

WALKING INTO ENGLISH I:

From theory to L2 teaching

Stuff about me

- Professor in the Department of Philology at the Universidad de Navarra
- Director of the **Speech Laboratory**:
<http://www.unav.edu/en/web/facultad-de-filosofia-y-letras/laboratorio-del-habla/instalaciones>
- Focus on Speech Sciences
- **Phonological acquisition** by diverse populations: First and Second language speakers, Bilinguals, Children with cochlear implants
- **Artificial intelligence**: Can I train a computer model to learn sound categories?

Basically, I design....

- Experiments to understand how diverse populations perceive and produce sounds and patterns of their L1 and L2.

A few initial questions to work in groups...

- What do you know about how children acquire their first (L1) and second (L2) languages?
- Are they totally different processes?
- What's the most important aspect of phonological acquisition?
- What are some of the stages of phonological/language acquisition?

First...

- We have to ask... *what is Phonology?*
 - Phonology is the system of
 - ▣ Sounds in a specific language.
 - ▣ How those sounds form patterns in a specific language.
- Phonology is a psychological/cognitive system.
- We form and store a language's structure in our



And....

- Children have to have all of this information about sounds and their patterns (Phonology) stored in their memories **BEFORE** they can even start thinking about learning to read.

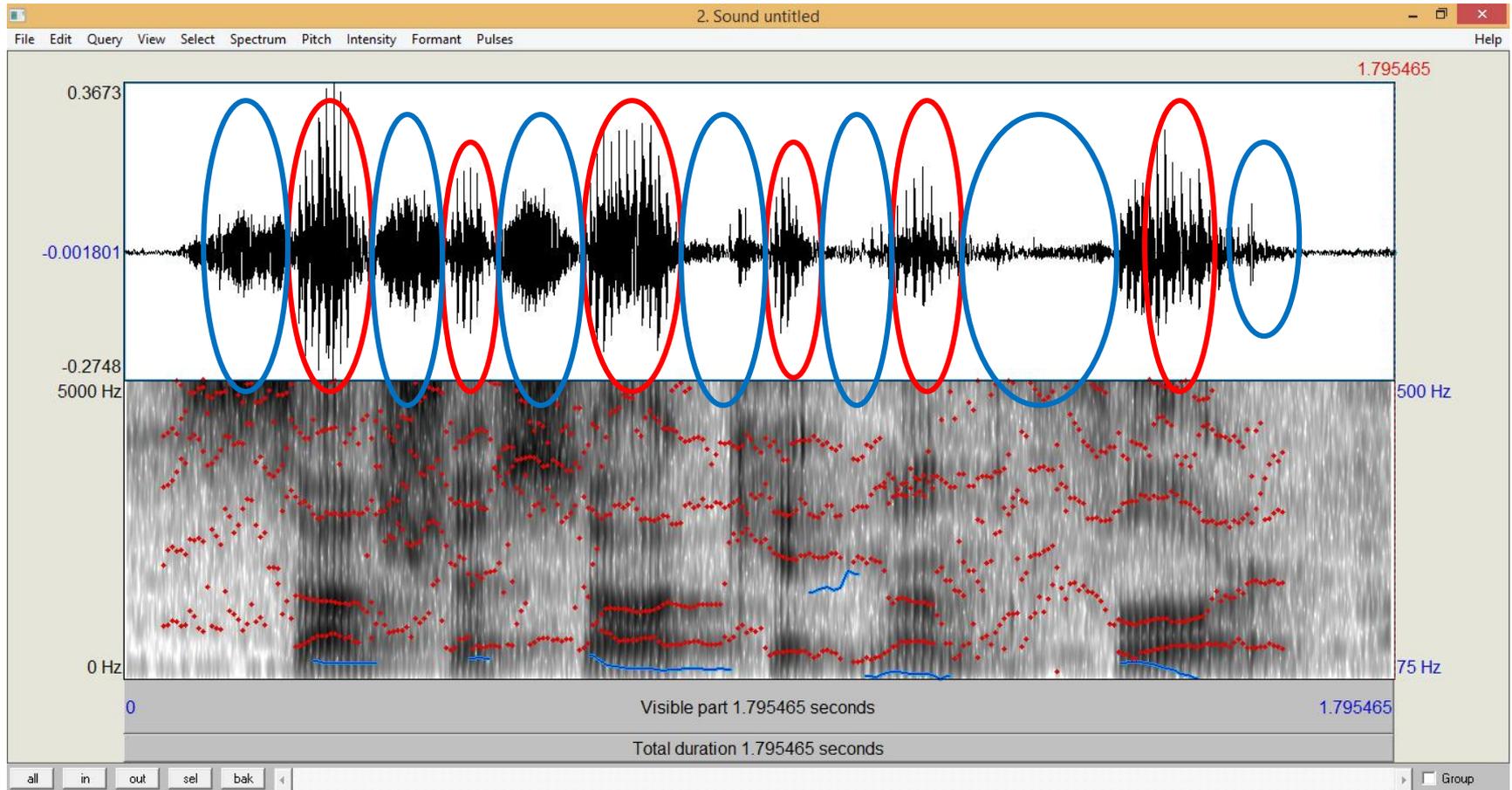
Fine, but what's a **sound**?

