STARTING BIG: WHY IS LEARNING A LANGUAGE HARDER FOR ADULTS THAN FOR CHILDREN?

Inbal Arnon *

Department of Psychology, Faculty of Social Sciences, The Hebrew University of Jerusalem, Jerusalem, Israel

All normally developing babies learn to speak. For most adults, however, it is hard to learn a new language, even though adults have more knowledge and more developed brains than children have. My research suggests that part of the advantage children have when it comes to learning a language is related to what they do not know: it may be easier for babies to learn a language because they do not know as much about words as adults do! When babies learn language, they need to discover what words are: they learn both individual words and also "chunks" of language that go together, like "time-for-bed." Because adults already know what a word is, they focus on learning new words when learning a new language, and pay less attention to the sequences. This makes it more difficult for them to learn the connections between words. In this article, I will explain how knowledge of words can explain some of the differences in learning a first and second language, and how our findings can help with learning a second language.

HUMAN SPEECH—A FASCINATING AND UNIQUE ABILITY

Have you ever tried to learn a new language? Maybe at school, or from a favorite TV show? If so, you know that it is not easy! There is a lot to learn: how to pronounce new sounds (for example the *th* in English), how sounds combine to make words, and how words fit into sentences. You must also learn the grammar—or the rules—of the new language (such as the plural of *table* is *tables*), as well as understand when the rules *do not* apply (the plural of *mouse* is *mice*). Even if we spend a long time learning a new language, it will still be apparent that it is not our **mother tongue** (the first language we learn). Most of the time we will speak with an accent, and we will make mistakes that a **native speaker** (someone who learned that language as a baby) would not make.

The difference in language learning between infants and adults raises an interesting question: Why is it harder for adults to learn a new language, even though they know more than infants and have more highly developed cognitive abilities? Usually, the opposite is true—a third-grade child, for example, can learn to add and subtract better than a 2-year-old toddler. To answer this question, we must first answer another question: How do babies learn to speak? Language is a uniquely human ability. While other animals have ways of communicating, no other animal (that we know of) uses language like we do. If we can understand how babies learn to talk, we can understand an important part of what makes us human.

HOW DO BABIES LEARN TO SPEAK?

People have been thinking and arguing about how babies learn to speak for thousands of years! This question has to do with a larger debate on the role of nature (what we are born with) versus nurture (what we learn) in human knowledge. On the one hand, there are people who say that babies are born with an understanding of how language works (**innate knowledge**). The most well-known supporter of this idea is Noam Chomsky, one of the most important linguists (someone who studies language) in the world [1]. Chomsky thinks that the rules of language cannot be learned only from our surroundings—infants must be born with innate knowledge about how language "works."

On the other hand, there are those who think that babies are born with little innate knowledge, and that most of their knowledge is learned from what they see and hear around them. According to this idea, babies are born with learning mechanisms that they use to learn the language that they hear [2]. Researchers who think this way—myself included—study how infants learn (their learning mechanisms) and the kind of language that they hear, to find out whether the combination

FIRST LANGUAGE/MOTHER TONGUE

The language in which a baby first learns to speak. Bilingual or multilingual babies, who are exposed to several languages from birth, will have several first languages.

NATIVE SPEAKER

A person who learned the language as an infant.

INNATE KNOWLEDGE

Knowledge that exists in us from the moment we are born, such as the ability to suck or the ability to distinguish between a right-side-up face and an upside-down face.

of learning mechanisms and linguistic experience can explain how babies learn to speak. Today we know that babies can learn a great deal about language from speech that they hear, although we still do not know exactly what the mechanisms look like or how they change as babies grow.

The process of learning language begins while the baby is still in the mother's womb. From the 26th week of pregnancy, unborn babies (fetuses) can hear what is happening outside their mothers' bodies. What they hear sounds like language heard from underwater: the sounds may be fuzzy, but the babies can hear the melody. Newborn babies know the difference between their mothers' voices and the voices of other women, and they prefer to listen to a language they heard in the womb over a language with a different melody. What does it mean for a language to have a melody? Each language has its own combination of sound and rhythm, called **prosody**. The languages of the world can be divided into three groups, each with a different type of prosody. English, for example, has a prosody similar to Hebrew, but different from Japanese or Italian (which also differ from one another).

How can we understand what newborn babies know or like, when they cannot tell us? They cannot point their fingers or even nod their heads. But there is one thing babies *can* do on their own: suck, in order to nurse. When babies hear something new or interesting, they suck faster, and when they get bored, they suck slower. If you read to a baby exposed to English in English until the baby gets bored (starts sucking slower) and then switch to Japanese, the baby will start sucking faster again—a sign that the baby can tell the difference between the languages! You can also tell which language babies prefer—they will keep sucking quickly for as long as they want to hear it. Studies have shown that babies prefer the language they heard when they were in the womb. That is, babies sucked faster, and for longer, when they heard their mother tongue than when they heard other languages. As they grow, babies continue to learn about the structure of language from what they hear around them, and they eventually become completely fluent.

WHY IS IT DIFFICULT FOR ADULTS TO LEARN A SECOND LANGUAGE?

