Figure 6.4 shows that at 6 to 8 months of age, English-learning infants readily discriminated between non-English phonemes; they could tell one Hindi syllable from another, and one Nthlakapmx syllable from another. At 10 to 12 months of age, however, the infants no longer perceived the differences they had detected a few months before. A similar change occurs (slightly earlier) for the discrimination of vowels (Kuhl et al., 1992; Polka & Werker, 1994).

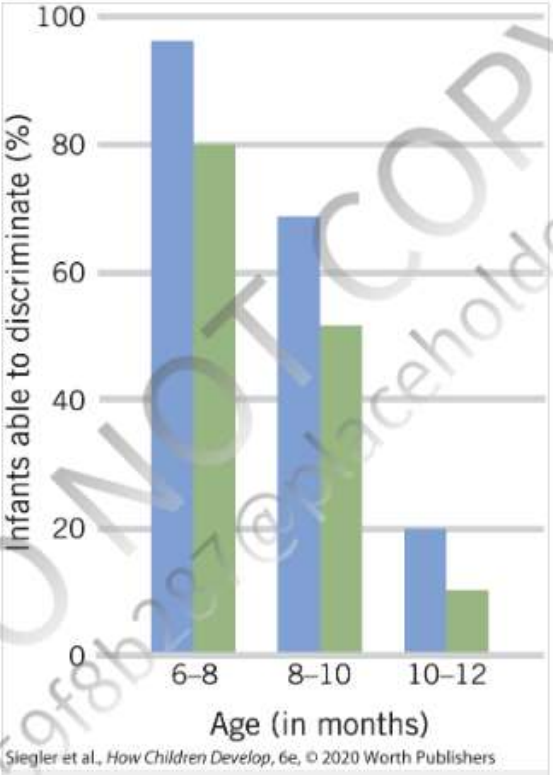
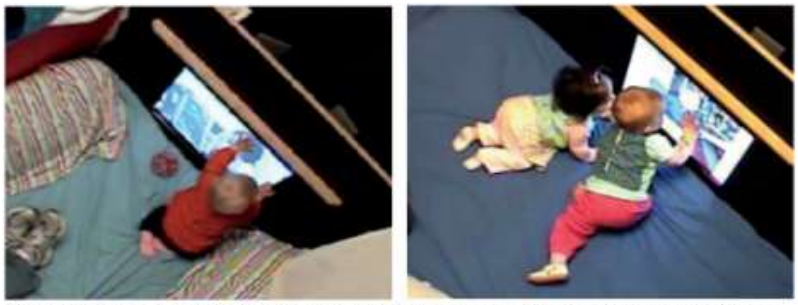


FIGURE 6.4 Percent of infants able to discriminate foreign-language speech sounds Infants' ability to discriminate between speech sounds that are not in their native language declines between 6 and 12 months of age. Most 6-month-olds from English-speaking families readily discriminate between syllables in Hindi (blue bars) and Nthlakapmx (green bars), but most 10- to 12-month-olds do not.

(Data from Werker, 1989)

Interestingly, perceptual narrowing does not appear to be an entirely passive process. Kuhl, Tsao, and Liu (2003) found that infants learned more about the phonetic structure of Mandarin from a live interaction with a Mandarin speaker than from watching a video of one. This is an example of the benefits of active learning, as discussed in Chapter 5. In an interesting twist, a follow-up study found that infant learners were more successful at learning Mandarin phonemes from the

that infant learners were more successful at learning Mandarin phonemes from the screen when they did so along with a peer (another 9-month-old) than when they were alone (see the photos on the next page; Lytle, Garcia-Sierra, & Kuhl, 2018).



TWO ARE BETTER THAN ONE: INFANT LANGUAGE LEARNING FROM VIDEO IMPROVES IN THE PRESENCE OF PEERS. SARAH ROSEBERRY LYTLE, ADRIAN GARCIASIERRA, AND PATRICIA K. KUHL. PNAS OCTOBER 2, 2018, 115 (40) PHOTO COURTESY SARAH LYTLE

In their study of Mandarin phoneme learning, Lytle and colleagues (2018) found that two is better than one: The peers on the right will be more successful at language learning from a screen than the solitary infant on the left.

Word Segmentation

As infants tune into the sounds of their language, they also begin to discover another crucial feature of speech: words. This is no easy feat. Unlike written language, there are no spaces between words in speech "*Lookattheprettybaby*! *Haveyoueverseensuchaprettybaby*?" Infants have to figure out where the spoken words start and end. They begin this process of **word segmentation** during the second half of the first year.

