TABLE 8.1 How's That Again? Ambiguous News Headlines. Language can be ambiguous and even unintentionally humorous when taken out of context. The examples in (A) are ambiguous because they use words that possess multiple meanings. The examples in (B) possess ambiguous grammar, resulting in two possible interpretations.

(A) Ambiguous Word Meaning
Drunk Gets Nine Months in Violin Case
Iraqi Head Seeks Arms
Man Struck by Lightning Faces Battery Charge
Old School Pillars Are Replaced by Alumni
Two Convicts Evade Noose, Jury Hung
(B) Grammatically Ambiguous
Eye Drops Off Shelf
British Left Waffles on Falkland Islands
Killer Sentenced to Die for Second Time in 10 Years
Ban on Soliciting Dead in Trotwood
Include Your Children When Baking Cookies
Juvenile Court to Try Shooting Defendant

"Sorry, but I'm going to have to issue you a summons for reckless grammar and driving without an apostrophe."

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How Does Language Work?

- **8.6** Describe the four levels of analysis that make up language.
- **8.7** Trace the development of language acquisition in children.
- **8.8** Identify the pros and cons of bilingualism.
- **8.9** Distinguish human language from nonhuman animal communication.

We tend to think that words possess fixed meanings, like the ones we find in the dictionary. But how we interpret a word depends on its context. Many funny (and sometimes not so funny) misunderstandings can arise when contextual information is missing. **TABLE 8.1** presents examples of actual newspaper headlines in which interpreting the words literally result in unintentionally humorous interpretations.

Language is a system of communication that combines symbols, such as words or gestural signs, in rule-based ways to create meaning. One hallmark of language is that it tends to be arbitrary: Its sounds, words, and sentences bear no clear relation to their meaning. For example, there's nothing about the word *dog* that resembles a friendly, furry animal that barks, and the word *tarantula* is much longer than the word *pig*, even though tarantulas are (thankfully) a lot smaller than pigs. Language serves several crucial functions. The most obvious is the transmission of information. When we tell our roommate "The party starts at nine" or we place an order at a coffee shop for a "skim latte," we're communicating information that enables us or someone else to accomplish a goal, like getting to the party on time or making sure our latte is nonfat.

Language serves key social and emotional functions, too. It enables us to express our thoughts about social interactions, such as conveying "I thought you were mad at me" or "That guy was hilarious." We spend much of our conversational time establishing or maintaining our relationships with others (Dunbar, 1996).

The Features of Language

We take language for granted because it's a highly practiced and automatic cognitive process. By *automatic*, we mean that using and interpreting language usually requires little attention, enabling us to perform other tasks, such as walking, cooking, or exercising, without speech getting in the way (Posner & Snyder, 1975; see Chapter 1). We don't realize how complex language is until we try to learn or use a new one. In fact, our ability to use language requires the coordination of an enormous number of cognitive, social, and physical skills. Even the mere ability to produce the sounds of our language requires the delicate interplay among breath control, vocal cords, throat and mouth position, and tongue movement.

We can think about language at four levels of analysis, all of which we need to coordinate to communicate effectively. These levels are (1) **phonemes**, the sounds of our language; (2) **morphemes**, the smallest units of meaningful speech; (3) **syntax**, the grammatical rules that govern how we compose words into meaningful strings; and (4) **extralinguistic information**, elements of communication that aren't part of the content of language but are crucial to interpreting its meaning, such as facial expressions and tone of voice. We can think of each level as similar to the different levels of specificity involved in preparing a meal—ranging from the individual ingredients to the menu items to the meal itself and, last but not least, to the overall dining experience.

language
largely arbitrary system of communication that combines symbols (such as words and gestural signs) in rule-based ways to create meaning

phoneme
category of sounds our vocal apparatus produces

morpheme
smallest meaningful unit of speech

syntax
grammatical rules that govern how words are composed into meaningful strings

extralinguistic information
elements of communication that aren't part of the content of language but are critical to interpreting its meaning

PHONEMES: THE INGREDIENTS. Phonemes are categories of sounds produced by our vocal apparatus. These categories are influenced by elements of our vocal tract, including our lips, teeth, tongue placement, vibration of the vocal cords, opening and closing of our throat, and other physical manipulations of our throat and mouth.

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Experts disagree on the total number of phonemes across all of the world's languages—probably around 100 in total—but they agree that each language includes only a subset of them. English contains between 40 and 45 phonemes, depending on how we count them. Some languages have as few as about 15; others, more than 60. Although there's some overlap across languages, some languages contain sounds that don't occur in other languages. This fact certainly adds to the challenge of learning a second language. The most famous example of this principle (at least among English speakers) is the Japanese *R/L* distinction. Japanese has a single sound category that encompasses both "r" and "l" sounds, a fact that's difficult for English speakers to understand because the sounds seem so different. However, there are similar examples that turn the tables on English speakers. English speakers easily distinguish "d" sounds from "t" sounds. But the Hindi language (spoken in many parts of India) has a third sound category that's partway between a *d* and a *t*, produced as if pronouncing the letter *d* but with the tongue pressed against the back of the teeth. This third category sounds just as distinct to Hindi speakers as *r* and *l* do to English speakers, and yet English speakers can't make out this difference (Werker & Tees, 2002). They hear it as either a *d* or a *t*.

