CHAPTER 8

Language Acquisition

The acquisition of language "is doubtless the greatest intellectual feat any one of us is ever required to perform."

Leonard Bloomfield, *Language* (1933)

The capacity to learn language is deeply ingrained in us as a species, just as the capacity to walk, to grasp objects, to recognize faces. We don't find any serious differences in children growing up in congested urban slums, in isolated mountain villages, or in privileged suburban villas.

Dan Slobin, *The Human Language Series 2* (1994)

Every aspect of language is extremely complex. Yet very young children — before the age of five — already know most of the intricate system we have been calling the grammar of a language. Before they can add 2 + 2, children are conjoining sentences, asking questions, using appropriate pronouns, negating sentences, forming relative clauses, and using the syntactic, phonological, morphological, and semantic rules of the grammar.

A normal human being can go through life without learning to read or write. Millions of people in the world today do. These same people speak and understand a language, and they can discuss ideas as complex and abstract as literate speakers can. Learning to speak and understand a language, and learning to read and write, are different. Similarly, millions of humans never learn algebra or chemistry or how to use a computer. They must be taught these skills or systems, but they do not have to be taught to walk or to talk. In fact, "We are designed to walk. . . . That we are taught to walk is impossible. And pretty much the same is true of language. Nobody is taught language. In fact you can't prevent the child from learning it."[1]

The study of the grammars of human languages has revealed a great deal about language acquisition, about what a child does and does not do when learning a language. First, it is obvious that children do not learn a language by storing all the words and all the sentences in some giant mental dictionary. The list of words is finite, but no dictionary can hold all the sentences, which are infinite in number. Rather, they learn to construct and understand sentences, most of which they have never produced or heard before.

Children must therefore construct the rules that permit them to use their language creatively. No one teaches them these rules. Their parents are no more aware of the phonological, morphological, syntactic, and semantic rules than are the children. Even if you remember your early years, do you remember anyone telling you to form a sentence by adding a verb phrase to a noun phrase, or to add [s] or [z] to form plurals? Children seem to act like efficient linguists equipped with a perfect theory of language, and they use this theory to construct the grammar of the language they hear.

In the preceding chapters you saw something of the richness and complexity of human language (but only a bit). How do children acquire such an intricate system so quickly and effortlessly? Even more difficult, the child must figure out the rules of language from very "noisy" data. She hears sentence fragments, false starts, speech errors, and interruptions. No one tells the child "this is a grammatical utterance and this is not." Yet, somehow she is able to "recreate" the grammar of the language of her speech community based on the language she hears around her. How does the child accomplish this phenomenal task?

Mechanisms of Language Acquisition

There have been various proposals concerning the psychological mechanisms involved in acquiring a language. Early theories of language acquisition were heavily influenced by behaviorism, a school of psychology prevalent in the 1950s. As the name implies,

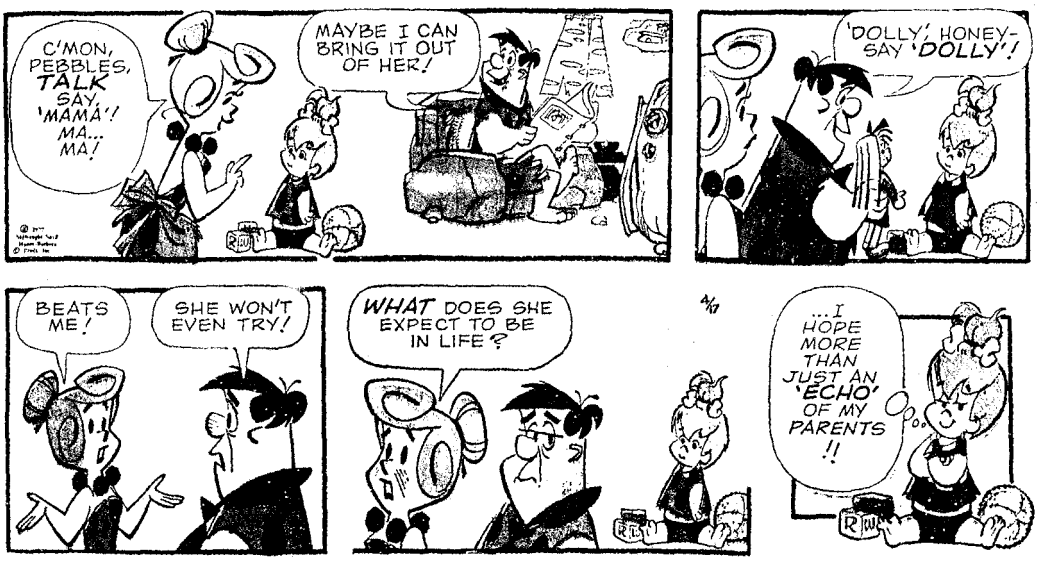
[1] N. Chomsky. 1994. *The Human Language Series* 2. G. Searchinger. New York: Equinox Films/Ways of Knowing, Inc.

behaviorism focused on people's behaviors, which are directly observable, rather than on the mental systems underlying these behaviors. Language was viewed as a kind of verbal behavior and it was proposed that children learn language through imitation, reinforcement, analogy, and similar processes.[2]

Do Children Learn through Imitation?

CHILD: My teacher holded the baby rabbits and we patted them.
ADULT: Did you say your teacher held the baby rabbits?
CHILD: Yes.
ADULT: What did you say she did?
CHILD: She holded the baby rabbits and we patted them.
ADULT: Did you say she held them tightly?
CHILD: No, she holded them loosely.

Courtney Cazden[3]



"Flintstones" reprinted by permission of Hanna-Barbera.

At first glance the question of how children acquire language doesn't seem to be such a difficult one to answer. Don't children just listen to what is said around them and imitate the speech they hear? **Imitation** is involved to some extent, of course, but the early words and sentences that children produce show that they are not simply imitating adult speech. Children do not hear words like *holded* or *tooths* or sentences such as *Cat*

[2] B. F. Skinner, one of the founders of behaviorist psychology, proposed a model of language acquisition in his book *Verbal Behavior* (1957). Two years later, in a devastating reply to Skinner, *Review of Verbal Behavior* (1959), Chomsky showed that language is a complex cognitive system that could not be acquired by behaviorist principles.

[3] C. Cazden. 1972. *Child Language and Education.* New York: Holt, Rinehart and Winston, p. 92.

stand up table or many of the other utterances they produce between the ages of two and three, such as the following:[4]

a my pencil
two foot
what the boy hit?
other one pants
Mommy get it my ladder
cowboy did fighting me

Even when children are trying to imitate what they hear, they are unable to produce sentences that they would not spontaneously produce.

ADULT:	He's going out.	CHILD:	He go out
ADULT:	That's an old-time train.	CHILD:	Old-time train.
ADULT:	Adam, say what I say Where can I put them?	CHILD:	Where I can put them?

Imitation cannot account for another important phenomenon: children who are unable to speak for neurological or physiological reasons learn the language spoken to them and understand it. When they overcome their speech impairment, they immediately use the language for speaking.

Do Children Learn through Reinforcement?

CHILD: Nobody don't like me.
MOTHER: No, say "Nobody likes me."
CHILD: Nobody don't like me.
(dialogue repeated eight times)
MOTHER: Now, listen carefully, say "*Nobody likes me.*"
CHILD: Oh, nobody don't likes me.

Another proposal is that children learn to produce correct (grammatical) sentences because they are positively reinforced when they say something right, and negatively reinforced when they say something wrong. One kind of reinforcement is correction of "bad grammar" and reward for "good grammar." Roger Brown and his colleagues at Harvard University studied parent-child interactions. They report that reinforcement seldom occurs, and when it does, it is usually incorrect pronunciation or incorrect reporting of facts that is corrected. They note, for example, that the ungrammatical sentence "Her curl my hair" was not corrected because Eve's mother was in fact curling her hair. However, when Eve uttered the syntactically correct sentence "Walt Disney comes on Tuesday" she was corrected because the television program was shown on Wednesday. They conclude that it is "truth value rather than syntactic well-formedness that

[4] Unless otherwise noted, the examples of child language in this chapter were taken from CHILDES (Child Language Data Exchange System), a computerized database of the spontaneous speech of children as they acquire many different languages. B. MacWhinney and C. Snow. 1985. "The Child Language Data Exchange System," *Journal of Child Language* 12:271–96.

chiefly governs explicit verbal reinforcement by parents — which renders mildly paradoxical the fact that the usual product of such a training schedule is an adult whose speech is highly grammatical but not notably truthful."[5]

Even if syntactic correction occurred more often than it actually does, it would not explain how or what children learn from such adult responses, or how children discover and construct the correct rules. In fact, attempts to correct a child's language are doomed to failure. Children do not know what they are doing wrong and are unable to make corrections even when they are pointed out, as shown by the preceding example and the following one:

CHILD: Want other one spoon, Daddy.
FATHER: You mean, you want *the other spoon.*
CHILD: Yes, I want other one spoon, please, Daddy.
FATHER: Can you say "the other spoon"?
CHILD: Other . . . one . . . spoon.
FATHER: Say . . . "other."
CHILD: Other.
FATHER: Spoon.
CHILD: Spoon.
FATHER: Other . . . spoon.
CHILD: Other . . . spoon. Now give me other one spoon?

Such conversations between parents and children do not occur often. This conversation was between a linguist studying child language and his child. Mothers and fathers are usually delighted that their young children are talking and consider every utterance a gem. The "mistakes" children make are cute and repeated endlessly to anyone who will listen.

Do Children Learn Language through Analogy?

It has also been suggested that children put words together to form phrases and sentences by **analogy**, by hearing a sentence and using it as a sample to form other sentences. But this doesn't work, as Lila Gleitman points out:

> So suppose the child has heard the sentence "I painted a red barn." So now, by analogy, the child can say "I painted a blue barn." That's exactly the kind of theory that we want. You hear a sample and you extend it to all of the new cases by similarity. . . . In addition to "I painted a red barn" you might also hear the sentence "I painted a barn red." So it looks as if you take those last two words and switch their order. . . . So now you want to extend this to the case of seeing, because you want to look at barns instead of paint them. So you have heard, "I saw a red barn." Now you try (by analogy) a . . . new sentence — "I saw a barn red." Something's gone wrong. This is an analogy, but the analogy didn't work. It's not a sentence of English.[6]

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[5] Brown, R.O. 1973. *Early Syntactic Development.* Cambridge, MA: MIT Press, p. 330.

[6] *The Human Language Series 2.* 1994. By G. Searchinger. New York: Equinox Films/Ways of Knowing, Inc.

This problem arises constantly. Consider another example. The child hears the following pair of sentences:

The boy was sleeping. Was the boy sleeping?

Based on pairs of sentences like this, he formulates a rule for forming questions, "move the auxiliary to the position preceding the subject." He then acquires the more complex relative clause construction:

The boy who is sleeping is dreaming about a new car.

He now wants to form a question. What does he do? If he forms a question on analogy to the simple yes-no question, he will move the first auxiliary *is* as follows.

*Is the boy who sleeping is dreaming about a new car?

Studies of spontaneous speech, as well as experiments, show that children never make mistakes of this sort. As discussed in chapter 4, sentences have structure, and the rules of grammar, such as the rule that moves the auxiliary, are sensitive to structure and not to linear order. Children seem to know about the structure dependency of rules at a very early age.

Recently, a computer model of language representation and acquisition called **connectionism** has been proposed that relies in part on behaviorist learning principles such as analogy and reinforcement. In the connectionist model no grammatical rules are stored anywhere. Linguistic knowledge, such as knowledge of the past tense, is represented by a set of neuronlike connections between different phonological forms, for example, between *play* and *played, dance* and *danced, drink* and *drank,* and so on. Repeated exposure to particular verb pairs in the input reinforces the connection between them, mimicking rule-like behavior. Based on similarities between words, the model can produce a past-tense form that it was not previously exposed to. On analogy to *dance-danced,* it will convert *prance* to *pranced;* on analogy to *drink-drank* it will convert *sink* to *sank.*

As a model of language acquisition, connectionism faces some serious challenges. The model relies on specific properties of the input data. However, investigation of the input that actual children receive shows that it is not consistent with the assumptions of this model. Past-tense learning cannot be based on phonological form alone but must also be sensitive to information in the lexicon. For example, the past tense of a verb derived from a noun is always regular even if an irregular form exists. When a fly ball is caught in a baseball game, we say the batter *flied out* not *flew out.* Similarly, when an irregular plural is part of a larger noun, it may be regularized. When we see several images of Walt Disney's famous rodent we describe them as Mickey Mouses, not Mickey Mice.

Do Children Learn through Structured Input?

Yet another suggestion is that children are able to learn language because adults speak to them in a special "simplified" language sometimes called **motherese**, or **child directed speech** (CDS) (more informally, **baby talk.**) This theory of acquisition places a lot of emphasis on the role of the environment in facilitating language acquisition.

In our culture adults do typically talk to young children in a special way. We tend to speak more slowly and more clearly, we exaggerate our intonation, and sentences are generally grammatical. However, motherese is not syntactically simpler. It contains a range of sentence types, including syntactically complex sentences such as questions: *Do you want your juice now?* Embedded sentences: *Mommy thinks you should sleep now.* Imperatives: *Pat the dog gently!* Negatives with tag questions: *We don't want to hurt him, do we?* Indeed, it is fortunate that motherese is not syntactically restricted. If it were, children might not have sufficient information to extract the rules of their language.

Although infants prefer to listen to motherese than normal adult speech, controlled studies show that motherese does not significantly affect the child's language development. In many cultures adults do not use a special register with children, and there are even communities in which adults hardly talk to babies at all. Children acquire language in much the same way, irrespective of these varying circumstances. Finally, adults seem to be the followers rather than the leaders in this enterprise. The child does not develop because he is exposed to ever more adultlike language. Rather, the adult adjusts his language to the child's increasing linguistic sophistication.

The exaggerated intonation and other properties of motherese may be useful for getting a child's attention and holding it, but it is not a driving force behind language development.

Analogy, imitation, and reinforcement cannot account for language development because they are based on the (implicit or explicit) assumption that what the child acquires is a set of sentences or forms rather than a set of grammatical rules. Theories that assume that acquisition depends on a specially structured input also place too much emphasis on the environment rather than on the grammar-making abilities of the child. These proposals do not explain the creativity that children show in acquiring language, why they go through stages, or why they make some kinds of "errors" but not others.

Children Construct Grammars

> Language learning is not really something that the child does; it is something that happens to the child placed in an appropriate environment, much as the child's body grows and matures in a predetermined way when provided with appropriate nutrition and environmental stimulation.
>
> Noam Chomsky[7]

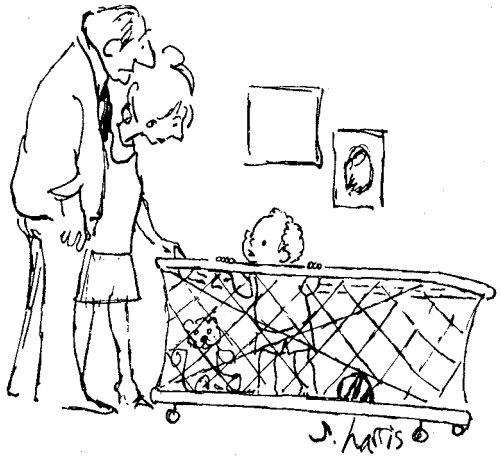
Language acquisition is a creative process. Children are not given explicit information about the rules, by either instruction or correction. They must somehow extract the rules of the grammar from the language they hear around them, and their linguistic environment does not need to be special in any way for them to do this. Observations of children acquiring different languages under different cultural and social circumstances

[7] N. Chomsky. 1988. *Language and the Problem of Knowledge: The Managua Lectures.* Cambridge, MA: MIT Press.

reveal that the developmental stages are similar, possibly universal. Even deaf children of deaf signing parents go through stages in their signing development that parallel those of children acquiring spoken languages. These factors lead many linguists to believe that children are equipped with an innate template or blueprint for language — **Universal Grammar** (UG) — and this blueprint aids the child in the task of constructing a grammar for her language. This is referred to as the **innateness hypothesis.**

The Innateness Hypothesis

> How comes it that human beings, whose contacts with the world are brief and personal and limited, are able to know as much as they do know?
>
> Bertrand Russell[8]



"WHAT'S THE BIG SURPRISE? ALL THE LATEST THEORIES OF LINGUISTICS SAY WE'RE BORN WITH THE INNATE CAPACITY FOR GENERATING SENTENCES."

