brain became part of the collection of the C. and O. Vogt Institute for Brain Research at the Heinrich Heine University in Düsseldorf. In a recent research study, Krebs's brain was compared with 11 others obtained from individuals without exceptional abilities (Amunts, Schleicher, & Zilles, 2004). The researchers found that Krebs's brain was architecturally different from the others in the areas of the left hemisphere associated with language processing.



▲ **Photo 7.4** Emil Krebs lived between 1867 and 1930 and is known for being an amazing polyglot. Which language would you start learning today if you were assured that you could master it?

self-report measures of proficiency (Marian, Blumenfeld, & Kaushanskaya, 2007). Studies have found that self-reported measures of proficiency are significantly correlated with bilinguals' performance on standardized language tests. For example, in a study of Spanish–English bilinguals, Delgado, Guerrero, Goggin, and Ellis (1999) found that proficiency was significantly correlated with participants' scores on the Woodcock–Muñoz Language Survey (Woodcock & Muñoz-Sandoval, 1993). Correlations were stronger for L1 than L2. Proficiency in L2 speaking and understanding were not correlated with performance on the language survey. Other studies have investigated the relationship between self-reported proficiency and performance on language processing tasks. Bahrick, Hall, Goggin, Bahrick, and Berger (1994) observed stronger correlations between proficiency and vocabulary tasks than between proficiency and oral comprehension tasks.

Numerous studies have investigated factors that are related to L2 proficiency. One of the strongest predictors is age of acquisition (Flege, MacKay, & Piske, 2002; Hyltenstam & Abrahamsson, 2003; Johnson & Newport, 1989). As you learned in Chapter 1, since the 1960s, language researchers have recognized that childhood is the prime time for learning language (Lenneberg, 1964, 1967). If language is learned after puberty, proficiency may not be achieved. For bilinguals, those learning L2 early in life are likely to attain a higher level of proficiency than those who begin learning L2 later in life (Johnson & Newport, 1989; Kovelman, Baker, & Petitto, 2008).

Other studies have considered the length of time that L2 speakers have lived in the geographic region where their L2 is used predominantly (Birdsong, 2005; Espenshade & Fu, 1997; Flege, Yeni-Komshian, & Liu, 1999; Genesee, 1985; Stevens, 1999). For example, Flege and colleagues (1999) investigated the relationship between how long bilinguals had resided in the United States and their performance on grammatical tasks in English. They found that performance was better for those who had been in the United States for the longest period of time. For children who begin learning an L2 in school because the L2 is the language of instruction, research suggests that most are able to become proficient in the language in 5 years (Hakuta, Butler, & Witt, 2000). Conger (2009) conducted a longitudinal study of schoolchildren in New York City for whom English was an L2. He found that by the end of the first year of school, between a quarter and a third of students had become proficient in English. After 3 years, half of the students had become proficient. The results showed that children who entered school at younger ages reached proficiency faster than children who had entered school at older ages. Proficiency was influenced by demographic variables, such as sex, socioeconomic status (SES), and ethnicity.

Research by Hakuta, Bialystok, and Wiley (2003) suggests that aging may be a factor in L2 proficiency. In their study, they used 1990 census data in the United States to investigate the factors that were related to respondents' self-reported L2 ability. The census data contained responses from 2.3 million immigrants who spoke English as an L2 and Spanish or Chinese as an L1. The results showed that several factors were related to respondents' proficiency, including age of immigration, socioeconomic level, and amount of formal education. They found that in both groups of speakers (i.e., L1 speakers of Spanish and L1 speakers of Chinese), as the years since their immigration to the United States increased, proficiency in English declined. Stevens (2004) suggested that different results might be observed using different sampling techniques and statistical procedures. Wiley, Bialystok,

and Hakuta (2005) reported the results of additional analyses, following the recommendations of Stevens (2004). They observed results similar to those reported by Hakuta et al. (2003). They concluded that the most plausible explanation for the steady decline in L2 proficiency was aging, but other factors may also play a role (e.g., amount and quality of daily experience with the language).