There are many differences between babies learning a first language and adults (or children) learning a **second language**. First, there are differences in brain structure and function between babies and adults. Second, there are differences in knowledge about language and the world. There are also differences in the learning environment—babies usually learn from a parent at home, while adults usually learn a second language from a teacher in a classroom. All these differences play a part in why adults and babies learn languages differently, but they do

---

PROSODY

The "melody" of a language; the way speech changes in its intensity, speed, and frequency over a sentence or several sentences. Prosody is also affected by meaning (questions differ in prosody from commands).

SECOND LANGUAGE

A language learned after speaking one language. Languages learned after the age of six are generally considered second languages, but there is still debate about this.

not fully explain why there are certain aspects of language that are more difficult for adults to learn.

For example, adults can easily learn new words, but they have difficulty learning the rules of grammar (how words connect to each other), especially when the rules do not make sense in the real world. For instance, it is easier to learn how to turn a single noun into a plural ("table" to "tables") than to remember whether "table" is masculine or feminine' in **gendered languages** like Hebrew or French.

Our research suggests that adults have more trouble learning languages than children do because babies and adults use different linguistic "building blocks" to learn language [3]. Babies learn both single words and word sequences that appear often, and without pauses, in their input. They treat these sequences as one long block, or "chunk." Such sequences could include "thank-you" or "give-it-to-me". Separating the chunks into words helps babies learn the connections between words. Adults, on the other hand, use single words as their building blocks, which makes it difficult for them to learn the relationships between words (Figure 1). This happens because adults already know what a *word* is, and they will specifically look for words in the new language. Over time, babies also learn to break word sequences down into individual words. I call this the Starting Big approach, and it forms the basis of our research.

GENDERED LANGUAGE

Languages that divide nouns into masculine and feminine (like Hebrew or Spanish). The nouns grammatical gender impacts which elements it appears with (e.g., casa negra vs. perro negro).

Figure 1

Young children must learn to break multiword sequences down into individual words. Since adults have learned words, they hear the flow of speech as separate words (Image credit: Hagar Segev).

Figure 1

OUR STUDIES AND WHAT WE FOUND

Our research focused on two predictions made by the Starting Big approach. The first is that babies learn both words and word sequences from an early age. We tested this in two ways. In one study, we showed that 10-month-old infants, who do not yet produce words, could identify three-word sequences that they heard often [4]. They could tell the difference between a three-word sequence that they hear a lot, such as "are you hungry?" and sequences that they hardly hear, like "are you home?" even though they hear the words "hungry" and "home" often. In another study, we showed that four-year-old children make fewer mistakes with irregular words ("teeth" as the plural of "tooth") when they are part of a sequence they hear often ("brush your teeth"). These results suggest that very young children extract word sequences from speech and use them to learn about words.

The second prediction was that learning word sequences can help learners remember the connections between words. To test this prediction, we conducted several studies using **artificial languages** [5]. An artificial language is a "miniature" language invented by researchers. It can be a language with unfamiliar sounds or new grammar rules, and it is taught in a laboratory. Researchers have been using artificial languages for the past 25 years, as tools to help them understand how languages are learned.

For our research, we taught a gendered artificial language to adults, to see if adults learned the language better when they learned from word sequences, as children naturally do. We focused on teaching grammatical gender—which is when nouns are either *male* or *female*, and have either a feminine or masculine markers. Many languages, including French, Spanish, and Hebrew use grammatical gender. Children speaking one of these languages as their mother tongue can easily remember if a chair is a "he" or a "she", but for adults learning a second language, this is very difficult.

In our study, subjects heard sentences in our artificial language, and had to try to remember which prefix (masculine or feminine) to use with which noun. We found that adults could learn better if they first heard the noun in a sentence, without any pauses between the words ("thechair" instead of "the chair"; Figure 2). When adults heard the prefix and the noun without pauses between them, they treated them as one word, or "chunk", and it was easier for them to learn the connection between the words. In other words, when we made adults learn like children, they learned better!

Babies, unlike adults, also do not know how to read. While speech is heard in chunks, in writing there is a clear separation between each word (in most languages). This separation may reduce the learner's use of word sequences. We found that children and adults who know

ARTIFICIAL LANGUAGE

A miniature language invented as a research tool and taught in a laboratory. An artificial language can include unfamiliar sounds and/or grammar and allows scientists to explore how new languages are learned.