The innateness hypothesis receives its strongest support from the observation that the grammar a person ends up with is vastly underdetermined by linguistic experience. In other words, we end up knowing far more about language than is exemplified in the language we hear around us. This argument for the innateness of UG is called the **poverty of the stimulus.**

Although children hear many utterances, the language they hear is incomplete, noisy, and unstructured. We said earlier that child directed speech is largely well formed, but children are also exposed to adult-adult interactions. These utterances include slips of the tongue, false starts, ungrammatical and incomplete sentences, and no information as to which utterances are well formed. Most important, children come to know aspects

[8] B. Russell. 1948. *Human Knowledge: Its Scope and Limits.* New York: Simon and Schuster.

of the grammar about which they receive *no* information. In this sense, the data they are exposed to is **impoverished.** It is less than what is necessary to account for the richness and complexity of the grammar they attain.

For example, we noted that the rules children construct are **structure dependent.** Children do not produce questions by moving the "first" auxiliary as in (1). Instead, they correctly invert the auxiliary of the main clause, as in (2). [We use ____ to mark the position from which a constituent moves.]

1. *Is the boy who ____ sleeping is dreaming of a new car.
2. Is the boy who is sleeping ____ dreaming of a new car.

To come up with a rule that moves the auxiliary of the main clause rather than the first auxiliary, the child must know something about the structure of the sentence.

Children are not told about structure dependency. They are not told about constituent structure. The input they get is a sequence of sounds, not a set of phrase structure trees. No amount of imitation, reinforcement, analogy, or structured input will lead the child to formulate a phrase structure tree or a principle of structure dependency. Yet, children do create phrase structures, and the rules they acquire are sensitive to this structure.

The knowledge that children and adults have of abstract principles (principles not identified in the input) can be shown in countless ways. The rules for formation of *wh* questions provide another illustration.

Statement	**Question**
Jack went up the hill.	Who went up the hill?
Jack and Jill went up the hill.	Who went up the hill?
Jack and Jill went home.	Jack and who went home?
Jill ate bagels and lox.	Jill ate what?
Jill ate cookies and ice cream.	Jill ate cookies and what?

To ask a question the child learns to replace the noun phrase (NP) *Jack, Jill, ice cream,* or *school,* or the coordinate NPs *Jack and Jill* or *bagels and lox* with the appropriate *wh* question word, *who* or *what* or *where.*

The *wh* phrase can replace any subject or object NP. But in coordinate structures, the *wh* phrase must stay in the original NP position. It can't be moved, as the following sentences show.

*Who did Jack and ____ go up the hill?
*What did Jill eat bagels and ____?

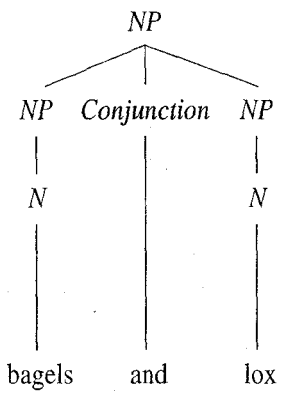
These sentences are ungrammatical, yet the following are acceptable:

Statement	**Question**
Jill ate bagels with lox.	What did Jill eat bagels with ____?
Jack went up the hill with Jill.	Who did Jack go up the hill with ____?

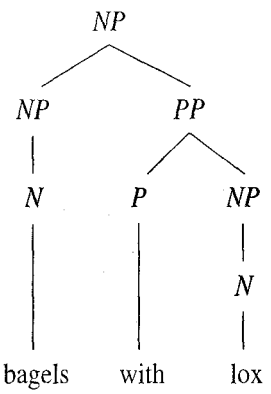
What accounts for the difference between the "and" questions and the "with" questions? *Bagels and lox* is a coordinate NP, that is, two NPs conjoined with *and* (NP and

NP). But *bagels with lox* is an NP composed of an NP followed by a prepositional phrase (NP + PP), as shown by the following diagrams.

Coordinate NP



NP + PP



In all languages that linguists have investigated, a coordinate structure constraint is part of the grammar. It prohibits the movement of a *wh* phrase out of a coordinate structure. Children do make errors in their early *wh* questions, but they never produce sentences that violate the coordinate structure constraint like the starred ones above . No one has told them that these sentences are impossible. No one corrects them because children never utter them to begin with. How do children know that *wh* phrases are frozen inside a coordinate structure? According to the innateness hypothesis, children come "prewired" with knowledge of Universal Grammar, including structure dependency and the coordinate structure constraint, among many other principles.

Of course the child must also learn many aspects of grammar from the specific linguistic environment. For example, English-speaking children learn that the subject comes first and that the verb precedes the object inside the VP. More technically, English is an SVO language. Japanese children acquire an SOV language. They learn that the object precedes the verb. Japanese children also learn that to form a yes-no question, the morpheme *-ka* is suffixed to a verb stem. In Japanese, sentence constituents are not rearranged. English-speaking children must learn that yes-no questions are formed by moving constituents. In yes-no questions the auxiliary moves from its original position to the beginning of the sentence, as follows:

You will come home → Will you ____ come home?

English-speaking children must also learn that in *wh* questions the *wh* phrase moves as follows (with the additional complexity of inserting *do*):

You like who → Who do you like ____?

In Mandarin Chinese, as in many other Asian languages, speakers form questions by leaving the question word in its original position, as in the example below; Chinese children obviously learn the Chinese way of forming questions:

Ni xihuan shei
'You like who'

According to the innateness hypothesis, the child extracts from the linguistic environment those rules of grammar that are language specific, such as word order and movement rules. However, he does not need to learn universal principles like structure dependency and the coordinate structure constraint, or general rules of sentence formation such as the fact that heads of categories can take complements. They are part of the innate blueprint for language that children use to construct the grammar of their language. For example, the English-speaking child must learn that forming a question involves movement of an auxiliary. This rule takes time to acquire and children may initially form questions with uninverted auxiliaries as follows.

Where Mommy is going?
What you can do?

Nevertheless, children never make the mistake of moving the wrong auxiliary in a complex sentence or a *wh* phrase out of a coordinate structure.

The innateness hypothesis provides an answer to *the logical problem of language acquisition* posed by Chomsky: What accounts for the ease, rapidity, and uniformity of language acquisition in the face of impoverished data? The answer is that children acquire a complex grammar quickly and easily without any particular help beyond exposure to the language because they do not start from scratch. UG helps them to extract the rules of their language and to avoid many grammatical errors. Because the child constructs his grammar according to an innate blueprint, all children proceed through similar developmental stages as we will discuss in the next section.

The innateness hypothesis also predicts that all languages will conform to the principles of UG. We are still far from understanding the full nature of the principles of UG. Research on more and more languages provides a way to test principles like the coordinate structure constraint, that linguists propose are part of our genetic makeup for language. If we investigate a language in which posited UG principles are absent, we will have to correct our theory and substitute other principles, as scientists must do in any field. But there is little doubt that human languages conform to abstract universal principles, and that the human brain is specially equipped for acquisition of human language grammars.

Stages in Language Acquisition

> . . . for I was no longer a speechless infant; but a speaking boy. This I remember; and have since observed how I learned to speak. It was not that my elders taught me words . . . in any set method; but I . . . did myself . . . practice the sounds in my memory. . . . And thus by constantly hearing words, as they occurred in various sentences . . . I thereby gave utterance to my will.
>
> St. Augustine *Confessions* (transl. F. J. Sheed, 1944), (circa 400 C.E.)

Children do not wake up one fine morning with a fully formed grammar in their heads. Relative to the complexity of the adult grammar that they eventually attain, the process of language acquisition is fast, but it is not instantaneous. From first words to virtual

adult competence takes three to four years, during which time children pass through linguistic stages. They begin by babbling, they then acquire their first words, and in just a few months they begin to put words together into sentences.

Observations of children in different language areas of the world reveal that the stages are similar, possibly universal. Some of the stages last for a short time; others remain longer. Some stages may overlap for a short period, though the transition between stages is often sudden.

The earliest studies of child language acquisition come from diaries kept by parents. More recent studies include the use of tape recordings, videotapes, and controlled experiments. Linguists record the spontaneous utterances of children and purposefully elicit other utterances to study the child's production and comprehension. Researchers have also invented ingenious techniques for investigating the linguistic abilities of infants, who are not yet speaking.

What the studies show is that child language is not just a degenerate form of adult language. At each stage of development the child's language conforms to a set of rules, a grammar. Although child grammars and adult grammars differ in certain respects, they also share many formal properties. Like adults, children have grammatical categories such as NP and VP, rules for building phrase structures and for moving constituents, as well as phonological rules, morphological rules, and semantic rules, and they adhere to universal principles such as structure dependency.

As we will illustrate, children's early utterances may not completely resemble comparable adult sentences. This is because the words and sentences the child produces conform to the phonology, morphology, and syntax that he has developed to that point. This may be why children do not respond to correction. *Nobody don't like me* and *want 'nother one spoon, daddy* may contain errors from the perspective of the adult grammar, but they are not errors from the child's point of view. They reflect his current grammar. Indeed, the so-called errors that children make provide us with a window into their grammar.

The Perception and Production of Speech Sounds

> An infant crying in the night:
> An infant crying for the light:
> And with no language but a cry.
>
> Alfred Lord Tennyson, "In Memoriam H.H.S."

The old idea that the neonate is born with a mind that is like a blank slate is belied by a wealth of evidence that infants are highly sensitive to some subtle distinctions in their environment and not to others. That is, the mind appears to be attuned at birth to receive certain kinds of information.

Experiments have shown that infants will increase their sucking rate when stimuli (visual or auditory) presented to them are varied, but will decrease the sucking rate when the same stimuli are presented repeatedly. Infants will respond to visual depth and distance distinctions, to differences between rigid and flexible physical properties of objects, and to human faces rather than to other visual stimuli.

Similarly, newborns respond to phonetic contrasts found in human languages even when these differences are not phonemic in the language spoken in the baby's home. A baby hearing a human voice over a loudspeaker saying [pa] [pa] [pa] will slowly decrease her rate of sucking. If the sound changes to [ba] or even [p^ha], the sucking rate increases dramatically. Controlled experiments show that adults find it difficult to differentiate between the allophones of one phoneme, but for infants it comes naturally. Japanese infants can distinguish between [r] and [l] while their parents cannot; babies can hear the difference between aspirated and unaspirated stops even if students in an introductory linguistics course cannot. Babies can discriminate between sounds that are phonemic in other languages and nonexistent in the language of their parents. For example, in Hindi, there is a phonemic contrast between a retroflex [ʈ] and the alveolar [t]. To English-speaking adults, these sound the same; to their infants, they do not.

Babies will not react, however, to distinctions that never correspond to phonemic contrasts in any human language, such as sounds spoken more or less loudly or sounds that lie between two phonemes. Furthermore, a vowel that we perceive as [i] or [u] or [a] is a different physical sound when produced by a male, female, or child, but babies ignore the nonlinguistic aspects of the speech signal just as we do. An [i] is an [i] is an [i] to an infant even if the physical sound is different. They do not increase their sucking rate when, after hearing many [i]s spoken by a male, they then hear an [i] spoken by a female. Yet, computational linguists still have difficulty programming computers to recognize these different signals as the "same."

An infant could not have learned to perceive linguistically relevant distinctions and ignore others, such as sex of the speaker. Infants appear to be born with the ability to perceive just those sounds that are phonemic in some language. They can perceive voicing contrasts such as [pa] versus [ba], contrasts in place of articulation such as [da] versus [ga], and contrasts in manner of articulation such as [ra] versus [la], or [ra] versus [wa], among many others. This partially accounts for the fact that children can learn any human language to which they are exposed. Infants have the sensory and motor abilities to produce and perceive speech sounds. During the first years of life the infant's job is to uncover the sounds of this language. From around six months, they begin to lose the ability to discriminate between sounds that are not phonemic in their own language. Their linguistic environment molds their initial perceptions. Japanese infants can no longer hear the difference between [r] and [l], which do not contrast in Japanese, whereas babies in English-speaking homes retain this perception. They have begun to learn the sounds of the language of their parents. Before that, they appear to know the sounds of human language in general.

The shaping by the linguistic environment that we see in perception also occurs in the speech the infant is producing. At around six months, the infant begins to babble. The sounds produced in this period include many which do not occur in the language of the household. However, **babbling** is not linguistic chaos. The twelve most frequent consonants in the world's languages make up 95 percent of the consonants infants use in their babbling. There are linguistic constraints even during this very early stage. The early babbles consist mainly of repeated consonant-vowel sequences, like *mama, gaga,* and *dada.* Later babbles are more varied.

Gradually, the child's babbles come to include only those sounds and sound combinations that occur in the target language. Babbles begin to sound like words though

they may not have any specific meaning attached to them. At this point adults can distinguish the babbles of an English-babbling infant from those of an infant babbling in Cantonese or Arabic. During the first year of life the infant's perceptions and productions are being fine-tuned to the language(s) of the surroundings.

Deaf infants produce babbling sounds that are different from those of hearing children. Babbling is related to auditory input and is linguistic in nature. Studies of vocal babbling of hearing children, and manual babbling of deaf children, support the view that babbling is a linguistic ability related to the kind of language input the child receives. These studies show that four to seven month old hearing infants exposed to spoken language produce a restricted set of phonetic forms. At the same age, deaf children exposed to sign language produce a restricted set of signs. In each case the forms are drawn from the set of possible sounds or possible gestures found in spoken and signed languages.

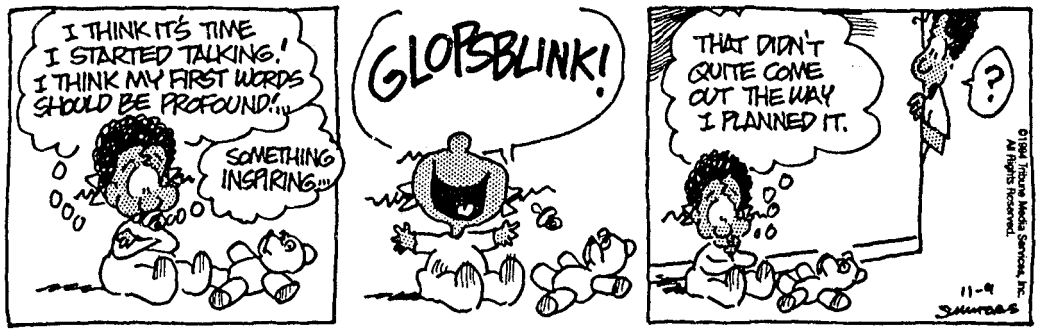
Babbling illustrates the readiness of the human mind to respond to linguistic cues from a very early stage. During the babbling stage, the intonation contours produced by hearing infants begin to resemble the intonation contours of sentences spoken by adults. The semantically different intonation contours are among the first linguistic contrasts that children perceive and produce. During this same period, the vocalizations produced by deaf babies are random and nonrepetitive. Similarly, the manual gestures produced by hearing babies differ greatly from those produced by deaf infants exposed to sign language. The hearing babies move their fingers and clench their fists randomly with little or no repetition of gestures. The deaf infants, however, use more than a dozen different hand motions repetitively, all of which are elements of American Sign Language, or the other sign languages used in deaf communities of other countries.

The generally accepted view is that humans are born with a predisposition to discover the units that serve to express linguistic meanings, and that at a genetically specified stage in neural development, the infant will begin to produce these units — sounds or gestures — depending on the language input the baby receives. This suggests that babbling is the earliest stage in language acquisition, in opposition to the earlier view that babbling was prelinguistic and merely neuromuscular in origin.