MORPHEMES: THE MENU ITEMS. Morphemes are the smallest units of meaning in a language. They're created by stringing phonemes together. Most of our morphemes are words such as *dog* and *happy*. Morphemes convey information about **semantics**—meaning derived from words and sentences. Nevertheless, we also have strings of sounds that aren't words by themselves, but modify the meaning of words when they're tacked onto them. These are morphemes, too, although they don't stand alone as words. For example, the morpheme *re-* as in *recall* and *rewrite* means "to do again," and the morpheme *-ish* as in *warmish* and *pinkish* means "to a moderate degree."

SYNTAX: PUTTING THE MEAL TOGETHER. Syntax is the set of rules of a language by which we construct sentences. For instance, the string of words *I ate pizza for dinner* forms a complete sentence that follows the syntactic rules of English. In contrast, *Pizza ate I for dinner* doesn't follow English syntax, although it follows the syntactic rules of some other languages. Syntax isn't just word order, though; it also includes *morphological markers* and sentence structure. Morphological markers are morphemes (which means they change the meaning of a word but they do so based on a grammatical rule). For example, in English, we add *s* for plural, *ed* for past tense, and *ing* for ongoing action.

Although syntactic rules describe how language is organized, real-world language rarely follows them perfectly. If you were to write down word for word what your psychology professor says at the beginning of your next class, you'd find that he or she violates at least one or two syntactic rules. So syntax describes an idealized form of language, much like the formal language we read in written documents.

EXTRALINGUISTIC INFORMATION: THE OVERALL DINING EXPERIENCE. We often think of language as self-explanatory: We say what we mean and mean what we say (most of the time, anyway). Yet we take a great deal of additional information for granted when we interpret the language we hear. Extralinguistic information isn't part of language, but it plays an essential role in allowing us to interpret it. Some examples include previous statements made by others in the conversation and the speaker's nonverbal cues—such as his or her facial expression, posture, gestures, and tone of voice. Misunderstandings can easily arise if people aren't attentive to this information or if some of it is blocked, such as during a phone conversation or in a text message (see Chapter 11).

Suppose we hear someone say, "It's just awful in here!" This sentence doesn't provide enough information to figure out what the speaker means. To understand her, we need to look at her facial expressions and gestures and consider where she is, what she's doing, and what people were talking about just prior to her making the statement. If she's waving her hand in front of her face and wiping her forehead while standing in a hot kitchen, we'd probably infer that she's referring to the temperature of the room. If she's

Factoid

The Hawaiian language contains a remarkably small number of phonemes (some estimates place it as low as 13), meaning that this language has fewer "ingredients" with which to construct words. This fact explains why many Hawaiian words consist of repetitions of only a few syllables, like *kaukau* (Hawaiian for food), *kakahiaka* (Hawaiian for morning), and our favorite, *Humuhumunukunukuapua'a* (the state fish of Hawaii).

How we interpret a sentence depends a great deal on the context. How would your interpretation of the sentence "It's just awful in here!" differ in these two contexts?

semantics
meaning derived from words and sentences

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holding her nose and looking disgusted while standing in a seafood shop, we'd probably infer that she's referring to a dreadful smell. And if she has a frustrated look on her face and someone just commented on the huge number of people at the event she's attending, we might infer she's referring to how crowded the room is.

LANGUAGE DIALECTS: REGIONAL AND CULTURAL DIFFERENCES IN DINING HABITS. Although each language has its own set of phonemes, morphemes, and syntactic rules, there's variability in these elements within, as well as across, languages. **Dialects** are variations of the same language used by groups of people from specific geographic areas, social groups, or ethnic backgrounds. Dialects aren't distinct languages, because speakers of two different dialects can, for the most part, understand each other (Labov, 1970; Tang & van Heuven, 2009). Different dialects may employ slight variations of the standard pronunciations, vocabulary, and syntax of the language. For instance, many people from Boston (and from England) are known for dropping their *r*'s ("I pahked my cah") and many Texans are known for their "twang." Similarly, you may refer to the same drink as "soda," "pop," "tonic," or "Coke" depending on where you live. It's important to understand that speakers of dialects that differ from the "standardized" version of the native language aren't making pronunciation or grammatical errors.

Many people assume that speakers of nondominant dialects are trying but failing to speak the majority (standard) version of the dialect (Smitherman-Donaldson & van Dijk, 1988). This assumption can lead to unwarranted and misguided prejudice (Baugh, 2000). Speakers of these dialects are using consistent syntactic rules in their speech, even though these rules differ from those used by the "mainstream" dialect (Ellis, 2006; Rickford & Rickford, 2000). For example, speakers of African-American Vernacular English might say "plug it *up*" instead of "plug it *in*." Speakers of Appalachian dialect, spoken by many people living in the Appalachian Mountains, might say, "He had *went* to the store" instead of "He had *gone* to the store." As long as they're using these constructions systematically, they're using an equally valid rule-based form of communication.