The first demonstration of infant word segmentation focused on 7-month-old infants (Jusczyk & Aslin, 1995). First, the babies listened to passages in which a particular word recurred—for example, "The *cup* was bright and shiny. A clown drank from the red *cup*. His *cup* was filled with milk." They were then tested using a head-turn preferential looking procedure to see whether they recognized the words that had been repeated in the sentences. In this method, flashing lights mounted near two loudspeakers located on either side of an infant are used to draw the infant's attention to one side or the other. When the infant turns to look at the light, sounds are played through the speaker on that side, continuing as long as the infant is looking in that direction. The length of time the infant spends looking at the light—and hence listening to the sound—provides a measure of the degree to which the infant is attracted to that sound.

Infants in this study were tested on repetitions of words that had been presented in

the sentences (such as *cup*) or words that had not (such as *bike*). The researchers found that infants listened longer to words that they had heard in the passages of fluent speech, as compared with words that never occurred in the passages. This result indicates that the infants were able to pull the words out of the stream of speech—a task so difficult that even sophisticated speech-recognition computer software often fails at it.

How do infants find words in pause-free speech? They appear to be remarkably good at picking up regularities in their native language that help them to find word boundaries. One example is stress patterning, an element of prosody. In English, the first syllable in two-syllable words is much more likely to be stressed than the second syllable (as in "English," "often," and "second"). By 8 months of age, English-learning infants expect stressed syllables to begin words and can use this information to pull words out of fluent speech (Curtin, Mintz, & Christiansen, 2005; Johnson & Jusczyk, 2001; Thiessen & Saffran, 2003).

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How quickly could you pick out a word from a stream of speech like the one shown here? It takes 8-month-old infants only 2 minutes of listening.

Another regularity to which infants are surprisingly sensitive concerns the **distributional properties** of the speech they hear. As discussed in Chapter 5, infants are skilled at statistical learning. Sounds that are part of the same word are more likely to occur together than are others. Sensitivity to such regularities in the speech stream was demonstrated in a series of statistical learning experiments (Saffran, Aslin, & Newport, 1996). The infants listened to a 2-minute recording of four different three-syllable "words" (e.g., *tupiro, golabu, bidaku, padoti*) repeated in random order with no pauses between the "words." Then, on a series of test trials, the babies were presented with the "words" they had heard (e.g., *bidaku, padoti*) or with sequences that were not words (e.g., *kupado,* made up from the end of *bidaku*

with sequences that were not words (e.g., *kapada*, made up from the end of *bidaku* and the beginning of *padoti*).

Using the same kind of preferential-listening test described for the Juscyzk & Aslin (1995) study, the researchers found that infants discriminated between the words and the sequences that were not words. To do so, the babies must have registered that certain syllables often occurred together in the sample of speech they heard. Thus, the infants used predictable sound patterns to fish words out of the passing stream of speech. This ability appears to be available at the youngest age tested, just days after birth (Fló et al., 2019).

Probably the most salient regularity for infants is their own name. Infants as young as 4½ months will listen longer to repetitions of their own name than to repetitions of a different name (Mandel, Jusczyk, & Pisoni, 1995). Just a few weeks later, they can pick their own name out of background conversations (Newman, 2005). This ability helps them to find new words in the speech stream. After hearing "It's Jerry's cup!" a number of times, 6-month-old Jerry is more likely to learn the word *cup* than if he had not heard it right after his name (Bortfeld et al., 2005). Over time, infants recognize more and more familiar words, making it easier to pluck new ones out of the speech that they hear.

Infants are exceptional in their ability to identify patterns in the speech surrounding them. They start out with the ability to make crucial distinctions among speech sounds but then narrow their focus to the sounds and sound patterns that make a difference in their native language. This process lays the groundwork for their becoming not just native listeners but also native speakers.

Preparation for Production

Newborns' repertoire of sounds is extremely limited: they cry, sneeze, sigh, burp, and smack their lips. At about 6 to 8 weeks of age, infants begin to coo—producing drawn-out vowel sounds, such as "ooohh" or "aaahh." They click, smack, blow raspberries, squeal—all with apparent fascination and delight. Through this practice, infants gain motor control over their vocalizations. While their sound repertoire is expanding, infants become increasingly aware that their vocalizations elicit responses from others, and they begin to engage in dialogues of reciprocal cooing with their caregivers. Indeed, infants with more responsive caregivers are more likely to use more mature vocalization patterns (Miller, 2014).