First Words

> From this golden egg a man, Prajapati, was born. . . . A year having passed, he wanted to speak. He said bhur and the earth was created. He said bhuvar and the space of the air was created. He said suvar and the sky was created. That is why a child wants to speak after a year. . . . When Prajapati spoke for the first time, he uttered one or two syllables. That is why a child utters one or two syllables when he speaks for the first time.
>
> Hindu Myth

Sometime after the age of one, children begin to use repeatedly the same string of sounds to mean the same thing. At this stage children realize that sounds are related to meanings. They have produced their first true words. This is an amazing feat. How do they discover where one word begins and another leaves off? Speech is a continuous stream broken only by breath pauses. Children are in the same fix that you might be in if you



tuned in a foreign language radio station. You wouldn't have the foggiest idea of what was being said, or what the words were. Remarkably, infants solve the problem in a relatively short time. The age of the child when this occurs varies, and has nothing to do with the child's intelligence (It is reported that Einstein did not start to speak until three or four.)

The child's first utterances differ from adult language. The following words of one child, J. P. at the age of 16 months,[9] illustrate the point:

[ʔaw]	"not," "no," "don't"	[s:]	"aerosol spray"
[bʌʔ]/[mʌʔ]	"up"	[sʲu:]	"shoe"
[da]	"dog"	[haj]	"hi"
[iʔo]/[siʔo]	"Cheerios"	[sr]	"shirt" "sweater"
[sa]	"sock"	[sæ:]/[əsæ:]	"what's that?" "hey, look!"
[aj]/[ʌj]	"light"	[ma]	"mommy"
[baw]/[daw]	"down"	[dæ]	"daddy"

J. P.'s mother reports that earlier he had used the words [bu] for "book," [ki] for "kitty," and [tsi] for "tree," but seemed to have lost them.

Most children go through a stage in which their utterances consist of only one word. This stage is the **holophrastic** stage (from *holo,* "complete" or "undivided," and *phrase,* "phrase" or "sentence") because these one-word utterances seem to convey a more complex message. For example, when J. P. says "down," he may be making a request to be put down, or he may be commenting on a toy that has fallen down from the shelf. When he says "cheerios" he may simply be naming the box of cereal in front of him, or he may be asking for some Cheerios. This suggests that children have a more complex mental representation than their language at this point allows them to express. The comprehension experiments we will discuss next confirm the hypothesis that children's grammatical competence is ahead of their productive abilities.

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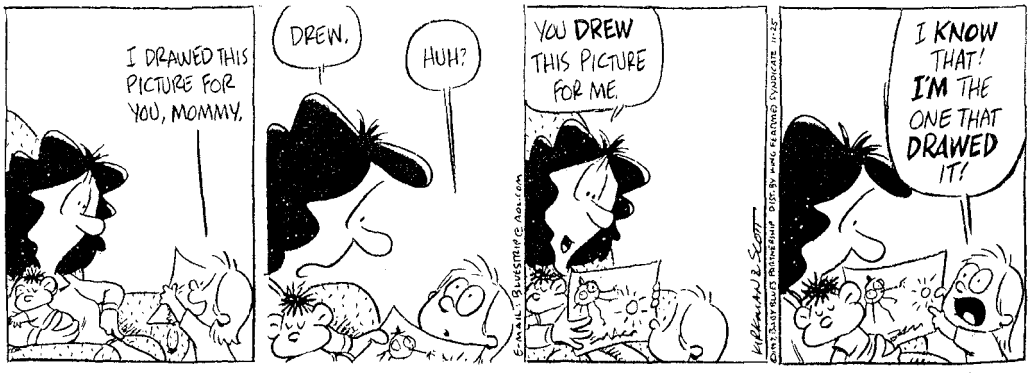
[9] We give special thanks to John Peregrine Munro for providing us with such rich data, and to Drs. Pamela and Allen Munro, J. P.'s parents, for their painstaking efforts in recording these data.

The Development of Grammar

Children are neurologically prepared to acquire all aspects of grammar, from phonetics to pragmatics. This section presents evidence and illustrations of the breadth of Universal Grammar, and the innateness of the several components of grammar discussed in preceding chapters.

Acquisition of Phonology

In terms of his phonology, J. P. is like most children at this stage. His first words are generally monosyllabic with a CV (consonant-vowel) form. The vowel part may be a diphthong, depending on the language being acquired. His phonemic or phonetic inventory — at this stage they are equivalent — is much smaller than is found in the adult language. The linguist Roman Jakobson suggested that children first acquire the small set of sounds common to all languages of the world, no matter what language they hear, and in later stages a child acquires the less common sounds of his own language. For example, most languages have the sounds [p] and [s], but [θ] is a rare sound. J. P.'s sound system was as Jakobson's theory predicted. His phonological inventory at an early stage included the consonants [b, m, d, k], which are frequently occurring sounds in the world's languages.



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In general the order of acquisition of classes of sounds goes by manner of articulation: nasals are acquired first, then glides, stops, liquids, fricatives, and affricates. Natural classes characterized by place of articulation features also appear in children's utterances according to an ordered series: labials, velars, alveolars, and palatals. It is not surprising that *mama* is an early word for many children.

In early language, children may not make a linguistic distinction between voiced and voiceless consonants, although they can perceive the difference. If the first year is devoted to figuring out the phonetic inventory of the target language, the second year involves learning how these sounds are used in the phonology of the language, especially which contrasts are phonemic. When they first begin to contrast one set — that is, when they learn that /p/ and /b/ are distinct phonemes — they also begin to distinguish between

/t/ and /d/, /s/ and /z/, and all the other voiceless-voiced phonemic pairs. As we would expect, the generalizations refer to natural classes of speech sounds.

Controlled experiments show that children at this stage can perceive or comprehend many more phonological contrasts than they can produce. The same child who says [waebɪt] instead of "rabbit," and who does not seem to distinguish [w] and [r], will not make mistakes on a picture identification task in which she must point to either a ring or a wing. In addition, children sometimes produce a sound in a way that makes it indiscernible to adult observers. Acoustic analyses of children's utterances show that the child's pronunciation of *wing* and *ring* are physically different sounds, though they may seem the same to the adult ear. As a further example, a spectrographic analysis of *ephant,* "elephant," produced by a three-year-old child clearly showed an [l] in the representation of the word even though the adult experimenter could not hear it.[10]

Many anecdotal reports also show the disparity between the child's production and perception at this stage. An example is the exchange between the linguist Neil Smith and his two-year-old son Amahl. (At this age Amahl's pronunciation of "mouth" is [maws].)

NS: What does [maws] mean?
A: Like a cat.
NS: Yes, what else?
A: Nothing else.
NS: It's part of your head.
A: [fascinated]
NS: [touching A's mouth] What's this?
A: [maws]

According to Smith, it took Amahl a few seconds to realize his word for "mouse" and for "mouth" were the same. It is not that Amahl and other children do not hear the correct adult pronunciation. They do, but they are unable in these early years to produce it themselves. Another linguist's child (yes, linguists love to experiment on their own children) pronounced the word *light* as *yight* [jajt] but would become very angry if someone said to him, "Oh, you want me to turn on the yight." "No no," he would reply, "not yight — yight!"

Therefore, even at this stage, it is not possible to determine the extent of the grammar of the child — in this case, the phonology — simply by observing speech production. It is sometimes necessary to use various experimental and instrumental techniques to tap the child's competence.

A child's first words show many substitutions of one feature for another or one phoneme for another. In the preceding examples, *mouth* [mawθ] is pronounced *mouse* [maws], with the alveolar fricative [s] replacing the less common interdental fricative [θ]; *light* [lajt] is pronounced *yight* [jajt], with the glide [j] replacing the liquid [l]; and *rabbit* is pronounced *wabbit,* with the glide [w] replacing the liquid [r]. Glides are acquired earlier than liquids, and hence substituted for them. These substitutions are

[10] K. Zuraw and T. Masilon. 1996. *Weak Syllable Deletion:: An Articulatory Phonological Account.* Unpublished UCLA manuscript.

simplifications of the adult pronunciation. They make articulation easier until the child achieves greater articulatory control.

Children's early pronunciations are not haphazard, however. The phonological substitutions are rule governed. The following is an abridged lexicon for another child, Michael, between the ages of 18 and 21 months:[11]

[pun]	"spoon"	[majtl]	"Michael"
[peyn]	"plane"	[dajtər]	"diaper"
[tɪs]	"kiss"	[pati]	"Papi"
[taw]	"cow"	[mani]	"Mommy"
[tin]	"clean"	[bərt]	"Bert"
[polər]	"stroller"	[bərt]	"(big) Bird"

Michael systematically substituted the alveolar stop [t] for the velar stop [k] as in his words for "cow," "clean," "kiss," and his own name. He also replaced labial [p] with [t] when it occurred in the middle of a word, as in his words for "Papi" and "diaper." He reduced consonant clusters in "spoon," "plane," and "stroller," and he devoiced final stops as in "Big Bird." In devoicing the final [d] in "bird," he created an ambiguous form [bərt] referring both to Bert and Big Bird. No wonder only parents understand their children's first words!

Michael's substitutions are typical of the phonological rules that operate in the very early stages of acquisition. Other common rules are reduplication — "bottle" becomes [baba], "water" becomes [wawa]; and the dropping of a final consonants — "bed" becomes [be], "cake" becomes [ke]. These two rules show that the child prefers a simple CV syllable.

Of the many phonological rules that children create, no one child will necessarily use all rules. Early phonological rules generally reflect natural phonological processes that also occur in adult languages. For example, various adult languages have a rule of syllable-final consonant devoicing (German does, English does not). Children do not create bizarre or whimsical rules. Their rules conform to the possibilities made available by UG.

The Acquisition of Word Meaning

> Suddenly I felt a misty consciousness as of something forgotten — a thrill of returning thought; and somehow the mystery of language was revealed to me. . . . Everything had a name, and each name gave birth to a new thought.
>
> Helen Keller[12]

In addition to phonological regularities, the child's early vocabulary provides insight into how children use words and construct word meaning. For J. P. the word *up* was

[11] Data from Michael Jaeggli.

[12] H. Keller quoted in J. P. Lash. 1980. *Helen and Teacher: The Story of Helen Keller and Anne Sullivan Macy.* New York: Delacorte press.

originally used only to mean "Get me up!" when he was either on the floor or in his high chair, but later he used it to mean "Get up!" to his mother as well. J. P. used his word for *sock* not only for socks but also for other undergarments that are put on over the feet, such as undershorts. This illustrates how a child may extend the meaning of a word from a particular referent to encompass a larger class.

When J. P. began to use words, the stimulus had to be visible, but that requirement did not last very long. He first used "dog" only when pointing to a real dog, but later he used the word for pictures of dogs in various books. A new word that entered J. P.'s vocabulary at seventeen months was "uh-oh," which he would say after he had an accident like spilling juice, or when he deliberately poured his yogurt over the side of his high chair. His use of this word shows his developing use of language for social purposes. At this time he added two new words meaning "no," [do:] and [no], which he used when anyone attempted to take something from him that he wanted, or tried to make him do something he did not want to do. He used them either with the imperative meaning of "Don't do that!" or with the assertive meaning of "I don't want to do that." Even at this early stage, J. P. was using words to convey a variety of ideas and feelings, as well as his social awareness.

But how do children learn the meanings of words? Most people do not see this aspect of acquisition as posing a great problem. The intuitive view is that children look at an object, the mother says a word, and the child connects the sounds with the object. However, this is not as easy as it seems, as the following quote demonstrates:

> A child who observes a cat sitting on a mat also observes . . . a mat supporting a cat, a mat under a cat, a floor supporting a mat and a cat, and so on. If the adult now says "The cat is on the mat" even while pointing to the cat on the mat, how is the child to choose among these interpretations of the situation?[13]

Even if the mother simply says "cat," and the child by accident associates the word with the animal on the mat, the child may interpret cat as "Cat," the name of a particular animal, or of an entire species. In other words, to learn a word for a class of objects such as "cat" or "dog," children have to figure out exactly what the word refers to. Upon hearing the word *dog* in the presence of a dog, how does the child know that "dog" can refer to any four-legged, hairy, barking creature. Should it include poodles, tiny Yorkshire terriers, bulldogs, and great Danes, all of which look rather different from one another? What about cows, lambs, and other four-legged mammals? Why are they not "dogs"? The important and very difficult question is: What are the relevant features that define the class of objects we call *dog* and how does a child acquire knowledge of them? Even if a child succeeds in associating a word with an object, nobody provides explicit information about how to extend the use of that word to other objects to which that word refers.

It is not surprising, therefore, that children often overextend a word's meaning, as J. P. did with the word *sock.* A child may learn a word such as *papa* or *daddy,* which she

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[13] L. R. Gleitman and E. Wanner. 1982. *Language Acquisition. The State of the State of the Art.* Cambridge, England: Cambridge University Press, p. 10.

first uses only for her own father and then extend its meaning to apply to all men, just as she may use the word *dog* to mean any four-legged creature. After the child has acquired her first seventy-five to one hundred words, the overextended meanings start to narrow until they correspond to those of the other speakers of the language. How this occurs is still not entirely understood.

The mystery surrounding the acquisition of word meanings has intrigued philosophers and psychologists as well as linguists. We know that all children view the world in a similar fashion and apply the same general principles to help them determine a word's meaning. For example, overextensions are usually based on physical attributes such as size, shape, and texture. *Ball* may refer to all round things, *bunny* to all furry things, and so on. However, children will not make overextensions based on color. In experiments, children will group objects by shape and give them a name, but they will not assign a name to a group of red objects.

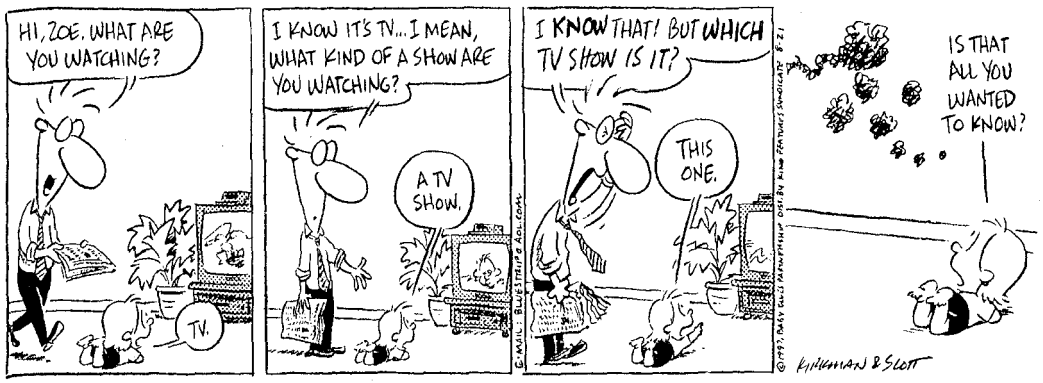
If an experimenter points to an object and uses a nonsense word like *blick* to a child, saying *that's a blick,* the child will interpret the word to refer to the whole object, not one of its parts or attributes. Given the poverty of stimulus for word learning, principles like the "form over color principle" and the "whole object principle" help the child organize experience in ways that facilitate word learning. Without such principles, it is doubtful that children could learn words as quickly as they do. Children learn approximately 14 words a day for the first six years of their lives. That averages to about 5,000 words per year. How many students know 10,000 words of a foreign language after two years of study?

Furthermore, as children are learning the meaning of words, they are also developing the syntax of the language and the syntactic categories. Syntax can help the child acquire meaning. A child will interpret a word like *blicking* to be a verb if the word is used while the investigator points to a picture of a person or thing performing an action, and will interpret the word *blick* to be a noun if used in the expression *a blick* or *the blick* while looking at the same picture. For example, suppose a child is shown a picture of some funny animal jumping up and down and hears either *See the blicking* or *See the blick.* Later, when asked to show "blicking," the child will jump up and down, but if asked to show a blick, will point to the funny animal. This process is called **syntactic bootstrapping.** Children use their knowledge of syntax to learn the syntactic category of the word: If the word is a verb it has a meaning referring to an action, if the word is a noun it refers to an object of some kind.