- Sounds can be linguistic or non-linguistic.
- Linguistic sound: consonant or vowel
- Non-linguistic sound: cough, laugh, sigh, sneeze
- Both types of sounds are used for communication.

Consonants and vowels:

Vowels= no obstruction of airflow

Consonants= obstruction of airflow



How do kids learn a phonological system?

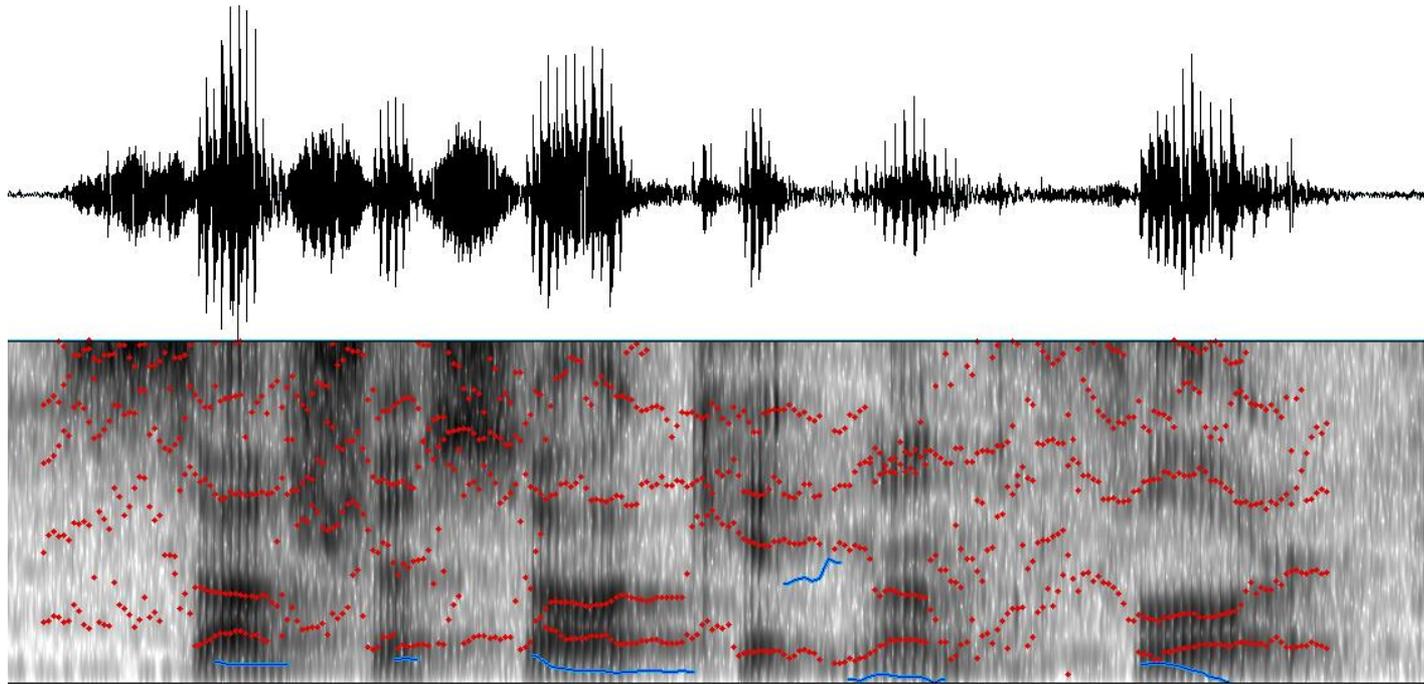
- First we have to ask *what* they have to learn before we can ask *how*.
- *What* they have to learn.
 - ▣ Sounds (consonants and vowels of a specific language).
 - ▣ How those sounds can group together (for example, can 'st' go together, can 'nt' go together etc.).
 - ▣ If so, in what syllable position? In English 'st' can go before (onset) or after (rime) the vowel, but 'nt' can only go after (rime).
 - ▣ Intonation patterns.
 - ▣ Temporal aspects: how long each sound lasts in relation to the other sounds (i.e. rhythm)
 - ▣ Children form sub-conscious categories and rules in their memories about these sounds and patterns.
 - ▣ They do this for the first languages and second languages.