Over the past three decades, an impressive amount of research has investigated language processing in bilingual individuals. In the past decade, researchers have begun to report studies in which processing differences for bilinguals and monolinguals have been observed. For example, in picture-naming tasks, research has shown that bilinguals are generally slower than monolinguals, even when bilinguals named pictures using their L1 (Ivanova & Costa, 2008). Roberts, Garcia, Desrochers, and Hernandez (2002) found that bilinguals made more errors in picture-naming than did monolinguals. Rosselli and colleagues (2000) found that on tasks of fluency in which one must produce as many words as possible within a minute that belong to a specific semantic category (e.g., fruits or animals) or begin with a particular letter (i.e., *s*, *a*, or *f*), Spanish–English bilinguals did not perform as well as monolinguals who were the same age. Rogers, Lister, Febo, Besing, and Abrams (2006) observed that bilinguals’ ability to perceive words embedded in white noise was poorer than monolinguals’. Bilinguals also experience TOT states more often than monolinguals (Gollan & Acenas, 2004; Gollan & Silverberg, 2001).

A topic that has received relatively little attention is how bilinguals use both languages in school and work. Sometimes, one may acquire information in one language but have to use that information in an L2. There is preliminary research suggesting that the knowledge that can be gained in one situation and applied in another is not dependent on the language that is used to gain the information. This research is described in Text Box 7.3.

How Are Multiple Languages Stored in Memory?

Among researchers interested in bilingualism, there is still a debate regarding whether the languages that a bilingual knows are stored in memory in a single, shared memory system (Francis, 1999; Klein, Milner, Zatorre, Zhao, & Nikelski, 1999) or whether there are separate memory systems, one for each language (Dehaene et al., 1997; Durgunoğlu & Roediger, 1987).

Numerous studies involving adult bilinguals have revealed how the knowledge about words from multiple languages is organized in memory. Of particular interest is whether words in the language being used are selectively accessed or whether all the words that the bilingual knows are activated, regardless of the language being used. Numerous studies have shown that there are differences in how quickly bilinguals can retrieve L2 and L1 words during language processing tasks. Some studies have observed differences using the bilingual-translation task. Bilinguals view a series of words in one language and are instructed to pronounce translation equivalents as rapidly as possible. Kroll and Stewart (1994) have observed that participants can translate an L2 word into L1 faster than they can translate an L1 word into L2. They proposed that memory links between L2 and L1 words are stronger than links between L1 and L2 words because of the processes involved in L2 learning. One more frequently associates an L2 word with an L1 word than vice versa.

Text Box 7.3 Research Discovery: Bilingual Problem Solving

In everyday life, bilinguals often acquire knowledge from one language, either via reading or listening, and then apply the knowledge to a task in which another language is used (García, 2008). Very little is known about how knowledge transfer of this type occurs. Researchers have begun to investigate knowledge transfer by bilinguals in studies involving problem solving in which there is the opportunity for participants to apply a previously encountered solution to a subsequent problem. The research utilizes the analogical transfer paradigm (Gick & Holyoak, 1980, 1983; Holyoak & Koh, 1987; Holyoak & Thagard, 1989; Spellman & Holyoak, 1992). When participants successfully apply a solution to a subsequent problem, they are viewed as having drawn an analogy between the two problems and having transferred solution of the first problem to the subsequent problem. Thus far, there have been only three bilingual studies using the analogical transfer paradigm (Bernardo, 1998; Francis, 1999; Fukumine & Kennison, 2011). The results of these studies indicate that bilinguals can acquire knowledge from a source problem in one language and transfer it to solve a problem in another language.