The Acquisition of Morphology

The child's acquisition of morphology provides the clearest evidence of rule learning. Children's errors in morphology reveal that the child acquires the regular rules of the grammar and overgeneralizes them. This **overgeneralization** manifests itself when children treat irregular verbs and nouns as if they were regular. We have probably all heard children say *bringed, goed, drawed,* and *runned,* or *foots, mouses, sheeps,* and *childs.*

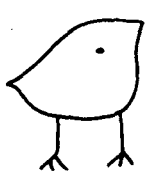
These mistakes tell us more about how children learn language than the correct forms they use. The child cannot be imitating; children use such forms in families where the parents never utter such "bad English." In fact, children can go through three phases in the acquisition of an irregular form:



Phase 1	Phase 2	Phase 3
broke	breaked	broke
brought	bringed	brought

In phase 1 the child uses the correct term such as *brought* or *broke*. At this point the child's grammar does not relate the form *brought* to *bring*, or *broke* to *break*. The words are treated as separate lexical entries. Phase 2 is crucial. This is when the child constructs a rule for forming the past tense and attaches the regular past-tense morpheme to all verbs — *play, hug, help,* as well as *break* and *bring*. Children look for general patterns, for systematic occurrences. What they do not know at phase 2 is that there are exceptions to the rule. Now their language is more regular than the adult language. During phase 3 the child learns that there are exceptions to the rule, and then once again uses *brought* and *broke,* with the difference being that these irregular forms will be related to the root forms.

The child's morphological rules emerge quite early. In a classic study,[14] preschool children and children in the first, second, and third grades were shown a drawing of a nonsense animal like the funny creature below. Each "animal" was given a nonsense name. The experimenter would then say to the child, pointing to the picture, "This is a wug."



Then the experimenter would show the child a picture of two of the animals and say, "Now here is another one. There are two of them. There are two _____?"

The child's task was to give the plural form, "wugs" [wʌgz]. Another little make-believe animal was called a "bik," and when the child was shown two biks, he or she again was to say the plural form [bɪks]. The children applied the regular plural formation rule

[14] J. Berko. 1958. "The Child's Learning of English Morphology," *Word* 14:150–77.

to words they had never heard. Their ability to add [z] when the animal's name ended with a voiced sound, and [s] when there was a final voiceless consonant, showed that the children were using rules based on an understanding of natural classes of phonological segments, and not simply imitating words they had previously heard.

More recently, studies of children acquiring languages with more inflectional morphology than English reveal that they learn agreement and case morphology at a very early age. For example, Italian verbs must be inflected for number and person to agree with the subject. This is similar to the English agreement rule "add *s* to the verb" for third-person, singular subjects — *He giggles a lot* but *We giggle a lot* — except that in Italian there are more verb forms that must be acquired. Italian-speaking children between the ages of 1;10 (one year, ten months) and 2;4 correctly inflect the verb, as the following utterances of Italian children show:[15]

Tu leggi il libro	"You (2nd-person singular) read the book."
Io vado fuori	"I go (1st-p. sg.) outside."
Dorme miao dorme	"Sleeps (3rd-p. sg.) cat sleeps."
Leggiamo il libro	"(We) read (1st-p. plural) the book."

Children acquiring other richly inflected languages such as Spanish, German, Catalan, and Swahili quickly acquire agreement morphology. It is rare for them to make agreement errors just as it is rare for an English-speaking child to say "I goes."

In these languages there is also gender and number agreement between the head noun and the article and adjectives inside the noun phrase. Children as young as two years old respect these agreement requirements, as shown by the following Italian examples.

E mia gonna.	"(It) is my (feminine singular) skirt."
Questo mio bimbo.	"This my (masculine singular) baby."
Guarda la mela piccolina.	"Look at the little (fem. sg.) apple."
Guarda il topo piccolino.	"Look at the little (masc. sg.) mouse."

Many languages have case morphology where nouns have different forms depending on their grammatical function: subject, object, possessor, and so on. Studies show that children acquiring Russian and German, two languages with extensive case systems, acquire case morphology at a very early age.

Children also show knowledge of the derivational rules of their language and use these rules to create novel words. In English, for example, we can derive verbs from nouns. From the noun *microwave* we now have a verb *to microwave;* from the noun *e(lectronic) mail* we derived the verb *to e-mail.* Children acquire this derivational rule early and use it often since there are lots of gaps in their verb vocabulary.

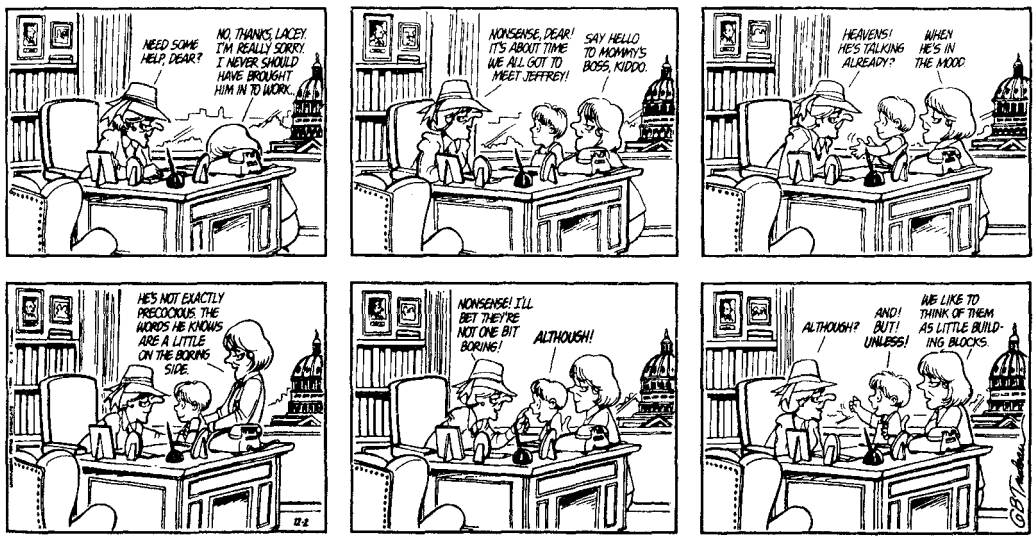
Child Utterance	Adult Translation
You have to scale it.	"You have to weigh it."
I broomed it up.	"I swept it up."
He's keying the door.	"He's opening the door (with a key).

[15] The data in examples were collected by M. Moneglia and E. Cresti and reported in N. Hyams. 1986. *Language Acquisition and the Theory of Parameters.* Dordrecht, the Netherlands: Reidel Publishers.

These novel forms provide further evidence that language acquisition is a creative process and that children's utterances reflect their internal grammars, which include both derivational and inflectional rules.

The Acquisition of Syntax

When children are still in the holophrastic stage, adults listening to the one-word utterances often feel that the child is trying to convey a more complex message. Indeed, new experimental techniques show that at that stage (and even earlier) children have knowledge of some syntactic rules. In these experiments the infant sits on his mother's lap and hears a sentence over a speaker while seeing two video displays depicting different actions, one of which corresponds to the sentence. Infants tend to look longer at the video that matches the sentence they hear. This methodology allows researchers to tap the linguistic knowledge of children who are only using single words or who are not talking at all. Results show that children as young as seventeen months can understand the difference between sentences such as "Ernie is tickling Bert" and "Bert is tickling Ernie." Because these sentences have all the same words, the child cannot be relying on the words alone to understand the meanings. He must also understand the word order rules and how they determine the grammatical relations of subject and object. Results such as these strongly suggest that children's syntactic competence is ahead of their productive abilities, which is also how their phonology develops.



"Doonesbury" copyright © 1982 and 1984 G. B. Trudeau.

Around the time of their second birthday, children begin to put words together. At first these utterances appear to be strings of two of the child's earlier holophrastic utterances, each word with its own single-pitch contour. Soon, they begin to form actual two-word sentences with clear syntactic and semantic relations. The intonation contour of the two words extends over the whole utterance rather than being separated by a pause

between the two words. The following utterances illustrate the kinds of patterns that are found in children's utterances at this stage.

allgone sock	hi Mommy
byebye boat	allgone sticky
more wet	it ball
Katherine sock	dirty sock

These early utterances can express a variety of semantic and syntactic relations. For example, noun + noun sentences such as *Mommy sock* can express a subject + object relation in the situation when the mother is putting the sock on the child, or a possessive relation when the child is pointing to Mommy's sock. Two nouns can also be used to show a subject-locative relation, as in *sweater chair* to mean "The sweater is on the chair," or to show attribution as in *dirty sock.* Often children have a variety of modifiers such as *allgone, more,* and *bye bye.*

Since children mature at different rates and the age at which children start to produce words and put words together varies, chronological age is not a good measure of a child's language development. Instead, researchers use the child's **mean length of utterances** (MLU) to compare children's progress. MLU is the average length of the utterances the child is producing at a particular point. MLU is usually measured in terms of morphemes rather than words, so the words *boys, danced,* and *crying* are each two morphemes long. Children with the same MLU are likely to have similar grammars even though they are different ages.

In their earliest multiword utterances, children are inconsistent in their use of function words (grammatical morphemes) such as *to* and *the,* auxiliary verbs such as *can* and *is,* and verbal inflection. Many (though not all) utterances consist only of open-class or content words, while some or all of the function words, auxiliaries, and verbal inflection may be missing. During this stage children often sound as if they are reading a Western Union message, which is why such utterances are sometimes called **telegraphic speech:**[16]

Cat stand up table
What that?
He play little tune
Andrew want that
Cathy build house
No sit there

J. P.'s early sentences were similar. (The words in parentheses are missing from J. P.'s sentences):

[16] Before the days of e-mail and faxes, people would send telegrams to get a message to someone faster than by postal mail. They would be charged by the word, so to save money they would omit words that were not required to express the meaning. The words left out of sentences would be mainly grammatical morphemes like *the, is, are, of,* and *for.* A notable instance of this occurred when a New York reporter wired a colleague in Hollywood inquiring about the age of the movie star Cary Grant. "How old Cary Grant?" said the four-word message. The reply came back instantly: "Old Cary Grant fine, how you?"

Age in Months		
25	[danʔ ɪ ʔ tˢɪʔ]	"don't eat (the) chip"
	[bʷaʔ tat]	"block (is on) top"
26	[mamis tu hæs]	"Mommy's two hands"
	[mo bʌs go]	"where bus go?"
	[dædi go]	"where Daddy go?"
27	[ʔaj gat tu dʲus]	"I got two (glasses of) juice"
	[do bajʔ mi]	"don't bite (kiss) me"
	[kʌdər sʌni ber]	"Sonny color(ed a) bear"
28	[ʔaj gat pwe dɪs]	"I('m) play(ing with) this"
	[mamis tak mɛns]	"Mommy talk(ed to the) men"

It takes many months before children use grammatical morphemes and auxiliary verbs consistently, which is defined to mean "in 90 percent of the contexts in which they are required." For example, the auxiliary *is* is required when the subject of the sentence is third-person singular and the verb has the progressive affix *-ing,* as in *Daddy* ____ *building a house.*

In an early study of children's morphological development, researchers examined the spontaneous utterances of three English-speaking children — Adam, Eve, and Sarah — over a period of years, noting their use of grammatical morphemes. They found that different morphemes reach the 90 percent criterion level at different times, and that the sequence was the same for all three children. The progressive morpheme *-ing,* as in *Me going,* was found to be among the earliest inflectional morphemes to be used consistently. The prepositions *in* and *on* were next, and then the regular plural ending, as in *two doggies* /tu dɔgiz/. The third-person singular marker (as in *Johnny comes*) and the possessive morpheme (as in *Daddy's hat*), which have the same phonological shape as the plural /s/, reached the 90 percent criterion six months to one year after the plural was acquired. This showed that the acquisition of these morphemes depends on the syntax, not the phonology. Eventually all the other inflections became stable features and the children's utterances sounded like those spoken by adults.

Though the children's utterances are described as telegraphic, the child does not deliberately leave out function words as would an adult sending a telegram. The sentences reflect the child's grammar at that particular stage of language development. Although these sentences may lack certain morphemes, they nevertheless appear to have hierarchical constituent structures and syntactic rules similar to those in the adult grammar. For example, children almost never violate the word order rules of their language. In languages with relatively fixed word order such as English, children use SVO order from the earliest stage. In languages with freer word order such as Russian, children typically use several (though not all) of the permissible orders.

In languages with freer word order, like Turkish and Russian, grammatical relations such as subject and object are generally marked by inflectional morphology, such as case markers. Children acquiring these languages quickly learn the morphological case markers. For example, two-year old Russian-speaking children mark subjects with nominative case, objects with accusative case, and indirect objects with dative case, with very few errors. Most errors arise with words that have an idiosyncratic or irregular case ending. This is reminiscent of the overgeneralization errors that children make with irregular

verb morphology in English. Children take longer to acquire aspects of grammar that are not predictable by rule.

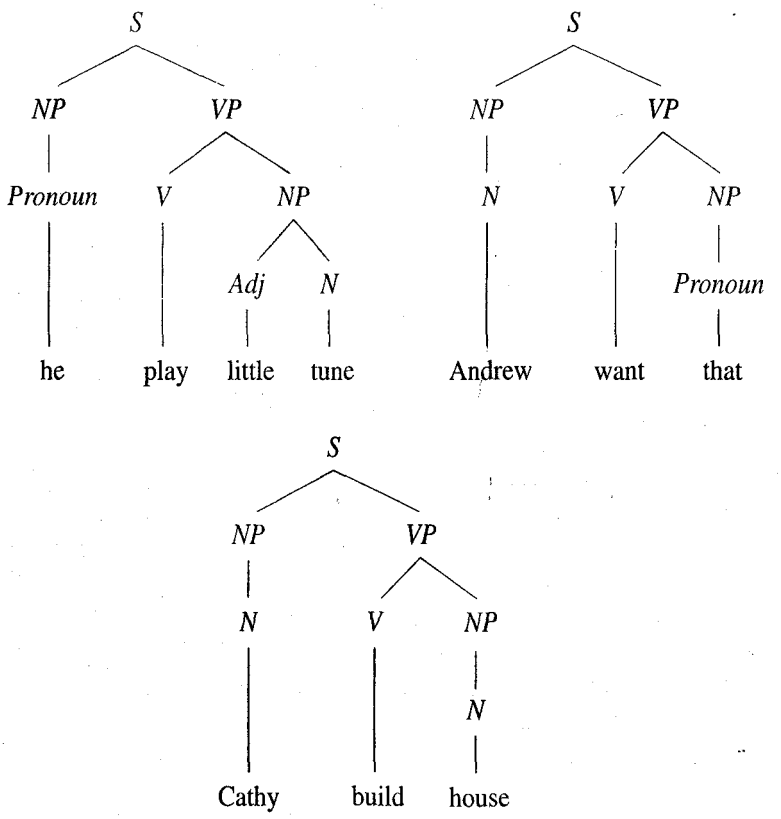
As we noted earlier, children acquiring Italian and other languages that mark subject agreement on the verb use correct agreement as soon as they produce multiword utterances. We repeat two of the examples here.

Tu leggi il libro.	"You read (2nd-p. sg.) the book."
Gira il pallone.	"Turns (3rd-p. sg.) the balloon."
	(The balloon turns.)

Various languages have been investigated and they all reveal that children rarely make subject-verb agreement errors.

Children have other agreement rules as well, such as the article-noun-adjective agreement found in Italian. There is nothing intrinsically masculine or feminine about the nouns that are marked for such grammatical gender. Children produce the correct forms based on the syntactic classification of these nouns and the agreement rules of the language.