Figure 2

The graph shows how well participants learned new nouns (noun trials) and the masculine or feminine prefixes (article trials). Participants who had first heard sentences without pauses between the words (unsegmented-first) learned better than participants who had first heard sentences with pauses (segmented-first). The graph also shows that both groups learned the nouns well (90% accuracy). As predicted, hearing sequences first did not affect learning the words, but did improve learning the connection between the nouns and their prefixes (Figure credit: [5]).
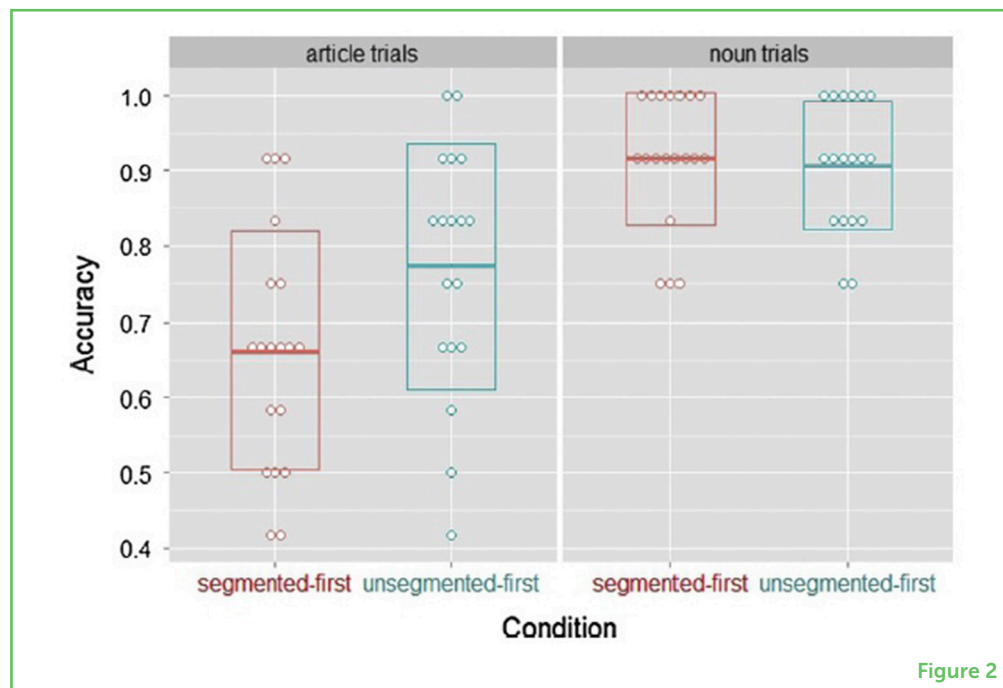
Figure 2

how to read depend less on word sequences when learning a new language than do children and adults who do not know how to read. The way words are written also affects learning. One study showed that when the prefix and the noun were written as one word, adults learned the relation between them better than when the words were written separately.

These results show that it is better to learn certain parts of a new language by hearing it, rather than reading it—and singing may be even better! This is because, in songs, the melody can help us treat a sequence of words as one big "chunk" (for example, small children often think that the L-M-N-O sequence from the alphabet song is one long word—elemeno)!

SUMMARY AND OPEN-ENDED QUESTIONS

Comparing language learning between children and adults teaches us that sometimes knowing *less* is actually an advantage—babies are better at learning languages because they do not yet know about words. This comparison also shows us that learning is flexible and can be shaped by our environment—we can help adults learn languages better by changing what they hear and see. The next time you try to learn a new language, check for yourself: Which parts are most difficult for you? Is it easier to learn when you hear the language or when you read it? Do you focus on single words or word sequences? Can you remember better when you hear the words in a song? We are convinced you will discover some interesting things!

ACKNOWLEDGMENTS

REFERENCES

1. Chomsky, N. 1965. *Aspects of the Theory of Syntax*. Cambridge, MA: MIT Press.
2. Tomasello, M. 2003. *Constructing a Language: A Usage-Based Theory of Language Acquisition*. Cambridge, MA: Harvard University Press.
3. Arnon, I. 2021. The Starting Big approach to language learning. *J. Child Lang.* 48:937–58. doi: 10.1017/S0305000921000386
4. Skarabela, B., Ota, M., and Arnon, I. 2021. "Clap your hands" or "take your hands?" One-year-olds distinguish between frequent and infrequent multiword phrases. *Cognition.* 211:104612. doi: 10.1016/j.cognition.2021.104612
5. Siegelman, N., and Arnon, I. 2015. The advantage of starting big: Learning from unsegmented input facilitates mastery of grammatical gender in an artificial language. *J. Mem. Lang.* 85:60–75. doi: 10.1016/j.jml.2015.07.003

YOUNG REVIEWERS

"ORT DAFNA" MIDDLE SCHOOL, KIRYAT BIALIK, AGE: 13
We are a 7th grade class for scientific and technological leadership in Dafna Middle School, ORT Education Campus, Kiryat Bialik. The class is made up of outstanding students with high scientific and mathematical affinity. We are a curious class who loves to discover new things.

AUTHOR

INBAL ARNON
Inbal Arnon is a professor in the Department of Psychology at the Hebrew University and a member of the Israel Young Academy. She is a linguist, cognitive scientist, and developmental psychologist who studies how children learn to speak, why it is more difficult for adults to learn a second language, and how our cognition shapes the structure of the languages of the world. Prof. Arnon enjoys engaging in science and building a diverse community of young researchers who are committed to doing innovative science as well as to making it accessible to the community. She is one of the founders of the Open Laboratory at the Bloomfield Science Museum Jerusalem, where parents and children can participate in research while visiting the museum. Prof. Arnon lives in south Tel Aviv, raises a curious and sweet child, and goes to the sea as much as possible. *inbal.arnon@gmail.com