Babbling

Babies begin **babbling** between 6 and 10 months of age (on average at around 7 months). They produce strings of consonant-vowel syllables ("papapa"; "babababa") drawn from a fairly limited set of sounds, some of which are not part of their native language (de Boysson-Bardies, 1996/1999).

Language exposure is a key component in the development of babbling. Deaf infants who are regularly exposed to signed languages like ASL babble with their hands! They produce repetitive hand movements made up of pieces of full ASL signs, just as vocally babbled sounds are made up of pieces of spoken words (Petitto & Marentette, 1991). Thus, like infants learning spoken languages, infants learning sign languages seem to experiment with the elements that will eventually become the words of their native language (Figure 6.5).

JEFFREY DEBELLE / DR. LAURA-ANN PETITO

FIGURE 6.5 Manual babbling Babies who are exposed to the sign language of their deaf parents babble with their hands. A subset of their hand movements differs from those of infants exposed to spoken language and corresponds to the rhythmic patterning of adult signs.

(Information from Petitto et al., 2001)

Infants' babbling gradually takes on the sounds, rhythm, and intonational patterns of the language infants hear (or see) daily. However, it is still very difficult to tell what language an infant is learning just by listening to their babbling. In one study of English-learning and Chinese-learning 12-month-olds, adult listeners were unable to tell from their babbles alone which language the infants were learning (Lee et al., 2016).

Early interactions

In a conversation, mature participants alternate between speaking and listening. Learning to take turns in social interactions is facilitated by parent–infant games, such as peekaboo and "give and take," in which caregiver and baby take turns giving

such as peekaboo and "give and take," in which caregiver and baby take turns giving and receiving objects (Bruner, 1977; Ratner & Bruner, 1978). In these "dialogues," the infant has the opportunity to alternate between an active and a passive role, as in a conversation, giving infants practice in bidirectional communication. Caregivers' responses to babbling may serve a similar function. Consistent with our active learning theme, infant babbling evokes a range of parental responses that in turn may help the infant learn (Albert, Schwade, & Goldstein, 2018). Babbling also provides a signal that the infant is attentive and ready to learn. When an adult labels an object for an infant just after the infant babbles, the infant learns more than when the labeling occurs in the absence of babbling (Goldstein et al., 2010).

As discussed in Chapter 4, successful communication also requires *intersubjectivity*, in which two interacting partners share a mutual understanding. The foundation of intersubjectivity is *joint attention*, in which the caregiver follows the baby's lead, looking at and commenting on whatever the infant is looking at. By 12 months of age, infants have begun to understand the communicative nature of pointing, with many infants also able to point themselves (Behne et al., 2012).

PAUL BURNS/GETTY IMAGES

This toddler is pointing to get her father to share her attention—to achieve intersubjectivity. Once the father identifies the focus of his daughter's attention, he may even decide to add it to the shopping basket.

First Words

To learn words, infants must map sounds (or signs) onto meanings. How do they figure out what words mean? Take the word "bunny." Even if the child hears this new word in the presence of a rabbit, how does the child know whether it refers to the rabbit itself, to its fuzzy tail, to its color, or to the twitching of its nose (Quine, 1960)?

Early Word Recognition

Infants begin to understand highly frequent words surprisingly early on. When 6-month-olds hear either "Mommy" or "Daddy," they look toward an image of the appropriate person (Tincoff & Jusczyk, 1999). Bergelson and Swingley (2012) showed infants pairs of pictures of common foods and body parts and tracked the infants' eye gaze when one of the pictures was named (see Figure 6.6). Even 6-month-olds looked to the correct picture significantly more often than would be expected by chance. Strikingly, most of their parents reported that the infants did not know the meanings of these words. So not only do infants understand far more words than they can produce; they also understand far more words than even their caregivers realize. The same phenomenon occurs for autistic toddlers, who tend to have delayed language abilities (as we will discuss in Box 6.5): parents think that their autistic toddlers understand fewer words than they actually do, as measured by sensitive eye-tracking tasks (Venker et al., 2016).

PHOTO BY ELIKA BERGELSON

FIGURE 6.6 Eye-tracking studies When this infant hears the word *mouth*, will she look at the mouth or the apple? The speed and accuracy of her response provide a measure of her vocabulary knowledge.