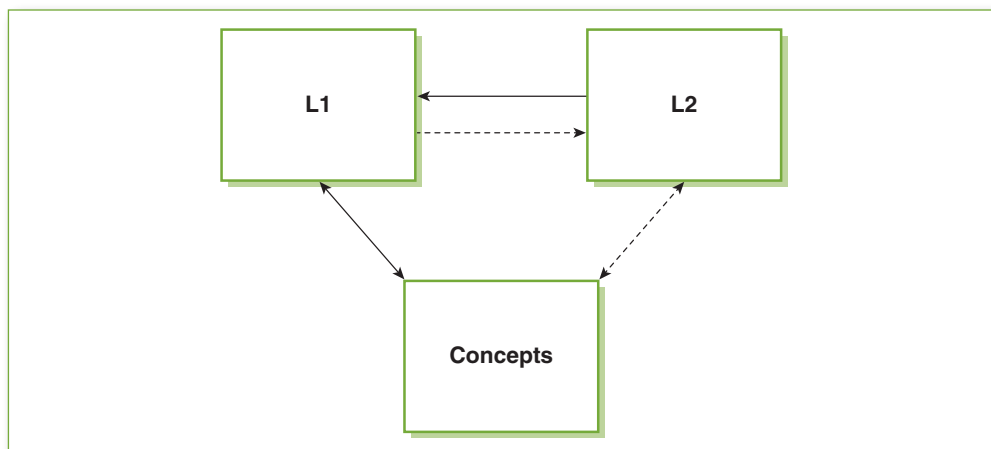
In a large study, Francis (1999) investigated how Spanish–English bilinguals solved problems that were written either in the same language or in different languages. She tested four groups of participants. For two groups, the source problem and the target problem were in the same language, either L1 or L2. For the other two groups, the source problem and the target problem were in different languages. One group received the source problem in L1, and the target problem in L2. The other group received the source problem in L2 and the target problem in L1. The results showed that analogical transfer occurred comparably often when the problems were presented in the same language as when they were presented in different languages. Across conditions, analogical transfer occurred most of the time (i.e., over 70%). The most surprising result in the study was that participants' language proficiencies were not strongly related to problem-solving performance. Consequently, Francis concluded that the knowledge that is transferred during problem solving across languages is stored in memory in a manner that is language-free or language-neutral.

Francis's (1999) results and those similar to them (Fukumine & Kennison, 2011) suggest that in settings in which bilinguals are asked to acquire knowledge rapidly, there is no reason to limit them to materials in one language. Educators and policymakers are likely to believe that using materials prepared in different languages might create barriers to learning. The research suggests the opposite. Once a bilingual acquires knowledge from a text or speech, it appears to be stored in memory in a representation that is not linked to any language. When the goal is acquiring knowledge, bilinguals' performance is likely to be facilitated by allowing them to access any useful materials, regardless of the language in which they are prepared.

Kroll and colleagues (Kroll & Stewart, 1994; Kroll, Van Hell, Tokowicz, & Green, 2010) proposed the revised hierarchical model to describe the organization of bilinguals' memory for L1 and L2 words. Figure 7.1 displays the model, showing that conceptual representations are connected to representations for L1 words and to representations for L2 words. The representations for L1 words are connected to the representations for L2 words and vice versa. The lines that connect the boxes indicate these connections. The darker the line in the figure, the stronger the link is believed to be. Research by Bowers and Kennison (2011) compared bilingual translation for words learned early in childhood and words learned after the age of 8. They found translation from L2 to L1 was faster than L1 to L2 only for L1 words that were learned early in childhood—perhaps because memory links are stronger for words learned early in childhood than for words learned later in childhood.