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How and Why Did Language Come About?

Scientists have long debated the question of how language evolved and what possible advantages such a complicated communication system offers. One clear advantage is that language allows us to communicate extremely complex thoughts. Some evolutionary theorists argue that language evolved into a complex system as our early apelike ancestors began to engage in increasingly complex social organizations and activities like coordinated group hunting. One thing on which evolutionary theorists agree is that language must provide the human species a strong survival advantage to offset its disadvantages. Indeed, there are plenty of disadvantages. For example, language requires a lengthy learning period and hefty brainpower. In addition, possessing a vocal tract that allows us to make a wide array of sounds actually increases our chances of choking (Lieberman, 2007).

One challenge to explaining how language evolved is the fact that language is generally arbitrary. Most phonemes, words, and syntactic rules are unrelated to things to which they refer. That seems like an unintuitive "design feature." Many scholars argue that language is arbitrary for a good reason. Using arbitrary words allows us more flexibility to express complex ideas that don't have sounds naturally associated with them. Still, there are intriguing examples of nonarbitrary language in which words *do* resemble their meaning. The most obvious is *onomatopoeia*, or words that resemble the sounds to which they refer, like *buzz*, *meow*, *beep*, and *zoom*. Another example is that across the world's languages, the word for mother nearly always starts with an *m* or *n*, whereas the word for father nearly always starts with a *b*, *p*, or *d*. This fact is probably more than a coincidence, particularly because these phonemes tend to be those that children acquire earliest; in the case of mother, "m" is a sound that babies make while nursing. Research on *sound symbolism*—the fact that certain

dialect
language variation used by a group of people who share geographic proximity or ethnic background

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speech sounds seem to be associated with particular meanings—challenges the idea of language as completely arbitrary (Aveyard, 2012; Imai et al., 2008; Nygaard, Cook, & Namy, 2009; see **FIGURE 8.4**). For example, in Japanese, the word *hayai* means "fast." English speakers told that *hayai* means "fast" learn this information more easily than those taught that it means "sweet" (Nygaard et al., 2009). This finding suggests that *hayai* sounds like its *real* meaning. The fact that at least some sound symbolism is consistent across languages raises the intriguing possibility that connections between auditory and other sensory systems in the brain (see Chapter 4) influenced how languages evolved.

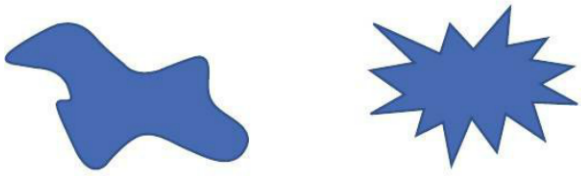
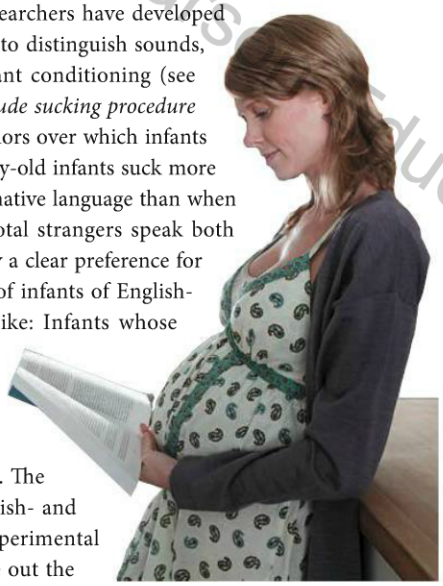


FIGURE 8.4 A Classic Example of Sound Symbolism. Which object looks like a "maluma" and which looks like a "takete"? If you're like most people (children *and* adults the world over), you'll say that the "maluma" is on the left and the "takete" is on the right.

How Do Children Learn Language?

Language is among the few documented cases in which children are more efficient learners than adults are. The language-learning process starts long before children begin talking. In fact, it begins even before they're born. By the fifth month of pregnancy, the auditory systems of unborn infants are developed enough that they can begin to make out their mother's voice, learn to recognize some characteristics of their mother's native language, and even recognize specific songs or stories they've heard repeatedly (DeCasper & Spence, 1988).

We know this to be true because researchers have developed a clever way to test newborn infants' ability to distinguish sounds, namely, a method that capitalizes on operant conditioning (see Chapter 6). The technique is the *high-amplitude sucking procedure* that takes advantage of one of the few behaviors over which infants have good control at birth—sucking. Two-day-old infants suck more on a pacifier when they hear their mother's native language than when they hear a foreign language, even when total strangers speak both languages. Even at this early age, they display a clear preference for their mother's native language. This is true of infants of English-speaking and Spanish-speaking mothers alike: Infants whose mothers speak English suck harder when they hear English rather than Spanish, and those whose mothers speak Spanish suck harder when they hear Spanish rather than English (Moon, Cooper, & Fifer, 1993). The fact that researchers tested babies with English- and Spanish-speaking mothers is an elegant experimental design feature. It allowed researchers to rule out the possibility that all babies prefer English over another language, regardless of which language their mothers speak.