With linguistic experience, infants become skilled at rapid word comprehension. In studies where infants were presented a pair of objects and hear one of them labeled, 15-month-olds waited until they had heard the whole word to look at the target object, but 24-month-olds looked at the correct object after hearing only the first part of its label, just as adults do (e.g., Fernald, Perfors, & Marchman, 2006).

first part of its label, just as adults do (e.g., Fernald, Perfors, & Marchman, 2006). Older children can also use context to help them recognize words. For example, toddlers who are learning a language that has a grammatical gender system (like Spanish or French) can use the gender of the article preceding the noun (*la* versus *el* in Spanish; *la* versus *le* in French) to speed their recognition of the noun itself (Lew-Williams & Fernald, 2007; Van Heugten & Shi, 2009).

PURESTOCK/AGE FOTOSTOCK

A classic problem posed by philosopher Willard Quine was how someone who does not know the word *bunny* could figure out exactly what those sounds refer to. These parents are helping their daughter learn a new word by labeling the referent while it is the focus of their child's attention.

Early Word Production

What counts as an infant's first word? It can be any specific utterance consistently used to refer to or express a meaning. Even with this loose criterion, identification of an infant's earliest few words can be problematic. For one thing, babbling can sound word-like. For another, early words may differ from their corresponding adult forms. For example, *Woof* was one of the first words spoken by the boy whose linguistic progress was illustrated at the beginning of this chapter. It was used to refer to the dog next door—both to excitedly name the animal when it appeared in the neighbors' yard and to wistfully request the dog's presence when it was absent.

On average, infants produce their first words between 10 and 15 months of age, but these early words are mispronounced in a variety of predictable ways. Infants leave out the difficult bits of words, turning *banana* into "nana," or they substitute easier sounds for hard-to-say ones—"bubba" for *brother*, "wabbit" for *rabbit*. Sometimes they

sounds for hard-to-say ones—"bubba" for *brother*, "wabbit" for *rabbit*. Sometimes they reorder parts of words to put an easier sound at the beginning of the word, as in the common "pisketti" (for *spaghetti*) or the more idiosyncratic "Cagoshin" (the way the child quoted at the beginning of the chapter pronounced *Chicago*).

Language Development in Infancy and Early Toddlerhood

Early words often refer to family members, pets, and important objects such as cookies, juice, and balls. Frequent routines are also labeled—"up," "bye-bye," "night-night." Important modifiers are also used—"mine," "hot," "all gone." Table 6.1 reveals substantial cross-linguistic similarities in the content of the most common first 10 words of children in the United States, Beijing, and Hong Kong. Many of infants' first words referred to specific people or were sound effects (Tardif et al., 2008). Indeed, early words across a range of cultures are similar in their meanings, suggesting that infants around the world have similar interests and priorities (Mayor & Plunkett, 2014).

TABLE 6.1 Rank-Ordered List of Earliest Words in Three Languages[i]

English	Putonghua (Mandarin)	Cantonese
Daddy	**Daddy**	**Mommy**
Mommy	Aah	**Daddy**
BaaBaa	**Mommy**	*Grandma (paternal)*
Bye	*YumYum*	*Grandpa (paternal)*
Hi	*Sister (older)*	**Hello?/Wei?**
UhOh	**UhOh** (Aiyou)	*Hit*
Grr	*Hit*	Uncle (paternal)
Bottle	**Hello/Wei**	Grab/grasp
YumYum	Milk	*Auntie (maternal)*
Dog	Naughty	**Bye**
No	*Brother (older)*	**UhOh** (Aiyou)
WoofWoof	*Grandma (maternal)*	*Ya/Wow*

[i]Words in boldface were common across all three languages; those in italics were common for two of the languages. Information from Tardif et al. (2008).

Initially, infants express their thoughts with one-word utterances. But what they want to talk about quickly outstrips their limited vocabularies. This dilemma results

in **overextension**—using a word in a broader context than is appropriate, as when children use *dog* for any four-legged animal, *moon* for a dishwasher dial, or *hot* for any reflective metal. Young children also exhibit **underextension**—using a word in a more limited context than appropriate, such as believing that *dog* refers only to their dog, but not the neighbor's dog. Both overextensions and underextensions represent efforts to communicate given the child's limited vocabulary. They may also reflect incorrect mappings between words and meanings that will have to be revised as language learning continues.