So how do kids learn phonological systems

- Children are born and start from 'zero' (and I mean zero!). They have no sounds codified in their memories, they don't know how many there are etc.
- Phonological acquisition starts the first second after they're born.
- Essentially, the audio signal goes in their ear and their brain starts trying to make sense (find patterns) of what he/she is perceiving.

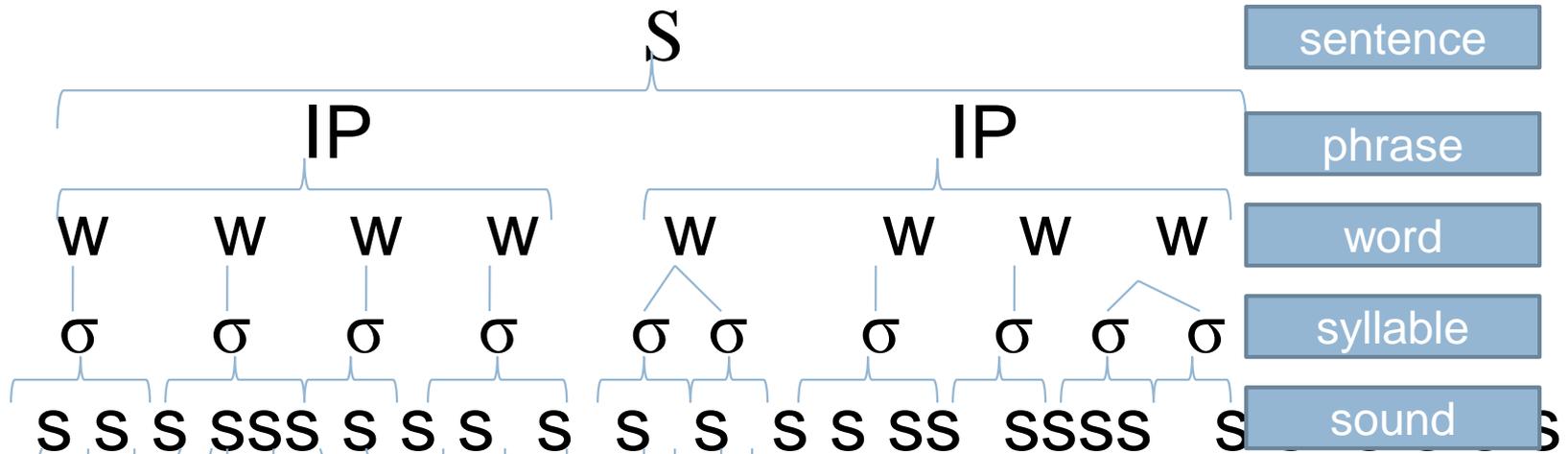


The child uses acoustic cues from the speech signal



But this is effortful because...

- Sounds are nested in syllables, syllables are nested in words, words are nested in phrases and phrases are nested in sentences.



- John likes the book, Mary likes the movie

This makes it effortful....

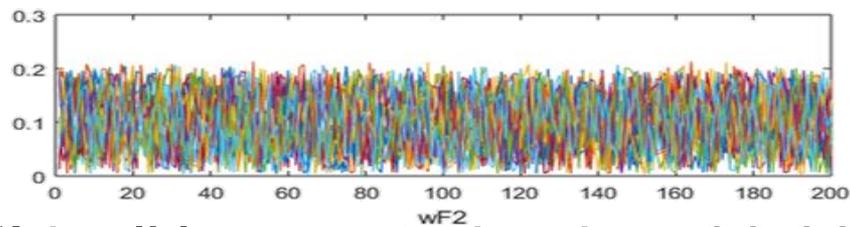
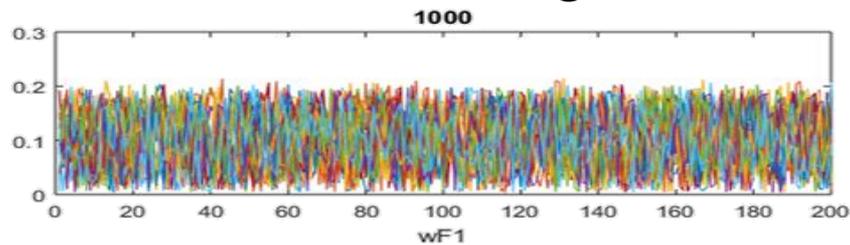
- To identify individual sounds.
- The child has to discover them through trial and error.
- A large part of this cannot be facilitated by outside influence, it depends solely on the child.