Fetuses can learn about the melody and rhythm of their native language and learn to recognize their mother's voice before birth. They even can learn to recognize a specific story read to them before birth (DeCasper & Spence, 1988).

Factoid

Related words often have similar-sounding initial consonant clusters, a phenomenon called phonesthemes (Hutchins, 1999; Bergen, 2004). For example, in English the "sn" sound is associated with a large number of nose-related activities, including sneeze, sniff, snore, snooze, snicker, snort, snoop (what a "nosy" person does, after all), and even snot! What other sound sequences occur in a cluster of related words?

PERCEIVING AND PRODUCING THE SOUNDS OF LANGUAGE. During the first year or so after birth, infants learn much more about the sounds of their native language. They begin to figure out the phonemes of their language and how to use their vocal apparatus to make specific sounds. Although children's babbling seems like nonsense—and it usually is—it plays an important role in language development by enabling babies to figure out how to move their vocal tracts to generate certain sounds. **Babbling** refers to any intentional vocalization (sounds other than crying, burping, sighing, and laughing, which are less intentional) that lacks meaning. Babbling evolves over the first year of life and follows a progression of stages demonstrating infants' increasing control of their vocal tract (Kent & Miolo, 1995). By the end of their first year, infants' babbling takes on a conversational tone that sounds meaningful even though it isn't (Goldstein & Schwade, 2008).

◀ **RULING OUT RIVAL HYPOTHESES**
Have important alternative explanations for the findings been excluded?

babbling
intentional vocalization that lacks specific meaning

Watch in **MyPsychLab** the **Video:**
Language Development

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Factoid

When children acquire their first words, most of them also begin producing "baby signs"—meaningful gestures that stand for things like "more," "juice," or "fish." These aren't examples of sign language, because they're made up by the infant and don't have a syntax. But they seem to improve infants' communicative effectiveness. Baby signs (or symbolic gestures, as they're often called) are probably easier to produce early on because infants have better physical control of their hands than of their vocal tracts. In fact, many parents have begun teaching their children baby signs to improve their children's ability to communicate.

As infants are fine-tuning their vocal tracts, they're fine-tuning their ears, too. As we've learned, different languages have different phonemes; so to be successful users of their native language, infants must learn which sets of sounds are relevant for their language. All babies initially share the same basic phoneme categories regardless of their parents' native language. However, babies adjust their phonemes rapidly over the course of the first year to match their native language. By ten months, infants' phoneme categories are very much like those of the adult speakers of their native language (Werker & Tees, 1984).

? Very young children with limited vocabularies can't talk very well and are often shy about talking in front of strangers. Can you think of ways researchers could measure what words children understand without depending on their ability to tell them? (See answer upside down at bottom of page.)

LEARNING WORDS. How and when do children begin to communicate using words? One key principle characterizes early word learning: *Comprehension precedes production*. Children learn to recognize and interpret words well before—sometimes months before—they can produce them. That's because they have only a limited ability to coordinate sounds to produce recognizable words. They may be perfectly aware that *elephant* refers to a large gray animal with a long trunk, but they may be unable to produce this big word.

Children start to *produce* their first words around their first birthdays, although there's considerable variability in this milestone. They acquire their first words slowly. Between one and one-and-a-half years of age, they gradually accumulate a vocabulary of between 20 and 100 words. As children become more experienced in learning new words, the rate at which they acquire words increases and the difference between the number of words they know and those they can say continues to narrow (Golinkoff et al., 2000; Smith, 2000). By the time they turn two, most children can produce several hundred words. By kindergarten, their vocabularies have ballooned to several thousand words.

? A child who uses the word grandpa to apply to any gray-haired man is committing what kind of mistake? (See answer upside down at bottom of page.)

Yet children typically make some mistakes in interpreting what words mean and how to use them, often over- and underextending. This means that they apply words in a broader sense (overextension, like referring to all adult men as "Daddy") than adults do or in a narrower sense (underextension, like thinking that the word *cat* applies only to their pet cat). Of course, most of the time, children manage to get word meanings exactly right, which is a remarkable achievement.

SYNTACTIC DEVELOPMENT: PUTTING IT ALL TOGETHER. The first major milestone in children's syntactic development is combining words into phrases. Children start off speaking in the **one-word stage**, during which they use individual words to convey entire thoughts. A child may use the word *doggie* to mean "There's a doggie!" "Where's the doggie?" or even "The doggie licked me!" Interpreting what children mean in the one-word stage can be challenging. By the time children turn two, most of them start to combine words into simple two-word phrases. Although these phrases are still far from complete sentences, they go a long way toward improving comprehensibility. For example, the child can now say "more juice" to request a refill or "uh-oh juice" to notify mom that his juice just spilled. Children at this stage have already grasped something about syntactic rules. For example, they tend to use words in the correct order, even if they're leaving some of them out.

one-word stage
early period of language development when children use single-word phrases to convey an entire thought

Answer (top photo): Researchers often ask infants to *show* what they know ("Which one is the ball?") or measure whether children look longer at the correct object when hearing a familiar word.
Answer (bottom photo): Overextension.