Word Learning

After producing their first words, children typically plod ahead slowly, reaching a productive vocabulary of 50 or so words by about 18 months of age. At this point, the rate of learning appears to accelerate, leading to what appears to be a "vocabulary spurt" (e.g., Bloom, 1973; McMurray, 2007). Although scholars disagree about whether learning actually speeds up for all or even most children (Bloom, 2000), it is clear that children's communicative abilities are growing rapidly (Figure 6.7).

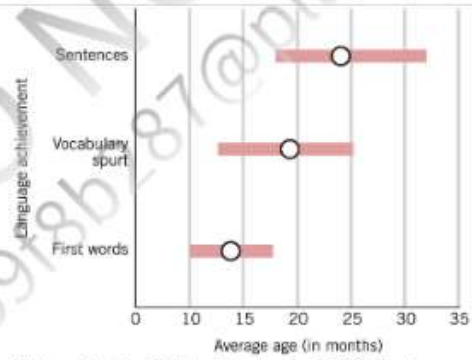

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FIGURE 6.7 Language achievement On average, American children say their first word at about 13 months, experience a vocabulary spurt at about 19 months, and begin to produce simple sentences at about 24 months. The error bars indicate substantial variability.

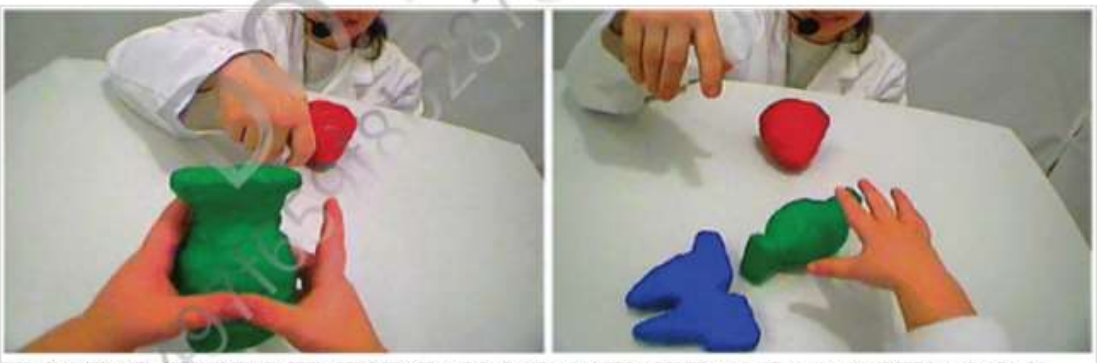
(Data from Bloom, 1998)

COURTESY OF JEAN L. BRIGGS

This young Inuit child is playing a naming game; her mother has just asked her to point to her nose.

Adult influences on word learning

The most important way that caregivers influence word learning is by talking to their children. As we discuss in Box 6.2, the amount and quality of talking that children hear predicts how many words they learn. In addition to using IDS, which makes word learning easier for infants, adults facilitate word learning by stressing or repeating new words. They also play naming games, asking the child to point to a series of named items—"Where's your nose?" "Where's your ear?" "Where's your tummy?" Adults can also enhance word learning by choosing optimal naming moments. For example, toddlers show better word learning when the object being labeled is centered in their visual field rather than in the periphery (see Figure 6.8; Pereira, Smith, & Yu, 2014).



REPUBLISHED WITH PERMISSION OF SPRINGER SCIENCE AND BUS MEDIA B V, FROM PEREIRA, A.F., ET AL. (2013) A BOTTOM UP VIEW OF TODDLER WORD LEARNING. 21:178, 178–185.

FIGURE 6.8 Visual information in word learning These images are taken from the infant's perspective; the infant is wearing a head-mounted eye tracker. The infant is more likely to learn the name for the green object when it is centered in the visual field (left panel) than when it is less prominent (right panel) at the moment it is labeled (Pereira, Smith, & Yu, 2014).

BOX 6.2 INDIVIDUAL DIFFERENCES

Language Development and Socioeconomic Status

Language Development and Socioeconomic Status

Parents often notice linguistic differences among their own children. These differences are greatly magnified across a community. In a single kindergarten classroom, there may be a tenfold difference in the number of words used by different children. What accounts for these differences?

The number of words children know is intimately related to the number of words they hear, which is linked to their caregivers' vocabularies. One of the key determinants of the language children hear is the socioeconomic status of their parents. In a seminal study, Hart and Risley (1995) recorded the speech that 42 parents used with their infants over the course of 2½ years. Some of the parents were upper-middle class, others were working class, and others were on welfare. The results were astonishing: the average child whose parents were on welfare received half as much linguistic experience (616 words per hour) as did the average working-class parents' child (1,251 words per hour) and less than one-third that of the average child in a professional family (2,153 words per hour). The researchers did the math and suggested that after 4 years, an average child with upper-middle-class parents would have heard 45 million words, compared with 26 million for an average child in a working-class family and 13 million for an average child with parents on welfare.