The correct use of word order, case marking, and agreement rules shows that even though children may often omit function morphemes, they are aware of constituent structure and syntactic rules. Their utterances are not simply words randomly strung together. From a very early stage onwards, children have a grasp of the principles of phrase and sentence formation, and of the kinds of structure dependencies mentioned in chapter 4, as revealed by these constituent structure trees:

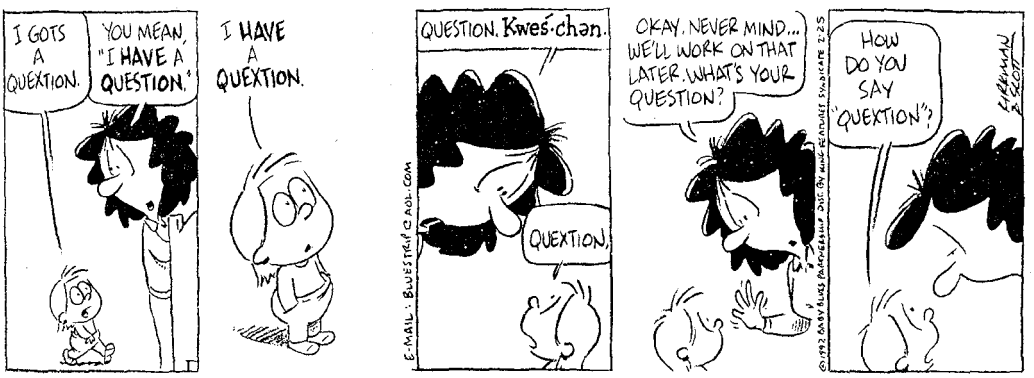


Sometime between the ages of 2;6 and 3;6 there is a virtual language explosion. At this point it is difficult to identify distinct stages because the child is undergoing so much development so rapidly. By the age of 3;0 most children are consistent in their use of function morphemes. Moreover, they have begun to produce and understand complex structures including coordinated sentences and embedded sentences of various kinds.

He was stuck and I got him out.
I want this doll because she's big.
I know what to do.
I like to play with something else.
I think she's sick.
Look at the train Ursula bought.
I gon' make it like a rocket to blast off with.
It's too early for us to eat.

The Acquisition of Pragmatics

In addition to acquiring the rules of grammar, children must learn the appropriate use of language in context, or pragmatics. The cartoon below is funny because of the inappropriateness of the interaction, showing that Zoe hasn't completely acquired the pragmatic "maxims of conversation" discussed in chapter 5.



Context is needed to determine the reference of pronouns. As also discussed in chapter 5, a sentence like "Amazingly, he loves her" is uninterpretable unless both speaker and hearer understand who the pronouns *he* and *her* refer to. If the sentence were preceded by "I saw John and Mary kissing in the park," then it would be clear to the listener who the pronouns refer to. Children are not always sensitive to the needs of their interlocutors and they may fail to establish the referents for pronouns. It is not unusual for a three- or four-year-old (or even older children) to use pronouns "out of the blue," like the child who cries to his mother "He hit me" when mom has no idea who did the deed.

The speaker and listener form part of the context of an utterance. The meaning of *I* and *you* depends on who's talking and who's listening, and this changes from situation to situation. Younger children (around age two) have difficulty with the "shifting reference"

of these pronouns. A typical error that children make at this age is to refer to themselves as "you," for example, saying "You want to take a walk" when he means "I want to take a walk."

Children also show a lack of pragmatic awareness by the way they sometimes use articles. Like pronouns, the interpretation of articles depends on context. The definite article (*the*) as in "the boy" can be used felicitously only when it is clear to speaker and hearer what boy is being discussed. In a discourse the indefinite article (*a/an*) must be used for the first mention of a new referent, the definite article (or pronoun) may be used in subsequent mentions, as illustrated below:

A boy walked into the class.
He was in the wrong room.
The teacher directed the boy to the right classroom.

Children do not always respect the pragmatic rules for articles. In experimental studies, three-year-olds are just as likely to use the definite article as the indefinite article for introducing a new referent. In other words, the child tends to assume that his listener knows who he is talking about without having established this in a linguistically appropriate way.

It may take a child several months or years to master those aspects of pragmatics that involve establishing the reference for function morphemes such as determiners and pronouns. Other aspects of pragmatics are acquired very early. Children in the holophrastic stage use their one-word utterances with different illocutionary force. The utterance "up" spoken by J. P. at sixteen months might be a simple statement such as "The teddy is up on the shelf," or a request "Pick me up."

The Development of Auxiliaries: A Case Study

We have seen in this chapter that language acquisition involves development in various components — the lexicon, phonology, morphology and syntax, as well as pragmatics. These different modules interact in complex ways to chart an overall course of language development.

As an example, let us take the case of the English auxiliaries. As noted earlier, children in the telegraphic stage do not typically use auxiliaries such as *can, will,* and or *do,* and they often omit *be* and *have* from their utterances. Several syntactic constructions in English depend on the presence of an auxiliary, the most central of which are questions and negative sentences. To negate a main verb requires the auxiliary *do* or a modal as in the following examples:

I don't like this movie
I won't see this movie.

An adult does not say "I not read this book."

Similarly, as discussed in chapter 4, English yes-no and *wh* questions are formed by moving an auxiliary to precede the subject, as in the following examples:

Can I leave now?
Where should John put the book?

Although the two-year-old does not have productive control of auxiliaries, she is able to form negative sentences and questions. During the telegraphic stage the child produces questions of the following sort:

Yes-No Questions	***Wh* Questions**
I ride train?	What cowboy doing?
Mommy eggnog?	Where milk go?
Have some?	Where kitty?

These utterances have a rising intonation pattern typical of yes-no questions in English, but since there are no auxiliaries, there can be no auxiliary movement. In *wh* questions there is also no auxiliary but there is generally a *wh* phrase that has moved to the beginning of the sentence. English-speaking children do not produce sentences such as "Cowboy doing what?" in which the *wh* phrase remains in its deep structure position.

The two-year-old has an insufficient lexicon. The lack of auxiliaries means that she cannot use a particular syntactic device associated with question formation in English—auxiliary movement. However, she has the pragmatic knowledge of how to make a request or ask for information, and she has the appropriate prosody, which depends on knowledge of phonology and the syntactic structure of the question. She also knows the grammatical rule that requires a *wh* phrase to be in the Comp position. Many components of language must be in place to form an adultlike question.

In languages that do not require auxiliaries to form a question, children appear more adultlike. For example, in Dutch and Italian, it is the main verb that moves. Since many main verbs are acquired before auxiliaries, Dutch and Italian children in the telegraphic stage produce questions that follow the adult rule:[17]

Dutch		
En wat doen ze daar?	And what do they there	(And what are they doing there?)
Wordt mama boos?	Becomes mama angry	(Is mommy angry?)
Weet je n kerk?	Know you a church	(Do you know a church?)
Valt ie hier om?	Falls in here	(Does it fall here?)
Italian		
Cosa fanno questi bambini?[18]	What do these children	(What are these babies doing?)
Chando vene a mama?	When comes the mommy	(When is Mommy coming?)
Vola cici?	Flies birdie	(Is the birdie flying?)
Veni teno?	Comes train	(Is the train coming?)

[17] In the child language examples from languages other than English, we have included a word-by-word translation and in parentheses the intended meaning of the utterance.

[18] Italian data from J. Schaeffer. 1990. *The Syntax of the Subject in Child Language: Italian Compared to Dutch.* Unpublished master's thesis, State University of Utrecht.

The Dutch and Italian children show us there is nothing intrinsically difficult about syntactic movement rules. The delay that English-speaking children show in producing adultlike questions is mainly because auxiliaries are acquired later than main verbs and English is idiosyncratic in forming questions by moving only auxiliaries.

The lack of auxiliaries during the telegraphic stage also affects the formation of negative sentences. An English-speaking child's negative sentences look like the following:

He no bite you.
Wayne not eating it.
Kathryn not go over there.
You no bring choo-choo train.
That no fish school.

Because of the absence of auxiliaries, these utterances do not look very adultlike. However, children at this stage understand the pragmatic force of negation. The child who says "no!" when asked to take a nap knows exactly what he means.

As children acquire the auxiliaries, they generally use them correctly, that is, the auxiliary usually appears before the subject, but not always.

Yes-No Questions

Does the kitty stand up?
Can I have a piece of paper?
Will you help me?
We can go now?

***Wh* Questions**

Which way they should go?
What can we ride in?
What will we eat?

The introduction of auxiliaries into the child's grammar also affects negative sentences. We now find correctly negated auxiliaries, though *be* is still missing in many cases.[19]

Paul can't have one.
Donna won't let go.
I don't want cover on it.
I am not a doctor.
It's not cold.
Paul not tired.
I not crying.

The child always places the negation in the correct position in relation to the auxiliary or *be*. Main verbs follow negation and *be* precedes negation. Children virtually never produce errors such as "Mommy dances not" or "I not am going."

[19] The fact that *be* seems to be omitted for a longer period than the other auxiliaries may be simply because it is easier for the researcher to note when there is a missing *be*.

In languages such as French and German, which are like Italian and Dutch in having a rule that moves inflected verbs, the verb shows up before the negative marker. French and German children respect this rule.

French

Veux pas lolo	"want not water"	(I don't want water)
Marche pas	"walks not"	(She doesn't walk)
Ça tourne pas	"that turns not"	(that doesn't turn)

German

Macht nich aua	"makes not ouch"	(It doesn't hurt.)
Brauche nich lala	"need not pacifier"	(I don't need a pacifier.)
Schmeckt auch nich	"tastes also not"	(It doesn't taste good either.)
Ich mach das nich	"I do that not"	(I don't/won't do that.)

Whether they are acquiring Dutch, German, Italian, French, or any other language, all children pass through a "telegraphic" stage, which is but one of many stages that a child goes through on the way to adult linguistic competence. Each of these stages corresponds to a system of rules that the child has internalized — a grammar — and includes a lexicon and pragmatic rules. Although the child's language may not look exactly like the adult language, it is rule-governed and not a haphazard approximation to the adult language.

Though the stages of language development are universal, they are shaped by the grammar of the particular adult language the child is acquiring. German, French, Italian, and English-speaking children all go through a telegraphic stage in which they do not use auxiliaries, but they form negative sentences and questions in different ways because the rules of question and negative formation are different in the respective adult languages. This tells us something essential about language acquisition: Children are sensitive to the rules of the adult language at the earliest stages of development. Just as their phonology is quickly fine-tuned to the adult language, so is their syntactic system.

The ability of children to form complex rules and construct grammars of the languages used around them in a relatively short time is indeed phenomenal. The similarity of the language acquisition stages across diverse peoples and languages shows that children are equipped with special abilities to know what generalizations to look for and what to ignore, and how to discover the regularities of language.

Children develop language the way they develop the ability to sit up, stand, crawl, or walk. They are not taught to do these things, but all normal children begin to do them at around the same age. Learning to walk or learning language is different from learning to read or to ride a bicycle. Many people never learn to read because they are not taught to do so, and there are large groups of people in many parts of the world that have no *written* language. However, they all have language.

Setting Parameters

There are aspects of syntax that children acquire very quickly, even while they are still in the telegraphic stage. Most of these early developments correspond to what we earlier referred to as the **parameters** of UG. One such parameter that we discussed in

chapter 4, the Head Parameter, determines whether the head of a phrase comes before or after its complements, for example, whether the order of the VP is VO as in English or OV as in Japanese. Children produce the correct word order of their language in their earliest multiword utterances, and they understand word order even when they are in the one-word stage of production. According to the parameter model of UG, the child does not actually have to formulate a word order rule. Rather, he must choose between two already specified values: head first or head last? He determines the correct value based on the language he hears around him. The English-speaking child can quickly figure out that the head comes before its complements; a Japanese-speaking child can equally well determine that his language is head final.

Other parameters of UG involve the verb movement rules. In some languages the verb can move out of the VP to higher positions in the phrase structure tree. We saw this in the Dutch and Italian questions discussed in the last section. In other languages, such as English, verbs do not move (only auxiliaries do). The verb movement parameters provide the child with an option: my language does/does not allow verb movement. As we saw, Dutch- and Italian-speaking children quickly set the verb movement parameters to the "does allow" value, and so they form questions by moving the verb. English-speaking children never make the mistake of moving the verb — even when they don't yet have auxiliaries. In both cases, the children have set the parameter at the correct value for their language. Even after English-speaking children acquire the auxiliaries and the Aux movement rule, they never overgeneralize this movement to include verbs. This supports the hypothesis that the parameter is set early in development and cannot be undone. In this case as well, the child does not have to formulate a rule of verb movement; he does not have to learn when the verb moves and where it moves to. This is all given by UG. He simply has to decide whether verb movement is possible in his language.

The parameters of UG limit the grammatical options to a small well-defined set — is my language head first or head last, does my language have verb movement, and so on. Parameters greatly reduce the acquisition burden on the child and contribute to explaining the ease and rapidity of language acquisition.

The Acquisition of Signed Languages

Deaf children who are born to deaf signing parents are naturally exposed to sign language just as hearing children are naturally exposed to spoken language. Given the universal aspects of sign and spoken languages, it is not surprising that language development in these deaf children parallels the stages of spoken language acquisition. Deaf children babble, they then progress to single signs similar to the single words in the holophrastic stage, and finally they begin to combine signs. There is also a telegraphic stage in which the function signs may be omitted. Use of function signs becomes consistent at around the same age for deaf children as function words in spoken languages. The ages at which signing children go through each of these stages are comparable to the ages of children acquiring a spoken language.

Like the acquisition of spoken languages, the acquisition of signed languages involves the interaction of universal and language-particular components. In our discussion of the acquisition of questions in English, we saw that children easily acquire *wh*

movement, which is governed by universal principles, but they show some delay in their use of Aux movement. This is because they first must learn the auxiliaries, which are specific to English.

In *wh* questions in ASL, the *wh* word can move or it can be left in its original position. Both of the following sentences are grammatical:

_____whq
WHO BILL SEE YESTERDAY?

_____whq
BILL SAW WHO YESTERDAY?

(NB: We follow the convention of writing the glosses for signs in uppercase letters.)

There is no Aux movement in ASL, but a question is accompanied by a facial expression with furrowed brows and the head tilted back. This is represented by the "whq" above the ASL glosses. This non-manual marker is part of the grammar of ASL. It is like the rising intonation we use when we ask questions in English and other spoken languages.

In one study of the acquisition of *wh* questions in ASL, researchers found that children easily learned the rules associated with the *wh* phrase. The children would sometimes move the *wh* phrase and sometimes leave it in place, as adult signers do. But the children often omitted the non-manual marker, which is not possible in the adult language. Like the English auxiliaries, the non-manual markers are specific to ASL and so they take longer to learn.

Sometimes the parallels between the acquisition of signed and spoken languages are surprising. Some of the grammatical morphemes in ASL are semantically transparent or **iconic,** that is, they look like what they mean. For example, the sign for the pronoun "I" involves the speaker pointing to his chest. The sign for the pronoun "you" is a point to the chest of the addressee. As we discussed earlier, at around age two children acquiring spoken languages often reverse the pronouns "I" and "you." Interestingly, at this same age signing children make this same error. They will point to themselves when they mean "you" and point to the addressee when they mean "I." Children acquiring ASL make this error despite the transparency or iconicity of these particular signs. This is because signing children (like signing adults) treat these pronouns as linguistic symbols and not simply as pointing gestures. As part of the language, the shifting reference of these pronouns presents the same problem for signing children that it does for speaking children.

Hearing children of deaf parents acquire both sign language and spoken language when exposed to both. Studies show that Canadian bilingual children who acquire Langues des Signes Quebecoise (LSQ), or Quebec Sign Language, develop the two languages exactly as bilingual children acquiring two spoken languages.[20] The LSQ–French bilinguals reached linguistic milestones in each of their languages in parallel

[20] L. Petitto, M. Katerelos, B. Levy, K. Guana, K. Tetreault, and V. Ferraro. 2001. "Bilingual Signed and Spoken Language Acquisition from Birth: Implications for the Mechanisms Underlying Early Bilingual Language Acquisition," *Journal of Child Language* 28:453–96.

with Canadian children acquiring French and English. They produced their first words, as well as their first word combinations, at the same time in each language. In reaching these milestones neither group showed any delay as compared to monolingual children.

Deaf children of hearing parents who are not exposed to sign language from birth suffer a great handicap in acquiring language. It may be many years before these children are able to make use of a spoken language or before they encounter a conventional sign language. Yet the instinct to acquire language is so strong in humans that these deaf children begin to develop their own manual gestures to express their thoughts and desires. A study of six such children revealed that they not only developed individual signs but joined pairs and formed sentences with definite syntactic order and systematic constraints. Although these "home signs," as they are called, are not fully developed languages like ASL or LSQ, they have a linguistic complexity and systematicity that could not have come from the input, since there was no input. Cases such as these demonstrate not only the strong drive that humans have to communicate through language, but also the innate basis of language structure.