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As is the case with word learning, children comprehend some basic syntactic rules before they can display them. Among other things, they understand how word order relates to meaning before they can generate complete sentences. Two researchers showed 17-month-olds two videos side by side, one showing Cookie Monster tickling Big Bird and another showing Big Bird tickling Cookie Monster. The experimenter asked the children, "Show me where Big Bird is tickling Cookie Monster." The children pointed toward the correct video, demonstrating they could determine from word order who was the "tickler" and who was the "ticklee" (Hirsh-Pasek & Golinkoff, 1996). (See **FIGURE 8.5** for a different example using a pig and a dog.)

Several months after they've begun using two-word phrases, children use more complex sentences involving three- and four-word combinations. Around the same time, they begin to produce morphological markers such as *-s* for plural and *-ed* for past tense in English. They acquire most syntactic rules by preschool age, but continue to acquire more complex rules in their early school years (Owens, 2011).

FIGURE 8.5 Children Display Comprehension of Word Order Prior to Sentence Production. Children can display their grasp of syntax by pointing to a video that matches a sentence they have heard. Here, a 17-month-old child is displaying her comprehension of the sentence *The pig is tickling the dog* by pointing to the video that corresponds to the sentence.

Critical Periods for Language Learning

As we noted earlier, younger children are better at learning language than are older children and adults. Much of the evidence for this conclusion derives from studies of second language acquisition. This research has focused on whether there's a *critical period* for developing language. Critical periods are windows of time in development during which an organism must learn an ability if it's going to learn it at all (see Chapter 10). We can look at the age of exposure to language to discover whether such exposure must occur during a specific time window for language to be learned.

For obvious ethical reasons, we'd never intentionally deprive a child of language exposure until a particular age for the sake of science. Nevertheless, several tragic cases have served as "natural experiments" in this regard. They provide important information about whether critical periods for learning language exist. For example, a girl named Genie was seriously neglected and abused, chained to a potty seat in a back bedroom for much of the first 13 years of her life, and deprived almost entirely of social interaction or language input (Curtiss, 1977). Once rescued from this abusive situation and exposed to language, Genie displayed a rudimentary ability to communicate. But she, and others like her, failed to use language fluently. Nevertheless, there are alternative explanations for impairment in these cases, such as the severe emotional and physical neglect these children experienced. As we learned in Chapter 2, case studies like Genie's tend to be limited in their ability to exclude rival hypotheses.

A young girl named Genie, who was deprived of language until adolescence, failed to learn to use language fluently. This is consistent with the idea of a critical period for language learning, although her abusive upbringing makes it difficult to draw firm conclusions.

RULING OUT RIVAL HYPOTHESES
Have important alternative explanations for the findings been excluded?

Susan Goldin-Meadow discovered an alternative way to study language deprivation, one that ruled out many of the rival explanations that plague cases like Genie's. She began studying children who were deaf but whose parents were hearing and didn't know any sign language. Unlike Genie, these children are loved, cared for, fed, and given the opportunity to develop normally in all respects except language. Goldin-Meadow found that many children who are deaf of hearing parents invent their own signs, even when not instructed in sign language. This phenomenon, called **homesign**, shows impressive ingenuity (and motivation to communicate) on the part of children, because they've invented these signs without guidance from adults (Goldin-Meadow et al., 2009). Still, without being exposed systematically to a language model, such as American Sign Language, homesigners never develop full-blown language. Still, this research doesn't directly address whether there's a specific age at which language exposure must occur for children to become fluent.

homesign
system of signs invented by children who are deaf and born of hearing parents and therefore receive no language input

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More recently, researchers have examined evidence of critical periods by studying children born deaf to hearing parents who have received *cochlear implants* at various ages. Cochlear implants allow these children's brains to receive auditory input. The implants tend to produce more positive effects on language among younger than older children (Svirsky, Chin, & Jester, 2007). It's not clear whether these age effects are due to the brain's ability to process and interpret the auditory stimulation in general or the ability to learn language specifically.

RULING OUT RIVAL HYPOTHESES ▶
Have important alternative explanations for the findings been excluded?

In another classic study, researchers found a different way to examine the critical period for language by studying how *second* language proficiency varies based on the age of exposure to that language. The goal was to measure the English grammar skills of adults who'd immigrated to the United States from China and Korea at various ages. The test required participants to detect grammatical errors such as "The man climbed the ladder up carefully" and "The little boy is speak to a policeman." The investigators found that overall language proficiency was near native levels for adults who'd first been exposed to English between one and seven years of age. But skills dropped off for adults who weren't exposed to English until after age seven (Johnson & Newport, 1989; see **FIGURE 8.6**). Notice, however, in Figure 8.8 that after the age of 7, the drop-off is gradual rather than abrupt. Syntax and pronunciation are more vulnerable to effects of the age of exposure than is vocabulary (Johnson & Newport, 1989; Piske, MacKay, & Flege, 2001).