The researchers noted differences in how parents talked to their children as well, with more questions and conversations initiated in the higher-income families. More recent research suggests that these estimated differences in the amount of input may be exaggerated because they discount speech that is not directed to the child via a primary caregiver (Sperry, Sperry, & Miller, 2018). Nevertheless, this body of research has brought a great deal of attention to income disparities in language input, resulting in numerous policy initiatives designed to heighten parents' awareness of the amount they talk to their infants, including Bloomburg Philanthropies' Providence Talks (Rhode Island) and the Thirty Million Words Initiative (Chicago).

Why are researchers and policy makers so worried about the amount of language input that children receive? One reason is that the number of words that children hear predicts the number of words they learn. On average, children from higher-SES families have larger vocabularies than children from lower-SES families. Differences in the amount of language input also affect how quickly toddlers recognize familiar words: children whose mothers talked more to them at 18 months of age were faster at recognizing words at 24 months than were children whose mothers provided less input (Hurtado, Marchman, & Fernald, 2008).

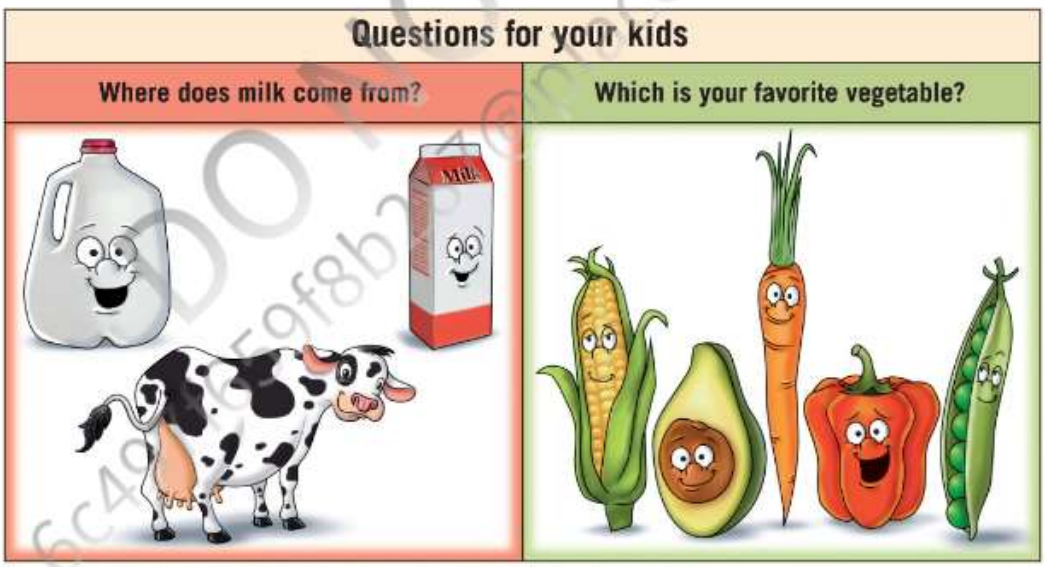
It is important to note that SES-related differences are average differences, subsuming a range of income brackets and parenting behaviors. In any given study, some parents from lower-SES backgrounds provide more input than some parents from higher-SES backgrounds (Rowe, 2018). And within groups of parents of similar SES, there is a great deal of variability in the amount of input parents provide. One study of low-income Spanish-speaking families in California found that 19-month-old infants who heard more speech had larger vocabularies and were faster at processing words 6 months later (Weisleder & Fernald, 2013). Thus, early differences in language input appear to have cascading effects on language development, potentially contributing to achievement gaps between wealthier and poorer children (e.g., Duncan & Murnane, 2011).

Input quality also impacts language learning, perhaps even more than input quantity. In one study of low-income toddlers, researchers found that the richness of the communicative context, as assessed by such variables as joint engagement, routines and rituals, and fluency, predicted children's language attainment a year later (Hirsh-Pasek, Adamson et al., 2015). Indeed, these indicators of quality were a better predictor of language development than the amount of speech the children heard. And

better predictor of language development than the amount of speech the children heard. And notably, children who experienced higher-quality language input—in particular, a greater number of conversational back-and-forths—showed greater activation in language areas of the brain (Romeo et al., 2018), as well as increased cortical surface area in left-hemisphere language regions (Merz et al., 2019).