Critics of the revised hierarchical model (Brysbaert & Duyck, 2010) believe that the Bilingual Interactive Activation Plus (BIA+) model (Dijkstra & Van Heuven, 2002) emphasizes the interconnectedness of the bilinguals' language knowledge, particularly when recognizing words. Numerous studies have shown that when bilinguals recognize words, they retrieve and use information about the words from both of their languages (Lam & Dijkstra, 2010). For example, studies have observed evidence that Dutch–English bilinguals who view the letters *work* briefly activate not only similar English words (e.g., *word* and *cork*): they also activate similar Dutch words (e.g., *werk*, *wolk*, and *worp*). The studies require participants to hit a key on a keyboard as quickly as possible when deciding whether a group of letters (e.g., *work*) is an actual word or is a nonword (e.g., *wark*). Research with monolinguals has shown that the time that participants take is related to the number of words that the person knows that look similar to the target

Figure 7.1 Kroll and Stewart's revised hierarchical model proposes that bilingual memory involves separate representations for L1 and L2 words. Both types of representations can activate the meaning or conceptual representation. The solid arrows indicate stronger memory links than the dotted arrows



Source: Kroll and Stewart (1994).

Table 7.2 Examples of Translation Equivalents (Noncognates), Cognates, and False Cognates for German and English

	German Word	English Translation
Noncognates	Zorn	Anger
	Brust	Chest
	Hund	Dog
	Saft	Juice
	Leute	People
	Frage	Question
Cognates	Tiger	Tiger
	Steak	Steak
	Garten	Garden
	Freund	Friend
	Gitarre	Guitar
	Papier	Paper
False Cognates	Gang	Hallway
	Mantel	Coat
	Tag	Day
	Kind	Child
	Bad	Bath
	Teller	Plate

Source: Friel and Kennison (2001).

Research by Lotto and de Groot (1998) found that in an L2 learning task, participants learned cognates faster than noncognates. A second type of word that has been particularly useful to researchers has been called false cognates or false friends. Beauvillain and Grainger (1987) showed that when bilinguals process a false cognate, they retrieve multiple meanings for the word from L1 and L2. For example, when French–English bilinguals view *coin*, they activate both the translation equivalent in English *corner* and the English word *coin*, which is related to money. In order to better understand how words from different languages can be similar in sound and meaning, refer to Table 7.2, which displays samples of translation equivalents (noncognates), cognates, and false cognates for German and English.

Can One Forget One’s First Language?

Among middle-aged and older bilinguals, there are some who may feel that they are not entirely proficient in any language. They may have acquired English and worked in an

word. When the target word is similar to many other known words of the same length, participants respond more quickly than when the target word is not similar to other known words of the same length (Andrews, 1989; Grainger, O’Regan, Jacobs, & Segui, 1989; Grainger & Segui, 1990). In studies with bilinguals, participants generally respond more quickly when a target word is similar to a word in the other language than when it is not.

The jury is still out regarding which of the two theories of bilingual memory best describes bilingual language processing. Proponents of both theories have found that there are some types of words that are particularly useful in testing the models. The types of words vary in terms of how similar they are to L1 and L2 words in terms of sound and memory. Most L2–L1 translation equivalents are completely dissimilar in terms of pronunciation and written form, as in the English word *apple* and the Spanish equivalent *manzana*. In contrast, some L2 and L1 translation equivalents are highly similar, as in the English word *map* and the Spanish equivalent *mapa*. Such cases are referred to as cognates. Bilinguals—particularly less proficient bilinguals—have been found to translate cognates more quickly than noncognates (de Groot, 1992).

English-speaking environment for many years. As a result, they may have grown unaccustomed to speaking their native language if it is not used daily in their home. Without the opportunity to speak the native language regularly, one may become rusty at speaking the native language. One example of this was reported by Isurin (2000); a native speaker of Russian was adopted by English-speaking parents at the age of 9. After that point, the child did not speak Russian. After 1 year, the child's vocabulary knowledge decreased by 20%. It is common for children who are adopted before the age of 9 and do not use their native language in their new homes to have little or no memory of their L1 (e.g., Pallier et al., 2003).

Several studies have found that bilinguals can experience some loss of their L1 over time (de Bot, 1999; Levy, McVeigh, Marful, & Anderson, 2007; Linck, Kroll, & Sunderman, 2009; Seliger & Vago, 1991). Linck and colleagues (2009) investigated the language performance of Spanish–English bilinguals in Spain. One group of bilinguals was learning Spanish in an immersion experience. The other group of bilinguals was learning Spanish in a classroom setting. Participants' comprehension and production abilities were measured in L2. Those participants learning L2 through immersion outperformed those learning in a classroom. The results also showed that L1 performance was worse for participants learning through immersion than for those learning in a classroom. The authors concluded that the learning of L2 inhibited L1.