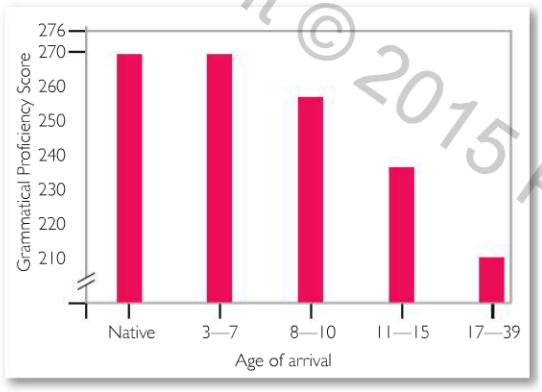

FIGURE 8.6 Proficiency in Second Language Depends on the Age of Exposure. Adults first exposed to English before age seven displayed proficiency comparable to that of native English speakers, whereas those who learned English after age 7 were significantly less proficient. (Based on Johnson & Newport, 1989)

It is clear that age of acquisition influences language learning. But there's no evidence in humans for strict critical periods, at least when it comes to language. Instead, language learning is typically marked by what psychologists call a *sensitive period*, an interval during which people are more receptive to learning and can acquire new knowledge more easily. We don't fully understand why older children and adults are less capable of learning new languages than younger children are. The most promising account is Elissa Newport's (1990) "less is more" hypothesis (Newport, Bavelier, & Neville, 2001). According to this hypothesis, children have more limited information-processing abilities, fewer analytic skills, and less specific knowledge about how language works than do adults. As a result, they learn language more naturalistically and gradually from the "ground up." In contrast, adults try to impose more organization and structure on their learning, ironically making learning a language more challenging.

Special Cases of Language Learning

Children learning language sometimes confront special challenges. These challenges may prevent, slow down, or complicate acquiring a language. We'll review two of them: sign language learning and bilingual language acquisition.

SIGN LANGUAGE. Sign language is a type of language developed by members of deaf communities that allows them to use visual rather than auditory communication. It involves using the hands, face, body, and "sign space"—the space immediately in front of the signer—to communicate. Just as there are many spoken languages, there are many sign languages used in different countries and deaf communities.

Many people hold a variety of misconceptions about sign languages (see **TABLE 8.2**). People often think of sign language as an elaborate form of gesturing, a charades-like attempt to act out silently what people would otherwise speak. This couldn't be further from the truth. Sign language is called "language" for a reason. It's a linguistic system of communication with its own phonemes, words, syntax, and extralinguistic information (Newport & Meier, 1985; Poizner, Klima, & Bellugi, 1987; Stokoe, Casterline, & Croneberg, 1976). Linguists who've analyzed the structure and organization of various sign languages (American Sign Language, French Sign Language, even Nicaraguan Sign Language) have confirmed that sign languages exhibit the same features as spoken languages, including a complex set of syntactic rules that determine when a string of signs is a grammatical sentence.

sign language
language developed by members of a deaf community that uses visual rather than auditory communication

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TABLE 8.2 Common Misconceptions about Deafness and Sign Language.

MYTH	REALITY
1. Deaf people don't need sign language because they can lip-read.	Even the most skilled lip-readers can pick up only about 30 to 35 percent of what's being said because most of the work is done behind the scenes by the throat, tongue, and teeth. Our lips look virtually identical when saying *nice* and *dice*—even words like *queen* and *white* look the same to lip-readers.
2. Learning to sign slows down deaf children's ability to learn to speak.	Historically, deaf education programs tried to prevent deaf children from learning to sign because they feared children would never learn to talk. It's now clear that learning a sign language actually speeds up the process of learning to talk.
3. American Sign Language is English translated word for word into signs.	American Sign Language (ASL) bears no resemblance to English; the syntax in particular differs completely from English syntax. Some deaf communities use what's called Signed English instead of ASL; Signed English translates English sentences word for word into signs from ASL.

Unlike this deaf child whose parent is a fluent signer, most deaf babies are born to hearing parents who don't begin learning sign language until after their babies are born (or sometimes even later).

A growing number of children hear one language spoken at home and another at school. Some are instructed in two different languages at school. Although bilingualism may slow the learning of some aspects of both languages, it promotes metalinguistic insight in the long run.

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Further evidence that sign language works like any other language comes from two sources. First, the same brain areas involved in processing spoken languages become active in sign languages (Hickok, Bellugi, & Klima, 2011; Poizner et al., 1987). In fact, native signers' brains involve both traditional "language areas" and other brain areas that play roles in visual and spatial processing (Newman et al., 2002). Second, babies who learn sign languages pass through the same developmental stages at about the same ages as babies who learn spoken languages (Newport & Meier, 1985; Orlanksy & Bonvillian, 1984; Petitto & Marentette, 1991).