The physical environments in which children learn language also influence the quality of language input. For example, toddlers have more difficulty learning new words in noisy environments (Dombroski & Newman, 2014; McMillan & Saffran, 2016). Children living in poverty are more likely to experience crowded and noisy home environments and to be exposed to street sounds and other sources of noise pollution that may make it more difficult for them to process language input.

Similar issues—of both quantity and quality in language input—emerge in the school context. When preschool children with low language skills are placed in classrooms with peers who also have low language skills, they show less language growth than do their counterparts who are placed with classmates who have high language skills (Justice et al., 2011). These peer effects have important implications for programs like Head Start (discussed fully in Chapter 8), which are designed to enhance language development and early literacy for children living in poverty. Congregating children from lower-SES families together in the same preschool classrooms may limit their ability to "catch up." However, negative peer effects may be offset by positive teacher effects. For example, one study found that children whose preschool teachers used a rich vocabulary showed better reading comprehension in 4th grade than did children whose preschool teachers used a more limited vocabulary (Dickinson & Porche, 2011).



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Signs with messages like these were placed around grocery stores in low-income neighborhoods to encourage caregivers to engage in more conversational interactions with their young children—and they worked!

One promising intervention to provide rich language exposure to children in low-SES environments lies in increased access to children's books, which often include words that parents don't typically use in conversation with their infants (Montag, Jones, & Smith, 2015). Reach Out and Read is an intervention program that provides books during pediatrician visits, building on studies that suggest that primary care physicians can influence language outcomes by modeling and promoting reading to

that primary care physicians can influence language outcomes by modeling and promoting reading to young children (High et al., 2014). Providing parents in Reach Out and Read programs with bookmarks that include age-specific advice about reading to children further increases family literacy-related behaviors (Obus et al., 2017).

Other interventions focus on increasing the amount of time that lower-SES parents spend speaking to their children. In one such intervention, signs were placed in supermarkets in low- and middle-SES neighborhoods, encouraging parents to converse with their children about foods they saw in the market (Ridge et al., 2015). In the low-SES neighborhood where the signs were present, parents increased both the quality and quantity of talk to their children while shopping (a similar effect was not found in the middle-SES neighborhood). Other interventions provide parents with individualized coaching about both quality and quantity of interactions; results suggest both enhanced parental input and larger child vocabularies (Ferjan Ramirez et al., 2018).

Larger-scale interventions like those mentioned earlier—Providence Talks and the Thirty Million Words Initiative—aim to do something similar by providing parents with recording devices that track how much they speak to their baby so that they can monitor and increase their amount of speech. These interventions are motivated by research suggesting that educating parents about their own role has a positive effect on language development outcomes (M. L. Rowe, 2008; Suskind et al., 2015). Finally, enhancing teacher training and support in low-income school settings is another promising route for intervention (Dickinson, 2011; Hindman, Wasik, & Snell, 2016). Regardless of the source, what goes in is what comes out: we can only learn words and grammatical structures that we hear (or see or read) in the language surrounding us.

Early word learning is also influenced by the contexts in which words are used. New words that are used in very distinct contexts (like kitchens or bathrooms) are produced earlier than words that are used across a range of contexts (Roy et al., 2015). These contexts can be quite specific. For example, while toddlers are generally better at learning the names for solid substances than non-solid substances, toddlers do better at learning the names for non-solids when seated in a high-chair—a context where they frequently encounter non-solid food items (Perry, Samuelson, & Burdinie, 2014).

Caregivers may also facilitate word learning by maintaining spatial consistency with the objects they are labeling. For instance, infants learn the names of objects more readily when the objects are presented in predictable locations (Benitez & Saffran, 2018; Benitez & Smith, 2012; Samuelson et al., 2011). Presumably, consistency in the visual environment helps children map words onto objects and events.

