

E. Acquiring Language

Module 3

B. Neurons: Structure & Function

What do children's brains do?

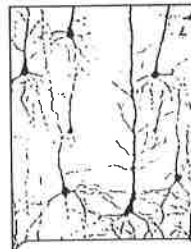
If Chomsky is correct that all children inherit the same innate program for learning grammar, then we would expect children from around the world to go through similar stages in developing language and acquiring the rules

for using language. And in fact, all children, no matter the culture or the language, do go through the same stages (Pinker, 1994).

Language stages refer to all infants going through four different periods or stages—babbling, single words, two-word combinations, and sentences. All children go through these four stages in the same order, and in each stage, children show new and more complex language skills.

The occurrence of each of the four stages is associated with further development of the brain. At birth, an infant's brain has almost all of its neurons but they have not yet made all their connections (adult brains can grow some new neurons—p. 49).

For example, a 6-month-old infant's brain (left figure) has few neural interconnections, which are associated with performing relatively



6-month-old brain has few connections.

simple behaviors, such as babbling. In comparison, a 24-month-old infant's brain (right figure) has hundreds of neural interconnections, which are associated with more complex behaviors, such as using two-word combinations (Ropper & Brown, 2005).



24-month-old brain has more connections.

Here are the four stages that each of us went through in learning to speak and understand the language of our parents or caregivers.

Four Stages in Acquiring Language

1 Babbling

One of the key features in human development is that infants begin to make sounds long before they can say real words. Infants repeat the same sounds over and over, and these sounds are commonly called babbling.

Babbling, which begins at about 6 months, is the first stage in acquiring language. Babbling refers to making one-syllable sounds, such as "deedeede" or "bababa," which are most common across all languages.

Bababa



A 6-month-old brain has limited capacity for language.



Babbling is an example of an innate "sound" program in the brain that is involved in making and processing sounds that will eventually be used to form words. Researchers have discovered that by 6 months of age, infants have already learned to discriminate between sounds, such as *ba* from *pa*, and to distinguish sounds in their native language from

those used in a foreign language (E. Bower, 2000). These findings indicate that, at an early age, infants have already become accustomed to making and hearing sounds that make up their native languages. At about 9 months, babbling sounds begin to resemble more the vowels and consonants that children will actually use in speaking their native languages.

In children who can hear, babbling is oral. In deaf children who have been exposed only to the sign language of their deaf parents, babbling is manual and not oral. That is, these babies babble by repeating the same hand sign over and over (Petitto & Marentette, 1991). This means that the brain has an innate program for acquiring language, whether spoken or sign language.

Through endless babbling, infants learn to control their vocal apparatus so that they can make, change, and repeat sounds and imitate the sounds of their parents or caregivers (Hoff, 2005). After babbling, infants begin to say their first words.

2 Single Word

Shortly before 1 year of age, an infant usually performs a behavior that every parent has been eagerly waiting for: to hear the child's first word. At about 1 year of age, infants begin not only to understand words but also to say single words.

Single words mark the second stage in acquiring language, which occurs at about 1 year of age. Infants say single words that usually refer to what they can see, hear, or feel.

An infant's ability to form sounds into words begins at about 8 months and results from an interaction between the brain's innate language program and the infant's experience with hearing sounds (Jusczyk & Hohne, 1997). About half the infant's single words refer to objects (juice, cookie, doll, dada), and the other half refer to actions, routines, or motions (up, eat, hot, more) (Pinker, 1994). The infant's single words, such as "Milk" or "Go," often stand for longer thoughts such as "I want milk" or "I want to go out."

As the infant learns to say words, parents usually respond by speaking in a specific way called parentese (motherese).

Parentese (motherese) is a way of speaking to young children in which the adult speaks in a slower and higher than normal voice, emphasizes and stretches out each word, uses very simple sentences, and repeats words and phrases.

In a study of mothers in the United States, Russia, and Sweden, researchers found that when talking to their infants, these mothers exaggerated certain sounds (vowel sounds), which they did not do when speaking to their husbands (Kuhl et al., 1997). Another researcher, who spent ten years traveling around the world to record child-parent interactions, concludes that parentese has two functions: getting an infant's attention and stimulating infants to make sounds they will need to speak themselves (Fernald, 1992).