A recent study by Levy and colleagues (2007) reached similar conclusions in a study with Spanish–English bilinguals. They utilized a procedure known as retrieval-induced forgetting (RIF) (Anderson, Bjork, & Bjork, 1994). In the typical RIF experiment, participants were instructed to study category-exemplar pairs (e.g., fruits-apple, fruits-pear, drinks-whiskey). After the pairs were learned, they were then instructed to practice remembering half of the items (i.e., every other pair of items in the previous list). Last, they were instructed to recall all of the words in the word pairs. Before performing the RIF task, they were asked to name pictures either in Spanish (L2) or in English (L1). The number of picture-naming trials was varied. The results showed that performance in the memory task in English was worse when participants had previously named pictures in Spanish. Participants who struggled the most with Spanish pronunciation showed the most interference in English on the memory task. Their third experiment showed that the sounds of L2 words, rather than the meaning of the L2 words, interfered with L1 words.

Summary and Theoretical Implications

Children who are reared in homes in which multiple languages are spoken develop language along the same time frame as children who are reared in homes in which only one language is spoken. Research shows that the perceptual abilities of bilingual and monolingual infants may differ early in childhood; however, it is unclear whether these differences impact later language development. Some studies have shown that bilingual children may have smaller vocabularies than monolingual children. Related research shows that other factors influence vocabulary size, such as sex, SES, and whether the L2 is a culturally dominant or minority language. An increasing number of studies have shown that bilingual children outperform monolingual children in tasks requiring attentional processing.

There are many methods that have been developed to teach L2s. Few studies have compared how well learners fare using the different methods. When languages share vocabulary

and grammatical rules, learning is easier than when languages do not share vocabulary and grammatical rules. Researchers debate about the extent to which the words in bilinguals' two languages are stored together or separate in memory. In language processing studies involving adult bilinguals, they tend to be slower and more error prone than monolinguals. Language studies have shown that the L1 is vulnerable to interference from the L2.

The four theoretical approaches to language development each have potential to account for some aspects of L2 acquisition and bilingualism. The behaviorist approach predicts that learning an L2 would be facilitated through the mechanisms of classical and operant conditioning. The social-interactionist approach predicts that learning an L2 would be facilitated when the learning occurs in a supportive social environment, which is characteristic of a total immersion language learning environment. The statistical learning approach is likely to have compelling explanations for language transfer effects. Last, because of the generative approach's claim that aspects of language learning are innate, the approach is compatible with the evidence that there is a critical period for language acquisition. With the current state of knowledge on the topic of L2 acquisition, we are not able to judge any view superior to any other. As research continues to be conducted, it may be possible to determine whether any of these approaches can completely account for how L2s are learned and processed.

KEY TERMS

age of acquisition	false cognates	negative language transfer
balanced bilinguals	first language (L1)	polyglot
bilingual education	free morpheme constraint	positive language transfer
bilinguals	fusion hypothesis	second language (L2)
code-switching	grammar-translation method	sequential bilingualism
cognates	immersion programs	simultaneous bilingualism
direct method	language transfer	translation equivalents
dominant language	monolingual	trilingual



REVIEW QUESTIONS

1. What is the difference between simultaneous and sequential bilingualism?
2. In terms of perceptual abilities, how do bilingual and monolingual infants differ?
3. In terms of vocabulary size, how do bilingual and monolingual children differ?
4. What factors are related to vocabulary size in bilingual children?