BILINGUALISM. Many of us have tried to learn a second language, and some of us are **bilingual**, adept at speaking and comprehending two languages. Given that so many of us have attempted to master a second language, why can so few of us call ourselves bilingual? Part of the answer lies in how we encounter a second language. We usually master a language more easily by living in a community where this language is spoken than by learning it in a classroom (Baker & MacIntyre, 2000; Genesee, 1985). Not surprisingly, our motivation to learn a new language also plays a key role (Ushioda & Dornyei, 2012). But as we observed in Figure 8.6, the best predictor of whether we'll become fluent is the age of acquisition: All things being equal, the earlier, the better (Johnson & Newport, 1989).

In most bilingual persons, one language is dominant. It's typically the first language learned, the one they heard most often as a child, and the one they use most often. There are cases in which a child is introduced to two languages from the outset, as when the parents speak two languages or the child has a full-time caretaker who speaks a different language from that of her parents. How do bilingual persons fluent in two languages keep them straight? How are these languages organized in their brain?

Children learning two languages follow the same stages in the same order for each language as do *monolingual* children—those learning a single language. There's some evidence that bilingual children experience a delay in syntax development in each of their languages relative to their monolingual counterparts (Gathercole, 2002a, b), although vocabulary development is relatively unimpaired (Pearson & Fernández, 1994; Pearson, Fernández, & Oller, 1993). Moreover, the delays that occur early in development are balanced out by a variety of long-term benefits (Bialystok, Craik, & Luk, 2012). Not only can bilingual individuals converse with two language communities rather than one, but the process of figuring out how two languages work gives them heightened **metalinguistic** insight—awareness of how language is structured and used. As a result, they tend to perform better on language tasks in general (Bialystok, 1988; Galambos & Hakuta, 1988; Ricciardelli, 1992). In fact, recent research suggests that bilingualism may even offer protection from cognitive decline in patients with Alzheimer's disease and other forms of dementia (Schweizer, Ware, Fischer, et al., 2012).

bilingual
proficient and fluent at speaking and comprehending two distinct languages

metalinguistic
awareness of how language is structured and used

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Studies of brain activation during language processing demonstrate that bilingual persons who learned a second language early in development process the two languages using similar brain areas (Buchweitz, Shinkareva, Mason, et al., 2012; Fabbro, 1999). In contrast, those who learned a second language later in development use different brain areas (Kim et al. 1997), suggesting that the brain may separate their first and second languages into different regions. An alternative hypothesis is that the distinct brain areas observed for later-age exposure to second language are due to the fact that people who acquire languages later are less proficient and require more brain involvement to master their second language as a result (Abutalebi, Cappa, & Perani, 2005).

RULING OUT RIVAL HYPOTHESES ▶
Have important alternative explanations for the findings been excluded?

Language clearly has an important learned component, because children adopted from a different country learn to speak the language of their adopted rather than biological parents.

OCCAM'S RAZOR ▶
Does a simpler explanation fit the data just as well?

Theoretical Accounts of Language Acquisition

Given children's impressive ability to learn to use such a complex system at an early age, what explains children's language learning? Some explanations fall more heavily on the nature side of the nature–nurture debate; others, on the nurture side. Yet even the strongest nature account acknowledges that children aren't born knowing their specific language; they learn what they hear. Similarly, the strongest nurture account acknowledges that children's brains are set up in a way that's receptive to learning and organizing language input. Here, we'll review four major theoretical accounts of language acquisition.

THE "PURE" NATURE AND NURTURE ACCOUNTS. The simplest explanation of children's language learning is that they learn through imitation. In this respect, this account is the most parsimonious hypothesis. Babies hear language used in systematic ways and learn to use language as adults use it. This is certainly true in one sense, because babies learn the language they hear. But a purely imitation-based explanation is unlikely tell the whole story for one reason: Language is **generative**. *Generativity* means that language isn't just a set of predefined sentences that we can pull out and apply in appropriate contexts. Instead, it's a system that allows us to create an infinite number of sentences, producing new statements, thoughts, and ideas never previously uttered (indeed, it's unlikely anyone has ever written the exact sentence you just read). The strongest nature view is the **nativist** account, which says that children come into the world with some basic knowledge of how language works. Nativists propose that children are born with expectations that there will be syntactic rules that influence how sentences are constructed (Chomsky, 1972), although the precise rules for their native language need to be determined through exposure. Noam Chomsky, who essentially invented the field of contemporary linguistics, hypothesized that humans possess a specific language "organ" in the brain that houses these rules. He called it the **language acquisition device** and argued that it comes preprogrammed to enable children to use language.

FALSIFIABILITY ▶
Can the claim be disproved?