- Of course, hearing problems, influence from other languages and cognitive limitations may affect the ability to discern individual sounds/patterns/intonation/rhythm/words (macand example).

One of the first big steps...

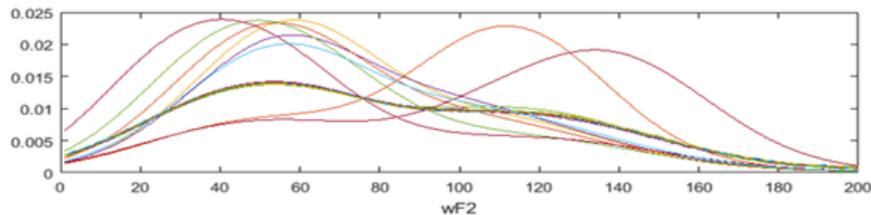
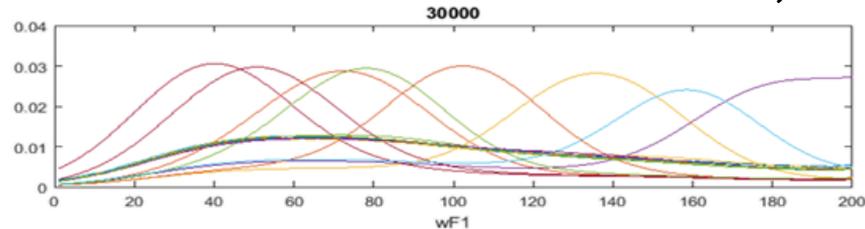
- Is to learn the different sounds and how they're different (i.e. if they're different because one is voiced like [z] or voiceless like [s], or because of where they're produced, with the lips like [p] or the tongue tip like [t]).
- In the beginning a child has no idea of where one sound starts and another sound ends
- This is called the 'Segmentation Problem' and it's one of the first steps in acquiring a language
- Let's take an easy example of how a child can learn a new sound:
 - 'This is a pencil' [ðɪsɪzəpɛntsəl]
 - 'Is a pencil used for writing?' [ɪzəpɛntsəl]
 - 'There might be a pencil...' [əpɛntsəl]
 - With every new example (input), the child is able to deduce individual sounds.
 - After thousands of inputs (examples, the child eventually learns the sounds of her language (first or second)).