Next, the young child begins to combine words.

Milk. Go.



A 1-year-old brain has more connections and more capacity for language.

3 Two-Word Combinations

Starting around age 2, children begin using single words that they have learned to form two-word combinations.

Two-word combinations, which represent the third stage in acquiring language, occur at about 2 years of age. Two-word combinations are strings of two words that express various actions (“Me play,” “See boy”) or relationships (“Hit ball,” “Milk gone”).

Hit ball.
Me play.



A 2-year-old brain has many connections and more capacity for language.



Each of the two words provides a hint about what the child is saying. In addition, the relationship between the two words gives hints about what the child is communicating. For example, “See boy” tells us to look at a specific object; “Daddy shirt” tells us that something belongs to Daddy. The child’s new ability to communicate by combining two words and changing their order marks the beginning of learning the rules of grammar. From about 2 years of age through adolescence, a child learns an average of a new word every 2 hours (Pinker, 1994).

A child’s language development is partly dependent on how responsive the parent or caretaker is. A responsive parent shows more contact, awareness, and warmth during the child’s verbal interactions. For

example, infants whose mothers were more responsive to their speech at 13 months had more advanced language abilities, including larger vocabularies at 21 months, compared to children of less responsive mothers (Tamis-LeMonda et al., 2001).

By the age of 2, a child may have a vocabulary of more than 50 words, many of which will be used in two-word combinations. Although children usually go through a stage of forming single words and then two-word combinations, there is no three-word stage. Instead, at a certain point the child will begin to form sentences, which gradually increase in length through the fourth year.

Going through the Stages

How fast does a child go through the stages?

Parents or caregivers sometimes worry about whether their child is late in developing language. In the real world, normal children pass through the four stages



1. Babbling



2. Single word



3. Two words



4. Sentences

of language at a pace that can vary by a year or more. However, as Chomsky’s theory predicts and research has shown, all normal children pass through the four stages, even though some of the stages may begin later or last for shorter or longer periods of time (Pinker, 1994).

As children proceed through the stages, there is a continuous interaction between environmental stimuli and brain development. For example, researchers used brain scans to identify maximum neural activity in 3-month-old infants who were listening to recordings of

4 Sentences

Children make a rather large language leap when they progress from relatively simple two-word combinations to using longer and more complex sentences.

Sentences, which represent the fourth stage of acquiring language, occur at about 4 years of age. Sentences range from three to eight words in length and indicate a growing knowledge of the rules of grammar.

However, a child’s first sentences differ from adult sentences in that the child may omit the “small words” and speak in a pattern that is called telegraphic speech.

Telegraphic speech is a distinctive pattern of speaking in which the child omits articles (the), prepositions (in, out), and parts of verbs.

For example, an adult may say, “I’m going to the store.” A 3- to 4-year-old child may use telegraphic speech (omit article) and say, “I go to store.” However, by the time children are 4 or 5 years old, the structure of their sentences improves and indicates that they have learned the basic rules of grammar.

Basic rules of grammar are the rules for combining nouns, verbs, adjectives, and other parts of speech to form meaningful sentences.

However, as children learn the rules of grammar, they often make errors of overgeneralization.

Overgeneralization means applying a grammatical rule to cases where it should not be used.

For example, after a child learns the rule of forming the past tense of many verbs by adding a *d* sound to the end, he or she may overgeneralize this rule and add a *d* to the past tense of irregular verbs (and say, for instance, “I goed to store”). By the time children enter school, they usually have a good grasp of the general rules of their language.

I goed to store.
I want blue toy.



A 4- to 5-year-old brain has significantly more connections so that a child can learn the basic rules of complex grammar.

human speech. The infants showed increased neural activity in brain areas that were similar to those used by adults in speaking and understanding language (Dehaene-Lambertz et al.,

2002). This study shows how environmental stimulation—hearing language sounds—activated the “language areas” of infants’ brains long before infants actually begin speaking. This study is a good example of how the brain and environment interact in the development of spoken language and points out the importance of caregivers regularly talking to (verbally stimulating) their infants.

Next, we’ll discuss a number of innate (genetic) and environmental interactions that are important in the development of language.