A key weakness of the nativist view is that many of its claims are difficult to falsify. Critics point out that children learn syntax gradually and that even adults use grammatically incorrect sentences. The nativist would reply that different aspects of grammar take more or less time to "set" and that ungrammatical sentences don't imply lack of knowledge of grammar. These are certainly reasonable explanations, but the theory's weakness is that it's hard to think of an outcome that nativists couldn't explain. As we've noted in earlier chapters, a theory that can explain every conceivable outcome essentially explains nothing Two less extreme accounts of language acquisition have stronger evidence on their side.

THE SOCIAL PRAGMATICS ACCOUNT. The **social pragmatics** account suggests that specific aspects of the social environment structure language learning. According to this model, children use the context of a conversation to infer its topic from the actions, expressions, gestures, and other behaviors of speakers (Bloom, 2000). Still, this account has its weaknesses. Explaining child language on the basis of social understanding requires us to assume that infants understand a great deal about how other people are thinking. In addition, we can explain most social pragmatic abilities without requiring as much insight on the part of the child (Samuelson & Smith, 1998). For example, social

generative
allowing an infinite number of unique sentences to be created by combining words in novel ways

nativist
account of language acquisition that suggests children are born with some basic knowledge of how language works

language acquisition device
hypothetical organ in the brain in which nativists believe knowledge of syntax resides

social pragmatics
account of language acquisition that proposes that children infer what words and sentences mean from context and social interactions

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pragmatic theorists might say that children learn to interpret meaning from pointing because children recognize that the speaker's communicative goal is to direct the child's attention to a particular object, like a toy. But children might use a simpler process altogether. Perhaps they notice that every time their caretaker points to a specific object, he or she utters the same word. In this way, children may infer that pointing is correlated with word meaning. This deduction doesn't require children to take into account the social context or communicative intentions of others.

OCCAM'S RAZOR
Does a simpler explanation fit the data just as well?

THE GENERAL COGNITIVE PROCESSING ACCOUNT. A final explanation for how children learn language is the *general cognitive processing* account. It proposes that children's ability to learn language results from general skills that children apply across a variety of activities. Children's ability to perceive, learn, and recognize patterns may be all they need to learn language. If so, there'd be no need to propose a language acquisition device as Chomsky did.

Still, there are challenges to this account, too. One is that children are better at learning languages than adults are, whereas adults are better at learning things in general. Another is that specific areas of the brain (see Chapter 3), especially the left temporal lobe (see **FIGURE 8.7**), are more active in language processing than in other types of learning, memory, and pattern recognition activities (Gazzaniga, Ivry, & Mangun, 2002). This finding implies that at least some distinct cognitive processes occur during language as opposed to other cognitive activities.

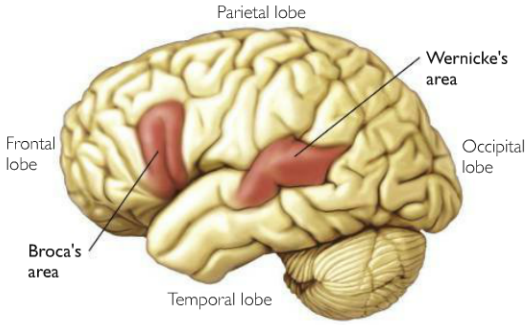

FIGURE 8.7 Language Processing Areas of the Brain. Two areas of the brain that play key roles in language processing are Broca's area, involved in speech production, and Wernicke's area, involved in speech comprehension (see Chapter 3).

psychomythology

DO TWINS HAVE THEIR OWN LANGUAGE?

The idea of being a twin has a certain appeal and allure. It's only natural to expect a special bond between two people who've been together from the moment of conception. One commonly held belief is that this special bond enables twins to invent their own secret language, one only they can understand—a phenomenon known as *cryptophasia*.

As fascinating as this notion is, the truth is less exotic, but no less interesting. Cases of apparent cryptophasia among twins turn out to be a result of phonological impairment and other types of language delay (Bishop & Bishop, 1998; Dodd & McEvoy, 1994) that are more prevalent among twins than among singletons (children born one at a time). Twin pairs who've supposedly developed a secret language are simply attempting to use their native language, but with poor articulation and significant pronunciation errors. These difficulties are serious enough to render their speech largely incomprehensible to the rest of us. This problem sometimes results in longer-term language impairment well into elementary school. Because twin pairs tend to make similar kinds of phonological errors, their speech is more understandable to each other than it is to their parents or nonrelated children (Dodd & McEvoy, 1994; Thorpe, et al., 2001).

? Popular psychology tells us that twins sometimes develop their own language. What does research indicate is really going on here? (See answer upside down at bottom of page.)

Nonhuman Animal Communication

The communication systems of different animal species differ in type and complexity. Some species use scent marking as their primary form of communication. Others rely on visual displays, such as baring their teeth or flapping their wings. Still others, like we humans, use vocal communication. Most species have a fixed number of ways of expressing a fixed number of messages but no means of communicating completely new ideas.

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Answer: Twins aren't developing their own language; instead, they are displaying very similar-sounding speech production disorders.

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