Knowing More Than One Language

> He that understands grammar in one language, understands it in another as far as the essential properties of Grammar are concerned. The fact that he can't speak, nor comprehend, another language is due to the diversity of words and their various forms, but these are the accidental properties of grammar.
>
> Roger Bacon (1214–1294)

People can acquire a second language under many different circumstances. You may have learned a second language when you began middle school, or high school, or college. Moving to a new country often means acquiring a new language. Other people live in communities or homes in which more than one language is spoken and may acquire two (or more) languages simultaneously. The term **second language acquisition,** or **L2 acquisition,** generally refers to the acquisition of a second language by someone (adult or child) who has already acquired a first language. **Bilingual language acquisition** refers to the (more or less) simultaneous acquisition of two languages beginning in infancy (or before the age of three years).

Childhood Bilingualism

Bilingual Hebrew-English- speaking child:	"I speak Hebrew and English."
Monolingual English-speaking child:	"What's English?"

Approximately half of the people in the world are native speakers of more than one language. This means that as children they had regular and continued exposure to more than one language. In many parts of the world, especially in Africa and Asia, bilingualism (even multilingualism) is the norm. In contrast, many Western countries (though by no means all of them) view themselves as monolingual, even though they may be home to

"Gina is by lingal . . . that means she can say the same thing twice, but you can only understand it once."

"Dennis the Menace"® used by permission of Hank Ketcham and by North American Syndicate.

speakers of many languages. In the United States and many European countries, bilingualism is often viewed as a transitory phenomenon associated with immigration.

Bilingualism is always an intriguing topic. People wonder how it's possible for a child to acquire two (or more) languages at the same time. There are many questions, such as: doesn't the child confuse the two languages; does bilingual language development take longer than monolingual development; are bilingual children brighter or does acquiring two languages negatively affect the child's cognitive development in some way; how much exposure to each language is necessary for a child to become bilingual?

Much of the early research into bilingualism focused on the fact that bilingual children sometimes "mix" the two languages in the same sentences, as the following examples from French-English bilingual children illustrate. In the first example, a French word appears in an otherwise English sentence. In the other two examples, all of the words are English but the syntax is French.

His nose is perdu.	(His nose is lost.)
A house pink	(A pink house)
That's to me	(That's mine)

In early studies of bilingualism, this kind of language mixing was viewed in a negative light. It was taken as an indication that the child was confused or having difficulty with the two languages. In fact, many parents, sometimes on the advice educators or psychologists, would stop raising their children bilingually when faced with this issue. However, it now seems clear that some amount of language mixing is a normal part of the early bilingual acquisition process, and not necessarily an indication of any language problem.

Theories of Bilingual Development

These mixed utterances raise an interesting question about the grammars of bilingual children. Does the bilingual child start out with only one grammar that is eventually differentiated, or does she construct a separate grammar for each language right from the start? The **unitary system hypothesis** says that the child initially constructs only one lexicon and one grammar. The presence of "mixed" utterances such as the ones just given is often taken as support for this hypothesis. In addition, at the early stages, bilingual children often have words for particular objects in only one language. For example, a Spanish-English bilingual child may know the Spanish word for milk, *leche,* but not the English word, or she may have the word *water* but not *agua.* This kind of complementarity has also been taken as support for the idea that the child has only one lexicon.

However, careful examination of the vocabularies of bilingual children reveals that although they may not have exactly the same words in both languages, there is enough overlap to make the single lexicon idea implausible. The reason children may not have the same set of words in both languages is that they use their two languages in different circumstances and acquire the vocabulary appropriate to each situation. For example, the bilingual English-Spanish child may hear only Spanish during mealtime and so he will first learn the Spanish words for foods. Also, bilingual children initially have smaller vocabularies in each of their languages than the monolingual child has in her one language. This makes sense since a child can only learn so many words a day, and the bilingual child has two lexicons to build. For these reasons the bilingual child may have more lexical gaps than the monolingual child at a comparable stage of development, and those gaps may be different for each language.

The **separate systems hypothesis** says that the bilingual child builds a distinct lexicon and grammar for each language. To test the separate systems hypothesis it is necessary to look at how the child acquires those pieces of grammar that are different in his two languages. For example, if both languages have SVO word order, this would not be a good place to test this hypothesis. A number of studies have shown that where the two languages diverge, children acquire the different rules of each language. Spanish-English and French-German bilingual children have been shown to use the word orders appropriate to each language, as well as the correct agreement morphemes for each language. Other studies have shown that children set up two distinct sets of phonemes and phonological rules for their languages.

The separate systems hypothesis also receives support from the study of the LSQ-French bilinguals discussed earlier. These children have semantically equivalent words in the two languages, just as spoken-spoken bilinguals do. In addition, these children, like all bilingual children, were able to adjust their language choice to the language of their addressees, showing that they differentiated the two languages. Like most bilingual children, the LSQ-French bilinguals produced "mixed" utterances — utterances that had words from both languages. What is especially interesting is that these children showed "simultaneous" language mixing. They would produce a LSQ sign and a French word at the same time, something that is only possible if one language is spoken and the other signed. However, this finding has implications for bilingual language acquisition in general. It shows that the language mixing of bilingual children is not due to confusion, but is rather the result of two grammars operating simultaneously.

If bilingual children have two grammars and two lexicons, what explains the mixed utterances? Various explanations have been offered. One suggestion is that children mix because they have lexical gaps; if the French-English bilingual child does not know the English word *lost,* she will use the word she does know, *perdu* — the "any port in a storm strategy." Another possibility is that the mixing in child language is like the special language usage of many adult bilinguals referred to as **code-switching** (discussed in chapter 10). In specific social situations, bilingual adults may switch back and forth between their two languages in the same sentence, for example, "I put the forks en las mesas" (I put the forks on the tables). Code-switching reflects the grammars of both languages working simultaneously; it is not "bad grammar" or "broken English." Adult bilinguals code-switch only when speaking to other bilingual speakers. It has been suggested that the mixed utterances of bilingual children are a form of code-switching. In support of this proposal, various studies have shown that bilingual children as young as two make contextually appropriate language choices: In speaking to monolinguals the children use one language, in speaking to bilinguals they mix the two languages.

Two Monolinguals in One Head

Although we must study many bilingual children to reach any firm conclusions, the evidence accumulated so far seems to support the idea that children construct multiple grammars at the outset. Moreover, it seems that bilingual children develop their grammars along the same lines as monolingual children. They go through a babbling stage, a holophrastic stage, a telegraphic stage, and so on. During the telegraphic stage they show the same characteristics in each of their languages as the monolingual children. For example, monolingual English-speaking children omit verb endings in sentences such as "Eve play there," "Andrew want that," and German-speaking children use infinitives as in "Thorstn das haben" (Thorstn that to have). Spanish- and Italian-speaking monolinguals never omit verbal inflection or use infinitives in this way. Remarkably, two-year-old German-Italian bilinguals use infinitives when speaking German but not when they speak Italian. Young Spanish-English bilingual children drop the English verb endings but not the Spanish ones, and German-English bilinguals omit verbal inflection in English and use the infinitive in German.[21] Results such as these have led some researchers to suggest that the bilingual child is like "two monolinguals in one head."

The Role of Input

One issue that concerns researchers studying bilingualism, as well as parents of bilingual children, is the relation between language input and "proficiency." What role does input play in helping the child to separate the two languages? One input condition that is thought to promote bilingual development is *une personne-une langue* (one person, one language). In this condition, each person, say Mom and Dad, speaks only one language

[21] M. Salustri, J. Berger-Morales, and J. Gilkerson. *An Analysis of the Spontaneous Utterances of Two Bilingual Children: Evidence for the Separate Systems Hypothesis.* Unpublished UCLA manuscript; S. Unsworth. 2000. *The Referential Properties of Root Infinitives in Bilingual (German/English) First Language Acquisition.* Unpublished master's thesis, University of Durham.

to the child. The idea is that keeping the two languages separate in the input will make it easier for the child to keep them separate. Whether this affects bilingual development in some important way has not been established. In practice this "ideal" input situation may be difficult to attain. It may also be unnecessary. We saw earlier that babies are attuned to various phonological properties of the input language such as prosody and phonotactics. This may provide a sufficient basis for the bilingual child to keep the two languages separate.

Another question is, how much input does a child need in each language to become "native" in both? The answer is not straightforward. It seems intuitively clear that if a child hears 12 hours of English a day and only 2 hours of Spanish, he will probably develop English much more quickly and completely than Spanish. In fact, under these conditions he may never achieve the kind of grammatical competence in Spanish that we associate with the normal monolingual Spanish speaker. In reality, bilingual children are raised in varying circumstances. Some may have more or less equal exposure to the two languages; some may hear one language more than the other but still have sufficient input in the two languages to become "native" in both; some may ultimately have one language that is "dominant" to a lesser or greater degree. Researchers simply do not know how much language exposure is necessary in the two languages to produce a "balanced bilingual." For practical purposes, the rule of thumb is that the child should receive roughly equal amounts of input in the two languages to achieve native proficiency in both.

Cognitive Effects of Bilingualism

Another issue is the effect of bilingualism on intellectual or cognitive development. Does being bilingual make you more or less intelligent, more or less creative, and so on? Historically, research into this question has been fraught with methodological problems and has often been heavily influenced by the prevailing political and social climate. Many early studies (before the 1960s) showed that bilingual children did worse than monolingual children on IQ and other cognitive and educational tests. The results of more recent research indicate that bilingual children outperform monolinguals in certain kinds of problem solving. Also, bilingual children seem to have better **metalinguistic awareness.** Metalinguistic awareness refers to a speaker's conscious awareness *about* language and the use of language. This is in contrast to linguistic knowledge, which, as we have seen, is knowledge *of* language and is unconscious. Bilingual children have an earlier understanding of the arbitrary relation between an object and its name, for instance. And they have sufficient metalinguistic awareness to speak the contextually appropriate language, as we mentioned.

Whether children enjoy some cognitive or educational benefit from being bilingual seems to depend a great deal on extralinguistic factors such as the social and economic position of the child's group or community, the educational situation, and the relative "prestige" of the two languages. Studies that show the most positive effects (for example, better school performance) generally involve children reared in societies where both languages are valued, and whose parents were interested and supportive of their bilingual development.

Second Language Acquisition

In contrast to the bilinguals just discussed, many people are introduced to a second language (L2) after they have achieved native competence in a first language (L1). If you have had the experience of trying to master a second language as an adult, no doubt you found it to be a challenge quite unlike your first language experience.

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Is L2 Acquisition the Same as L1 Acquisition?

With some exceptions, adults do not simply "pick up" a second language. It usually requires conscious attention, if not intense study and memorization, to become proficient in a second language. Again, with the exception of some remarkable individuals, adult second-language learners (L2ers) do not often achieve nativelike grammatical competence in the L2, especially with respect to pronunciation. They generally have an accent and they may make syntactic or morphological errors that are unlike the errors of children acquiring their first language (L1ers). For example, L2ers often make word order errors, especially early in their development, as well as morphological errors in grammatical gender and case. L2 errors may **fossilize** so that no amount of teaching or correction can undo them

Unlike L1 acquisition, which is uniformly successful across children and languages, adults vary considerably in their ability to acquire an L2 completely. Some people are very talented language learners. Others are hopeless. Most people fall somewhere in the middle. Success may depend on a range of factors, including age, talent, motivation, and whether you are in the country where the language is spoken or sitting in a classroom five mornings a week with no further contact with native speakers. For all these reasons, many people, including many linguists who study L2 acquisition, believe that second language acquisition is something different from first language acquisition. This hypothesis is referred to as the **fundamental difference hypothesis** of L2 acquisition.

In certain important respects, however, L2 acquisition is like L1 acquisition. Like L1ers, L2ers do not acquire their second language overnight; they go through stages.

Like L1ers, L2ers construct grammars. These grammars reflect their competence in the L2 at each stage and so their language at any particular point, though not nativelike, is rule-governed and not haphazard. The intermediate grammars that L2ers create on their way to the target have been called **interlanguage grammars.**

Consider word order in the interlanguage grammars of Romance (Italian, Spanish, and Portuguese) speakers acquiring German as a second language. The word order of the Romance languages is Subject-(Auxiliary)-Verb-Object (like English). German has two basic word orders depending on the presence of an auxiliary. Sentences with auxiliaries have Subject-Auxiliary-Object-Verb, as in (1). Sentences without auxiliaries have Subject-Verb-Object, as in (2).

1. Hans hat ein Buch gekaufen. "Hans has a book bought."
2. Hans kauft ein Buch. "Hans bought a book."

Studies show that Romance speakers acquire German word order in pieces. During the first stage they use German words but the S-Aux-V-O word order of their native language, as follows:[22]

Stage 1: Mein vater hat gekaufen ein buch.
"My father has bought a book."

At the second stage, they acquired the VP word order Object-Verb.

Stage 2: Vor personalrat auch meine helfen.
in the personnel office [a colleague] me helped
"A colleague in the personnel office helped me. "

At the third stage they acquired the rule that places the verb or (auxiliary) in second position

Stage 3: Jetzt kann sie mir eine frage machen.
now can she me a question ask
"Now she can ask me a question."

I kenne nich die welt.
I know not the world.
"I don't know the world."

These stages differ from those of children acquiring German as a first language. For example, German children know from the start that the language has SOV word order. However, like L1ers, L2ers attempt to uncover the grammar of the target language.

Unlike children acquiring their first language, second-language learners often do not reach the target. Proponents of the fundamental difference hypothesis believe that L2ers construct grammars according to different principles than those used in L1 acquisition, principles that are not specifically designed for language acquisition, but for the problem-solving skills used for tasks like playing chess or learning math. According to

[22] Data from P. Jordens. 1988. "The Acquisition of Word Order in L2 Dutch and German," in P. Jordens and J. Lalleman, eds. *Language Development.* Dordrecht: Foris. (These stages are simplified for expository purposes.)

this view, L1ers have specifically linguistic principles of UG to help them, but adult L2ers do not. In response to this position, others have noted that adults are superior to children in solving all sorts of nonlinguistic problems. If they were using these problem-solving skills to learn their L2, shouldn't they be uniformly more successful than they are? Also, linguistic savants such as Christopher, discussed in chapter 2, argue against the view that L2 acquisition involves only nonlinguistic cognitive abilities. Christopher's IQ and problem-solving skills are minimal at best. Yet, he has become proficient in several languages.

Many L2 acquisition researchers reject the idea that L2 acquisition is fundamentally different from L1 acquisition. They point to various studies that show that interlanguage grammars do not generally violate principles of UG, which makes the process seem more similar to L1 acquisition. In the German L2 examples above, the interlanguage rules may be wrong for German, or wrong for Romance, but they are not impossible rules. These researchers also note that although L2ers may fall short of L1ers in terms of their final grammar, they may acquire rules in the same way as L1ers.

Native Language Influence in L2 Acquisition

One respect in which L1 acquisition and L2 acquisition are clearly different is that adult L2ers already have a fully developed grammar of their first language. As discussed in chapter 1, linguistic competence is unconscious knowledge. We cannot suppress our ability to use the rules of our language. We cannot decide not to understand English. Similarly, L2ers — especially at the beginning stages of acquiring their L2 — seem to rely on their L1 grammar to some extent. This is shown by the kinds of errors L2ers make, which often involve the **transfer of grammatical rules** from their L1. This is most obvious in phonology. L2ers generally speak with an accent because they may transfer the phonemes, phonological rules, or syllable structures of their first language to their second language. We see this in the Japanese speaker, who does not distinguish between *write* [rajt] and *light* [lajt] because the r/l distinction is not phonemic in Japanese; in the French speaker, who says "ze cat in ze hat" because French does not have [ð]; in the German speaker, who devoices final consonants, saying [hæf] for *have;* and in the Spanish speaker, who inserts a schwa before initial consonant clusters, as in [əskul] for *school* and [əsnab] for *snob.*

Similarly, English speakers may have difficulty with unfamiliar sounds in other languages. For example, in Italian long (or double) consonants are phonemic. Italian has minimal pairs such as the following:

ano	"anus"	anno	"year"
pala	"shovel"	palla	"ball"
dita	"fingers"	ditta	"company"

English-speaking L2 learners of Italian have difficulty in hearing and producing the contrast between long and short consonants. This can lead to very embarrassing situations, for example on New Year's Eve, when instead of wishing people *buon anno* (good year), you wish them *buon ano.*

Native language influence is also found in the syntax and morphology. Sometimes this influence shows up as a wholesale transfer of a particular piece of grammar. For

example, a Spanish speaker acquiring English might drop subjects in non-imperative sentences because this is possible in Spanish, as illustrated by the following examples.[23]

Hey, is not funny.
In here have the mouth.
Live in Columbia.