Children's contributions to word learning

When confronted with new words, children exploit the context in which the word was used in order to infer its meaning. Theorists have proposed that children are guided by a number of assumptions about the possible meanings of a new word. For

guided by a number of assumptions about the possible meanings of a new word. For example, children expect that a given entity will have only one name, an assumption referred to as *mutual exclusivity*. Early evidence for this assumption came from a study in which 3-year-olds saw pairs of objects—a familiar object for which the children had a name and an unfamiliar one for which they had no name. When the experimenter said, "Show me the blicket," the children mapped the novel label to the novel object, the one for which they had no name (see Figure 6.9a; Markman & Wachtel, 1988). Interestingly, bilingual and trilingual infants, who are accustomed to hearing more than one name for a given object, are less likely to follow the mutual exclusivity assumption in word learning (Byers-Heinlein & Werker, 2009) and, unlike monolingual infants, are unsurprised when an object has more than one name (Byers-Heinlein, 2017)

COURTESY OF JUDY DELOACHE

FIGURE 6.9 Cues for word learning (a) Mutual exclusivity: Because this child already knows the name of the familiar object, she will pick up the novel object when the adult requests "the blicket."

(b) Pragmatic cues: This child will assume that when the experimenter says a novel word, it refers to the novel object the experimenter is looking at, even though the child cannot see the object and is looking at a different novel object.

(c–d) Pragmatic cues: This child will learn "gazzer" as the name of the novel object that the adult smiles at triumphantly after she had previously announced that she wanted to find "the gazzer."

Another useful constraint on word learning is known as the *whole-object* assumption: children expect a novel word to refer to a whole object rather than to a part, property, action, or other aspect of the object (Markman, 1989). Thus, in the case of Quine's rabbit problem (see page 211), the whole-object assumption leads children to map the label "bunny" to the whole animal, not just to its tail or the twitching of its nose.

Children also exploit a variety of **pragmatic cues** to word meaning by paying attention to the *social contexts* in which the words are used. For example, children use an adult's focus of attention as a cue to word meaning. In a study by Baldwin (1993), an experimenter showed 18-month-olds two novel objects and then concealed them in separate containers. Next, the experimenter peeked into one of the containers and commented, "There's a modi in here." The adult then removed and gave both objects to the child. When asked for the "modi," the children picked the object that the experimenter had been looking at when saying the label (see Figure 6.9b).

Infants can even use an adult's emotional response to infer the name of a novel object that they cannot see (Tomasello, Strosberg, & Akhtar, 1996). In a study establishing this fact, an adult announced her intention to "find the gazzer." She then picked up one of two objects and showed obvious disappointment with it. When she gleefully seized the second object, the infants inferred that it was a "gazzer." (Figure 6.9c–d depicts another instance in which a child infers the name of an unseen object from an adult's emotional expression.)

If an adult's labeling of an object conflicts with a child's knowledge of that object, they will nevertheless accept the label if the adult clearly used it intentionally (for a recent review, see Harris et al., 2018). When an experimenter simply used the label "dog" in referring to a picture of a catlike animal, preschool children were reluctant to extend the label to other catlike stimuli, or to learn a new word from this "untrustworthy" adult. However, they were much more willing to do so when the experimenter made it clear that he really intended his use of the unexpected label by saying, "You're not going to believe this, but this is actually a dog."

Word Learning

Young children also use the linguistic context in which a novel word occurs to infer

Young children also use the linguistic context in which a novel word occurs to infer its meaning. In one of the first experiments on language acquisition, Roger Brown (1957) established that the grammatical form of a novel word influences how children interpret its meaning. He showed preschool children a picture of a pair of hands kneading a mass of material in a container (Figure 6.10). The picture was described to one group of children as "sibbing," to another as "a sib," and to a third as "some sib." The children subsequently interpreted *sib* as referring to the action, the container, or the material, depending on which form (verb, count noun, or mass noun) of the word they had heard. Even infants and toddlers can draw on some of these links to interpret the meaning of novel words (e.g., Ferguson, Graf, & Waxman, 2018).

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FIGURE 6.10 Linguistic context When Roger Brown, a pioneer in the study of language development, described a drawing like this as "sibbing," "a sib," or "some sib," preschool children made different assumptions about the meaning of "sib."

Object shape is another useful tool in word learning, possibly because shape is a good cue to category membership. Children readily extend a novel noun to novel objects of the same shape, even when those objects differ dramatically in size, color, and texture (Graham & Poulin-Dubois, 1999; Landau, Smith, & Jones, 1988). Thus, a child who hears a U-shaped wooden block called "a dax" will assume that *dax* also refers to a U-shaped object covered in blue fur or to a U-shaped piece of red wire—but not to a wooden block of a different shape (Figure 6.11). This attention to the shared shape of objects is evident in categorization tasks before infants have acquired many productive words (Graham & Diesendruck, 2010).