5. What is code-switching? What evidence is there that code-switching involves grammatical rules?
6. What are the cognitive benefits for children who know more than one language?
7. What evidence is there that attentional processing differs for bilingual and monolingual children?
8. What differences have been observed in brain-imaging studies between bilingual and monolingual brains?
9. What area of the brain has been identified as involved when a bilingual switches from one language to another?
10. What is the evidence that one's L2 interferes with one's L1?
11. What is language transfer? What is the difference between positive language transfer and negative language transfer?
12. How does the performance of adult bilinguals and monolinguals on language processing tasks differ?
13. What are the most common ways in which people learn L2s and L3s? Has research shown that one or more methods are more effective than others?
14. What has research shown about the effectiveness of immersion programs as compared with other programs?
15. How did bilingual education come about in the United States in the 1960s and 1970s?
16. What is a polyglot? How did the brain of one famous polyglot, Emil Krebs, differ from the brains of non-polyglots?
17. What is a cognate? What has research shown about how bilinguals process this type of word?
18. What is a false cognate? What has research shown about how bilinguals process this type of word?
19. What evidence is there that bilinguals activate words from both languages when they are recognizing words?
20. What are the two competing models of bilingual memory? How do they differ?



RECOMMENDED READING

- Altarriba, J., & Heredia, R. R. (2008). *Introduction to bilingualism*. New York: Psychology Press.
- Bialystok, E., & Hakuta, K. (1995). *In other words: The science and psychology of second language acquisition*. New York: Basic Books.
- Gardner-Chloros, P. (2007). *Codeswitching*. Cambridge, UK: Cambridge University Press.
- Grosjean, F. (2010). *Bilingual: Life and reality*. Cambridge, MA: Harvard University Press.
- Hakuta, K. (1997). *The mirror of language: The debate on bilingualism*. New York: Basic Books.
- Kroll, J., & de Groot, A. (2009). *Handbook of bilingualism*. Oxford, UK: Oxford University Press.
- Myers-Scotten, C. (2005). *Multiple voices: An introduction to bilingualism*. New York: John Wiley.



RECOMMENDED FILMS

Jeffcoat, J. (Director). (2006). *Outsourced* [Motion picture]. United States: ShadowCatcher.
 Nava, G. (Director). (2008). *El norte* [Motion picture]. United States: Criterion Collection.
 Pakula, A. (Director). (1982). *Sophie's choice* [Motion picture]. United States: Universal Pictures.
 Schrieber, L. (Director). (2006). *Everything's illuminated* [Motion picture]. United States: Warner Home Video.
 Wang, W. (Director). (1982). *Chan is missing* [Motion picture]. United States: Koch Lorber Films.



SUGGESTIONS FOR CLASS PROJECTS

1. Investigate public opinion about bilingual education. Work alone or in groups to develop a brief questionnaire. Questions may relate to the public's understanding of the federal law that mandates bilingual education, the ways in which local school districts implement bilingual education, and attitudes about the advantages and disadvantages of bilingual education. Determine whether respondents' opinions are changed after they learn about the recent research demonstrating that children who acquire more than one language experience cognitive benefits.

2. Survey your peers in other classes about their views on whether an infant should be raised to be bilingual from birth or whether parents of an infant who speak different languages should pick a single language of the household to use with the infant. The questionnaire can be designed to assess others' opinions about which approach they would use if placed in that situation and also to assess why they believe that option to be the best. The reasons that respondents give may reveal beliefs about bilingualism that may or may not be supported by empirical research. Discuss either in a class presentation or in a paper what commonly held views are or are not supported by empirical research.

3. Survey up to five peers about their experiences trying to learn an L2. Be sure to ask respondents their age when they began trying to learn the L2; whether they learned in a formal classroom setting or in a naturalistic, immersion setting; and the level of proficiency that they achieved in the L2. Share your findings with the entire class. The class can then analyze the group results, speculating about the role of age of acquisition and method of acquisition in success in learning an L2.



For additional ancillary resources, please visit the companion website at www.sagepub.com/kennison.

- Video Links
- Audio Links
- Web Resources
- Internet Activities
- Flashcards
- Web Quizzes