Or speakers may begin with the word order of their native language, as we saw in the Romance-German interlanguage examples.

Native language influence may show up in more subtle ways. For example, people whose L1 is German acquire English yes/no questions faster than Japanese speakers do. This is because German has a verb movement rule for forming yes-no questions that is very close to the English Aux movement rule, while in Japanese there is no syntactic movement in question formation.

The Creative Component of L2 Acquisition

It would be an oversimplification to think that L2 acquisition involves only the transfer of L1 properties to the L2 interlanguage. There is a strong creative component to L2 acquisition. Many language-particular parts of the L1 grammar do not transfer. Items that a speaker considers irregular, infrequent, or semantically difficult are not likely to transfer to the L2. For example, speakers will not typically transfer L1 idioms such as *He hit the roof* meaning "He got angry." They are more likely to transfer structures in which the semantic relations are transparent. For example, a structure such as (1) will transfer more readily than (2).

1. It is awkward to carry this suitcase.
2. This suitcase is awkward to carry.

In (1) the NP "this suitcase" is in its logical direct object position, while in (2) it has been moved to the subject position away from the verb that selects it.

Many of the "errors" that L2ers do make are not derived from their L1. For example, in one study Turkish speakers at a particular stage in their development of German used SVAdv (Subject-Verb-Adverb) word order in embedded clauses (the *wenn* clause in the following example) in their German interlanguage, even though both their native language and the target language have SAdvV order:

Wenn	ich	geh	zuruck ich	arbeit elektriker	in turkei
if	I	go	back, I	work (as an) electrician	in Turkey

The embedded SVAdv order is most likely an overgeneralization of the verb second requirement in main clauses that we discussed above. As we noted earlier, overgeneralization is a clear indication that a rule has been acquired.

Why certain L1 rules transfer to the interlanguage grammar and others don't is not well understood. It is clear, however, that although construction of the L2 grammar is influenced by the L1 grammar, there are also developmental principles — possibly uni-

[23] Examples from S. Hillis. 1989. *Access to Universal Grammar and Second Language Acquisition.* UCLA Ph.D. dissertation.

versal — that operate in L2 acquisition. This is best illustrated by the fact that speakers with different L1s go through similar L2 stages. For example, Turkish, Serbo-Croatian, Italian, Greek, and Spanish speakers acquiring German as an L2 all drop articles to some extent. Since some of these L1s have articles, this cannot be due to transfer but must involve some more general property of language acquisition

A Critical Period for L2 Acquisition?

Age is a significant factor in L2 acquisition. The younger a person is when exposed to a second language, the more likely she is to achieve nativelike competence.

In an important study of the effects of age on ultimate attainment in L2 acquisition, Jacqueline Johnson and Elissa Newport tested several groups of Chinese and Korean speakers who had acquired English as a second language.[24] The subjects, all of whom had been in the United States for at least five years, were tested on their knowledge of specific aspects of English morphology and syntax. They were asked to judge the grammaticality of sentences such as:

The little boy is speak to a policeman.
The farmer bought two pig.
A bat flewed into our attic last night.

Johnson and Newport found that the test results depended heavily on the age at which the person had arrived in the United States. The people who arrived as children (between the age of three and eight) did as well on the test as American native speakers. Those who arrived between the ages of eight and fifteen did not perform like native speakers. Moreover, every year seemed to make a difference for this group. The person who arrived at age nine did better than the one who arrived at age ten; those who arrived at age eleven did better than those who arrived at age twelve and so on. The group that arrived between the ages of seventeen and thirty-one had the lowest scores.

Does this mean that there is a critical period for L2 acquisition, an age beyond which it is *impossible* to acquire the grammar of a new language? Most researchers would hesitate to make such a strong claim. Although age is an important factor in achieving nativelike L2 competence, it is certainly possible to acquire a second language as an adult. Indeed, many teenage and adult L2 learners become quite proficient, and a few highly talented ones even manage to pass for native speakers.

It is more appropriate to say that there is a gradual decline in L2 acquisition abilities with age and that there are "sensitive periods" for the nativelike mastery of certain aspects of the L2. The sensitive period for phonology is the shortest. To achieve nativelike pronunciation of an L2 generally requires exposure during childhood. Other aspects of language, such as syntax, may have a larger window.

Recent research with "heritage language" learners provides additional support for the notion of sensitive periods in L2 acquisition. UCLA psychologist Terry Au and her colleagues investigated the acquisition of Spanish by college students who had overheard the language as children (and sometimes knew a few words), but who did not oth-

[24] J. Johnson and E. Newport. 1989. "Critical Period Effects in Second Language Learning: The Influence of Maturational State on the Acquisition of English as a Second Language," *Cognitive Psychology* 21:60–99.

erwise speak or understand Spanish. The "overhearers" were compared to people who had no exposure to Spanish before the age of fourteen. All of the students were native speakers of English studying their "heritage language" as a second language. Au's results showed that the "overhearers" acquired a nativelike accent while the other students did not. However, the overhearers did not show any advantage in acquiring the grammatical morphemes of Spanish. Early exposure may leave an "imprint" that facilitates the late acquisition of certain aspects of language.[25]

Second-Language Teaching Methods

Many approaches to foreign-language instruction have developed over the years. In one method, **grammar-translation,** the student memorizes words, inflected words, and syntactic rules and uses them to translate from English to L2 and vice versa. The **direct method** abandons memorization and translation; the native language is never used in the classroom, and the structure of the L2 language or how it differs from the native language is not discussed. The direct method attempts to stimulate learning a language as if the students found themselves in a foreign country with only natives to speak to. The direct method seems to assume that adults can learn a foreign language in a way they learned their native language as children. Practically, it is difficult to duplicate the social, psychological, or physical environment of the child, or even the number of hours that the learner is exposed to the language to be acquired, even if there is no critical-age factor.

An audio-lingual language-teaching method is based on the assumption that language is acquired mainly through imitation, repetition, and reinforcement, an assumption which is very likely to be as wrong for L2 acquisition as it is for L1 acquisition. All language acquisition involves creativity on the part of the learner.

Most individual methods have serious limitations: Probably a combination of many methods is required as well as motivation on the part of the student, intensive and extensive exposure, native or near-native speaking teachers who can serve as models, and instruction and instructional material that is based on linguistic analysis of all aspects of the language.

Can Chimps Learn Human Language?

> . . . It is a great baboon, but so much like man in most things . . . I do believe it already understands much English; and I am of the mind it might be taught to speak or make signs.
>
> Entry in Samuel Pepys' *Diary,* August 1661

In this chapter, the discussion has centered on human language acquisition. Recently, much effort has been expended to determine whether nonhuman primates (chimpanzees, monkeys, gorillas, and so on) can learn human language.

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[25] T. Au, L. Knightly, S. Jun, and J. Oh. In press. "Overhearing a Language During Childhood," *Psychological Science.*

In their natural habitat, primates communicate with each other in systems that include visual, auditory, olfactory, and tactile signals. Many of these signals seem to have meaning associated with the animals' immediate environment or emotional state. They can signal danger and can communicate aggressiveness and subordination. Females of some species emit a specific call to indicate that they are anestrus (sexually quiescent), which inhibits attempts by males to copulate. However, the natural sounds and gestures produced by all nonhuman primates show their signals to be highly stereotyped and limited in the type and number of messages they convey. Their basic vocabularies occur primarily as emotional responses to particular situations. They have no way of expressing the anger they felt yesterday or the anticipation of tomorrow.

Despite their limited natural systems of communication, these animals have provoked an interest in whether they have the capacity to acquire complex linguistic systems that are similar to human language.

Gua

In the 1930s, Winthrop and Luella Kellogg raised their infant son with an infant chimpanzee named Gua to determine whether a chimpanzee raised in a human environment and given language instruction could learn a human language. Gua understood about one hundred words at sixteen months, more words than their son at that age, but she never went beyond that. Moreover, comprehension of language involves more than understanding the meanings of isolated words. When their son could understand the difference between *I say what I mean* and *I mean what I say,* Gua could not understand either sentence.

Viki

A chimpanzee named Viki was raised by Keith and Cathy Hayes, and she too learned a number of individual words, even learning to articulate, with great difficulty, the words *mama, papa, cup,* and *up*. That was the extent of her language production.

Washoe

Psychologists Allen and Beatrice Gardner recognized that one disadvantage suffered by the primates was their physical inability to pronounce many different sounds. Without a sufficient number of phonemic contrasts, spoken human language is impossible. Many species of primates are manually dexterous, and this fact inspired the Gardners to attempt to teach American Sign Language to a chimpanzee that they named Washoe, after the Nevada county in which they lived. Washoe was brought up in much the same way as a human child in a deaf community, constantly in the presence of people who used ASL. She was deliberately taught to sign, whereas children raised by deaf signers acquire sign language without explicit teaching, as hearing children learn spoken language.

By the time Washoe was four years old (June 1969), she had acquired eighty-five signs with such meanings as "more," "eat," "listen," "gimme," "key," "dog," "you," "me," "Washoe," and "hurry." According to the Gardners, Washoe was also able to produce sign combinations such as "baby mine," "you drink," "hug hurry," "gimme flower," and "more fruit."

Sarah

At about the same time that Washoe was growing up, psychologist David Premack and his wife Ann Premack raised a chimp named Sarah in their home and attempted to teach her an artificial language designed to resemble human languages in some aspects. The "words" of Sarah's "language" were plastic chips of different shapes and colors that had metal backs. Sarah and her trainers "talked" to each other by arranging these symbols on a magnetic board. Sarah was taught to associate particular symbols with particular meanings. The form-meaning relationship of these "morphemes" or "words" was arbitrary; a small red square meant "banana," and a small blue rectangle meant "apricot," while the color red was represented by a gray chip and the color yellow by a black chip. Sarah learned a number of "nouns," "adjectives," and "verbs," symbols for abstract concepts like "same as" and "different from," "negation," and "question."

There were drawbacks to the Sarah experiment. She was not allowed to "talk" spontaneously, but only in response to her trainers. There was the possibility that her trainers unwittingly provided cues that Sarah responded to.

Learning Yerkish

To avoid these and other problems, Duane and Sue Rumbaugh and their associates at the Yerkes Regional Primate Research Center began in 1973 to teach a different kind of artificial language, called Yerkish, to three chimpanzees: Lana, Sherman, and Austin. The words of Yerkish, called lexigrams, are geometric symbols displayed on a computer keyboard. Certain fixed orders of these lexigrams constitute grammatical sentences in Yerkish. The computer records every button pressed so that a complete 24/7 record of the chimps' "speech" was obtained. The researchers are particularly interested in the ability of primates to communicate using abstract, functional symbols.

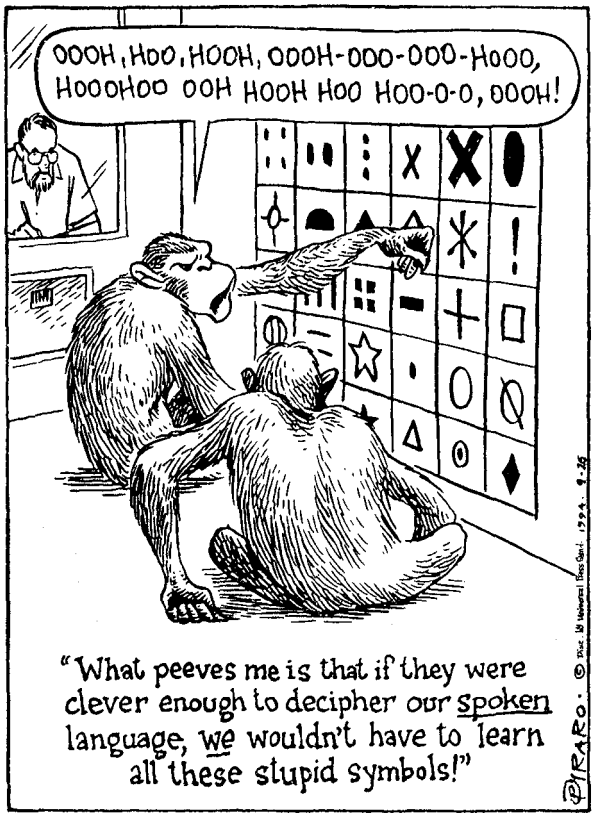
Koko

Another experiment aimed at teaching sign language to primates involved a gorilla named Koko, who was taught by her trainer, Francine "Penny" Patterson. Patterson claims that Koko has learned several hundred signs, is able to put signs together to make sentences, and is capable of making linguistic jokes and puns, composing rhymes such as BEAR HAIR (which is a rhyme in spoken language but not ASL), and inventing metaphors such as FINGER BRACELET for ring.

Nim Chimpsky

The psychologist H. S. Terrace and his associates studied a chimpanzee named Nim Chimpsky in a project specifically designed to test the linguistic claims that had emerged from prior primate experiments.[26] An experienced teacher of ASL taught Nim to sign. Under carefully controlled experimental conditions that included thorough record-

[26] Collaborating with Terrace were Laura Petitto, Richard Sanders, and Thomas Bever. The results of Project Nim are reported in H. S. Terrace (1979), *Nim: A Chimpanzee Who Learned Sign Language*, New York: Knopf.



keeping and many hours of videotaping, Nim's teachers hoped to show beyond a reasonable doubt that chimpanzees had a humanlike linguistic capacity, in contradiction to the view put forth by Noam Chomsky (after whom Nim was ironically named) that human language is species-specific. In the nearly four years of study, Nim learned about 125 signs, and during the last two years Nim's teachers recorded more than 20,000 utterances including two or more signs. Nim produced his first ASL sign (DRINK) after just four months, which greatly encouraged the research team at the start of the study. Their enthusiasm soon diminished when he never seemed to go much beyond the two-word stage. Terrace concluded that "his three-sign combinations do not . . . provide new information. . . . Nim's most frequent two- and three-sign combinations [were] PLAY ME and PLAY ME NIM. Adding NIM to PLAY ME is simply redundant," writes Terrace. This kind of redundancy is illustrated by a sixteen-sign utterance of Nim's: GIVE ORANGE ME GIVE EAT ORANGE ME EAT ORANGE GIVE ME EAT ORANGE GIVE ME YOU. Other typical sentences do not sound much like the early sentences of children we cited earlier.

Nim eat Nim eat.
Drink eat me Nim.
Me Eat Me eat.
You me banana me banana you.

Nim rarely signed spontaneously as children do when they begin to use language (spoken or sign). Only 12 percent of his utterances were spontaneous. Most of Nim's signing occurred only in response to prompting by his trainers and was related to eating, drinking, and playing; that is, it was stimulus-controlled. As much as 40 percent of his output was simply repetitions of signs made by the trainer. Children initiate conversations more and more frequently as they grow older, and their utterances repeat less and less of the adult's prior utterance. Some children rarely imitate in conversation. Children become increasingly more creative in their language use, but Nim showed almost no tendency toward such creativity. Furthermore, children's utterances increase in length and complexity as time progresses, finally mirroring the adult grammar, whereas Nim's language did not.

The lack of spontaneity and the excessive noncreative imitative nature of Nim's signing led to the conclusion that Nim's acquisition and use of language is qualitatively different from a child's. After examining the films of Washoe, Koko, and others, Terrace drew similar conclusions regarding the signing of the other primates.

Signing chimpanzees are also unlike humans in that when several of them are together they do not sign to each other as freely as humans would under similar circumstances. There is also no evidence to date that a signing chimp (or one communicating with plastic chips or computer symbols) will teach another chimp language, or that offspring will acquire language from their parent.

Clever Hans

Like Terrace, the Premacks and the Rumbaughs suggest that the sign-language studies lacked sufficient control and that the reported results were too anecdotal to support the view that primates are capable of acquiring a human language. They also question whether each of the others' studies, and all those attempting to teach sign language to primates, suffer from what has come to be called the Clever Hans phenomenon.

Clever Hans was a performing horse that became famous at the end of the nineteenth century because of his apparent ability to do arithmetic, read, spell, and even solve problems of musical harmony. He answered the questions posed by his interrogators by stamping out numbers with his hoof. It turned out, not surprisingly, that Hans did not know that 2 + 2 = 4, but he was clever enough to pick up subtle cues conveyed unconsciously by his trainer as to when he should stop tapping his foot.

Sarah, like Clever Hans, took prompts from her trainers and her environment to produce the plastic-chip sentences. In responding to the string of chips standing for

SARAH INSERT APPLE PAIL BANANA DISH

all Sarah had to figure out was to place certain fruits in certain containers, and she could decide which by merely seeing that the apple symbol was next to the pail symbol, and the banana symbol was next to the dish symbol. There is no evidence that Sarah actually grouped strings of words into constituents. There is also no indication that Sarah would understand a new compound sentence of this type. The creative ability so much a part of human language is not demonstrated by this act.

Problems also exist in Lana's acquisition of Yerkish. Thompson and Church[27] studied the Lana project and were able to simulate Lana's behavior with a computer model. They concluded that the chimp's "linguistic" behavior can all be accounted for by her learning to associate lexigrams with objects, persons, or events, and to produce one of several "stock sentences" depending on situational cues (like Clever Hans).

How Sarah and Lana learned to manipulate symbols differs in several significant respects from how children learn language. In the case of the chimpanzees, each new rule or sentence form was introduced in a deliberate, highly constrained way. When parents speak to children, however, they do not confine themselves to a few words in a particular order for months, rewarding the child with a chocolate bar or a banana each time the child correctly responds to a command. Nor do they wait until the child has mastered one rule of grammar before going on to a different structure. Unless they were linguists, parents wouldn't know how to do such a thing. Young children require no special language training.

Kanzi

Research on the linguistic ability of nonhuman primates continues. Two investigators studied a different species of chimp, a male bonobo (or pygmy chimpanzee) named Kanzi. They used the same plastic lexigrams and computer keyboard as used with Lana. They concluded that Kanzi "has not only learned, but also invented grammatical rules that may well be as complex as those used by human two-year-old children."[28] The grammatical rule referred to was the combination of a lexigram (such as that meaning "dog") followed by a gesture meaning "go." After combining these, Kanzi would then go to an area where dogs were located to play with them. Greenfield and Savage-Rumbaugh claim that this "ordering" rule was not an imitation of his caretakers' utterances, whom they say use an opposite ordering, in which "go" was followed by "dogs."

The investigators report that Kanzi's acquisition of "grammatical skills" was slower than that of human children, taking about three years (starting when he was five and a half years old).

Most of Kanzi's so-called sentences are fixed formulas with little if any internal structure. Kanzi has not yet exhibited the linguistic knowledge of a human three-year-old, whose complexity level includes knowledge of structure dependencies and hierarchical structure. Moreover, unlike Kanzi who used a different word order from her caretakers, children rapidly set the word order parameters of UG to correspond to the input.

As often happens in science, the search for the answers to one kind of question leads to answers to other questions. The linguistic experiments with primates have led to many advances in our understanding of primate cognitive ability. Premack has gone on to investigate other capacities of the chimp mind, such as causality; the Rumbaughs and Greenfield are continuing to study the ability of chimpanzees to use symbols. These

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[27] C. R. Thompson and R. M. Church. 1980. "An Explanation of the Language of a Chimpanzee," *Science* 208:313–14.

[28] The study, conducted by UCLA psychologist P. Marks Greenfield and Georgia State University biologist E. S. Savage-Rumbaugh, was reported in an article in *The Chronicle of Higher Education,* 26 September 1990.

studies also point out how remarkable it is that human children, by the age of three and four, without explicit teaching, and without overt reinforcement, create new and complex sentences never spoken and never heard before.

Summary

When children acquire a language, they acquire the grammar of that language — the phonological, morphological, syntactic, and semantic rules. They also acquire the pragmatic rules of the language as well as a lexicon. Children are not taught language. Rather, they extract the rules (and much of the lexicon) from the language around them.

A number of learning mechanisms have been suggested to explain the acquisition process. Imitations of adult speech, reinforcement, and analogy have all been proposed. None of these possible learning mechanisms account for the fact that children creatively form new sentences according to the rules of their language, or for the fact that children make certain kinds of errors but not others. Empirical studies of the **motherese** show that grammar development does not depend on structured input. **Connectionist models** of acquisition also depend on the child having specially structured input.

The ease and rapidity of children's language acquisition and the uniformity of the stages of development for all children and all languages, despite the **poverty of the stimulus** they receive, suggest that the language faculty is innate and that the infant comes to the complex task already endowed with a Universal Grammar. UG is not a grammar like the grammar of English or Arabic, but represents the principles to which all human languages conform. Language acquisition is a creative process. Children create grammars based on the linguistic input and are guided by UG.

Language development proceeds in stages. These stages are universal. During the first year of life, children develop the sounds of their language. They begin by producing and perceiving many sounds that do not exist in their language input. Gradually, their productions and perceptions are fine-tuned to the environment. Children's late **babbling** has all the phonological characteristics of the input language. Deaf children exposed at birth to sign languages also produce manual babbling, showing that babbling is a universal first-stage in language acquisition that is dependent on the linguistic input received.

At the end of the first year, children utter their first words. During the second year, they learn many more words and they develop much of the phonological system of the language. Children's first utterances are one-word "sentences" (the **holophrastic** stage). After a few months, the child puts two or more words together. These early sentences are not random combinations of words: The words have definite patterns and express both syntactic and semantic relationships.

During the **telegraphic stage,** the child produces longer sentences that often lack function or grammatical morphemes. The child's early grammar still lacks many of the rules of the adult grammar, but is not qualitatively different from it. Children at this stage have correct word order and rules for agreement and case, which show their knowledge of structure.

Children make various kinds of errors. For example, they will **overgeneralize** morphology. This shows that they are acquiring rules. They also need to learn rules that are particular to their specific language, and there may be errors related to this learning. There are other kinds of errors that children never make, errors that would involve violating principles of Universal Grammar.

Deaf children exposed to **sign language** show the same stages of language acquisition as do hearing children exposed to spoken languages.

Children may acquire more than one language at a time. **Bilingual** children seem to go through the same stages as monolingual children except that they develop two grammars and two lexicons simultaneously. This is true for children acquiring two spoken languages as well as for children acquiring a spoken language and a signed language. Whether the child will be equally proficient in the two languages depends on the input she receives and the social conditions under which the languages are acquired.

Like first language learners, **L2 learners** construct grammars of the target language and they also go through stages — called **interlanguage grammars.** In **second language acquisition,** influence from the speaker's first language makes L2 acquisition appear different from L1 acquisition. Adults often do not achieve nativelike competence in their L2, especially in pronunciation. The difficulties encountered in attempting to learn languages after puberty may be due to the fact that there are sensitive periods for L2 acquisition. Some theories of second language acquisition suggest that the same principles operate that account for first language acquisition. A second view suggests that the acquisition of a second language in adulthood involves general learning mechanisms rather than the specifically linguistic principles used by the child.

There are a number of second-language teaching methods that have been proposed, some of them reflecting different theories of the nature of language and language acquisition.

Questions as to whether language is unique to the human species have led researchers to attempt to teach nonhuman primates systems of communication that purportedly resemble human language. Chimpanzees like Sarah and Lana have been taught to manipulate symbols to gain rewards, and other chimpanzees, like Washoe and Nim Chimpsky, have been taught a number of ASL signs. A careful examination of the utterances in ASL by these chimps shows that unlike children, their language exhibits little spontaneity, is highly imitative (echoic), and reveals little syntactic structure. It has been suggested that the pygmy chimp Kanzi shows grammatical ability greater than the other chimps studied, but he still does not have the ability of even a three-year-old child.

The universality of the language acquisition process, of the stages of development, of the relatively short period in which the child constructs a complex grammatical system without overt teaching, and the limited results of the chimpanzee experiments, suggest that the human species is innately endowed with special language acquisition abilities, and that language is biologically and genetically part of the human neurological system.

All normal children everywhere learn language. This ability is not dependent on race, social class, geography, or even intelligence (within a normal range). This ability is uniquely human.

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Exercises

1. *Baby talk* is a term used to label the word forms that many adults use when speaking to children. Examples in English are *choo-choo* for "train" and *bow-wow* for "dog." Baby talk seems to exist in every language and culture. At least two things seem to be universal about baby talk: The words that have baby-talk forms fall into certain semantic categories (e.g., food and animals), and the words are phonetically simpler than the adult forms (e.g.,tummy /tʌmi/ for "stomach" /stʌmɪk/). List all the baby-talk words you can think of in your native language; then (1) separate them into semantic categories, and (2) try to state general rules for the kinds of phonological reductions or simplifications that occur.

2. In this chapter we discussed the way children acquire rules of question formation. The following examples of children's early questions are from a stage that is later than those discussed in the chapter. Formulate a generalization to describe this stage.

Can I go?	Can I can't go?
Why do you have one tooth?	Why you don't have a tongue?
What do frogs eat?	What do you don't like?
Do you like chips?	Do you don't like bananas?

3. Find a child between two and four years old and play with the child for about thirty minutes. Keep a list of all words and/or "sentences" that are used inappropriately. Describe what the child's meanings for these words probably are. Describe the syntactic or morphological errors (including omissions). If the child is producing multiword sentences, write a grammar that could account for the data you have collected.

4. Noam Chomsky has been quoted as saying:

   > It's about as likely that an ape will prove to have a language ability as that there is an island somewhere with a species of flightless birds waiting for human beings to teach them to fly.

   In the light of evidence presented in this chapter, comment on Chomsky's remark. Do you agree or disagree, or do you think the evidence is inconclusive?

5. Roger Brown and his coworkers at Harvard University (see References in this chapter) studied the language development of three children, referred to in the literature as Adam, Eve, and Sarah. The following are samples of their utterances during the "two-word stage."

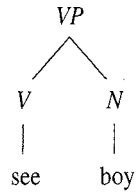
see boy	push it
see sock	move it
pretty boat	mommy sleep
pretty fan	bye-bye melon
more taxi	bye-bye hot
more melon	

A. Assume that the above utterances are grammatical sentences in the children's grammars.

(1) Write a minigrammar that would account for these sentences.

Example: One rule might be: VP → V N

(2) Draw phrase structure trees for each utterance. *Example:*



B. One observation made by Brown was that many of the sentences and phrases produced by the children were ungrammatical from the point of view of the adult grammar. The research group concluded, based on utterances such as those below, that a rule in the children's grammar for a noun phrase was:

NP → M N (where M = any modifier)

A coat	My stool	Poor man
A celery	That knee	Little top
A Becky	More coffee	Dirty knee
A hands	More nut	That Adam
My mummy	Two tinker-toy	Big boot

(3) Mark with an asterisk any of the above NPs that are ungrammatical in the adult grammar of English.

(4) State the "violation" for each starred item.

For example, if one of the utterances were *Lotsa book* you might say: "The modifier *lotsa* must be followed by a plural noun."

6. In the holophrastic (one-word) stage of child language acquisition, the child's phonological system differs in systematic ways from that in the adult grammar. The inventory of sounds and the phonemic contrasts are smaller, and there are greater constraints on phonotactic rules. (See chapter 7 for discussion on these aspects of phonology.)

A. For each of the following words produced by a child, state what the substitution is.

Example: spook (adult) [spuk] (child) [pʰuk] — substitution: initial cluster [sp] reduced to single consonant; /p/ becomes aspirated, showing that child has acquired aspiration rule.

(1) don't [dot]
(2) skip [kʰɪp]
(3) shoe [su]
(4) that [dæt]
(5) play [pʰe]
(6) thump [dʌp]

(7) bath [bæt]
(8) chop [t^hap]
(9) kitty [kɪdi]
(10) light [wajt]
(11) dolly [dawi]
(12) grow [go]

B. State general rules that account for the children's deviations from the adult pronunciations.

7. Children learn demonstrative words such as *this, that, these, those;* temporal terms such as *now, then, tomorrow;* and spatial terms such as *here, there, right, behind* relatively late. What do all these words have in common? Why might that factor delay their acquisition?

8. We saw in this chapter how children overgeneralize rules such as the plural rule, producing forms such as *mans* or *mouses.* What might a child learning English use instead of the adult words given:

a. children
b. went
c. better
d. best
e. brought
f. sang
g. geese
h. worst
i. knives
j. worse

9. The following words are from the lexicons of two children ages 1 year 6 months (1;6) and 2 (2;0) years old. Compare the pronunciation of the words to adult pronunciation.[29]

Child 1 (1;6)				**Child 2 (2.0)**			
soap	[doʊp]	bib	[bɛ]	light	[wajt]	bead	[biː]
feet	[bit]	slide	[daɪ]	sock	[sʌk]	pig	[pɛk]
sock	[kɑk]	dog	[dɑ]	geese	[gis]	cheese	[tis]
goose	[gos]	cheese	[čis]	fish	[fɪs]	biz	[bɪs]
dish	[dɪč]	shoes	[dus]	sheep	[šip]	bib	[bɪp]

a. What happens to final consonants in the language of these two children? Formulate the rule(s) in words. Do all final consonants behave the same way? If not, which consonants undergo the rule(s)? Is this a natural class?

b. On the basis of these data, are there any pairs of words that allow you to identify any of the phonemes in the grammars of these children? What are they? Explain how you were able to determine your answer.

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[29] These data are from M. Kehoe and C. Stoel Gammon. 2001. "The Development of Syllable Structure in English-Speaking Children with Particular Reference to Rhymes," *Journal of Child Language* 28(2):393–432.

10. Make up a "wug test" to test a child's knowledge of the following morphemes:

comparative	-er	(as in *bigger*)
superlative	-est	(as in *biggest*)
progressive	-ing	(as in *I am dancing*)
agentive	-er	(as in *writer*)

11. Children frequently produce sentences such as the following:

Don't giggle me.

I danced the clown.

Yawny Baby – you can push her mouth open to drink her.

Who deaded my kitty cat?

Are you gonna nice yourself?

a. How would you characterize the difference between the grammar or lexicon of children who produce such sentences and adult English?

b. Can you think of similar, but well-formed, examples in adult English?

12. Many Arabic speakers tend to insert a vowel in their pronunciation of English words. The first column has examples from L2ers whose L1 is Egyptian Arabic and the second column from L2ers who speak Iraqi Arabic:[30]

L1 = Egyptian Arabic		**L1 = Iraqi Arabic**	
[bilastik]	plastic	[ifloor]	floor
[θirii]	three	[ibleen]	plane
[tiransilet]	translate	[čilidren]	children
[silayd]	slide	[iθrii]	three
[fired]	Fred	[istadi]	study
[čildiren]	children	[ifred]	Fred

a. What vowel do the Egyptian Arabic speakers insert and where?

b. What vowel do the Iraqi Arabic speakers insert and where?

c. Based on the position of the epenthetic vowel in the third example, can you guess which list, A or B, belongs to Egyptian Arabic and which belongs to Iraqi Arabic?

Arabic A		**Arabic B**	
kitabta	"I wrote him"	katabtu	"I wrote him"
kitabla	"He wrote to him"	katablu	"He wrote to him"
kitab*i*tla	"I wrote to him"	katabt*i*lu	"I wrote to him"

[30] This problem is based on E. Broselow. 1992. "Nonobvious Transfer: On Predicting Epenthesis Errors." In S. Gass and L. Selinker, eds. *Language Transfer in Language Learning.* Amsterdam: John Benjamins.