Artificial intelligence learning American English vowels

- 'Ideal' before training. Can't distinguish vowel sounds.



- 'Ideal' learner trained on 90,000 iterations of AE vowels.



After 'listening' to 90,000 iterations....

- Of the vowels, the ideal learner can identify the different vowel categories.
- Children do this with all the linguistic categories.
- They start from nothing, and over time they deduce the different phonological categories from the speech signal based on their acoustic properties.

Normal phonological development.

- By about 3 months, infants can identify the native language of the mother using only prosodic cues.
- Acquisition is multi-modal: Children use visual stimuli as well as auditory stimuli to distinguish sounds: p/b/m are among the first sounds learned because aside from acoustic input, they also have a nice visual input of where the sounds are produced.
- By about 6 months, infants can identify certain morpho-phonological contrasts (singular vs plural due to 's').
- At around 11 months, the babbling stage starts.
- Listen and make a list of some of the phonological/linguistic information the children have acquired:
- https://www.youtube.com/watch?v=_JmA2CIUvUY
- Children of different language groups group together because English babble is different from Spanish babble for example (children apply phonological rules from L1 to their babble).

First words

- Around 12 months, infants start word learning (high frequency words get learned first, the same as highly frequent sounds are acquired first).
- Word learning is really slow at first. First 50 words goes really, really slow.
- From 16-28 months, word learning increases faster.
- At the same time, and thanks to word learning, phonological development goes really fast as well.
- By 36 months, children should be able to produce complex onsets (though sometimes with deletion of one of the segments 'play', 'stay'....), and most rimes (though with deletion as well: 'worked', 'best', etc)
- <https://www.youtube.com/watch?v=RE4ce4mexrU>

From 36-48 months

- Children go refining their phonological skills as vocabulary increases: the more words children learn, the more phonological information they can extract from them.
- From 48mos to 7 years, children perfect their skills. It's still normal to have some errors (deletion, sound switching, etc.), but for the most part these errors reduce dramatically as the child reaches 7 years old.
- It's assumed that phonological development ends at around 7 for a child's L1.
- Reading can start when a child has about 85% of the phonological system **codified in memory (somewhere between kindergarten and 1st grade for a native speaker of a language)**.

L2 phonological acquisition

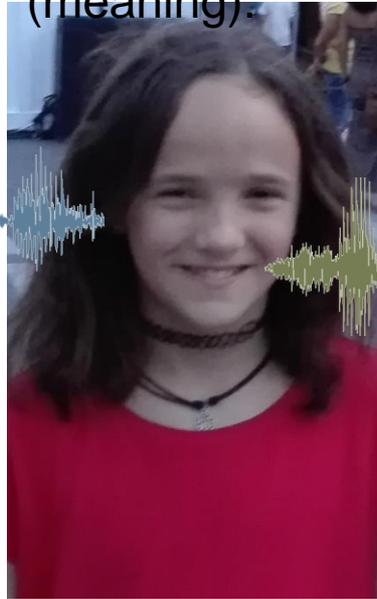
- L2 phonological acquisition in many ways is quite similar to L1 acquisition.
- Both require input and a variety of stimuli from the linguistic environment.
- Both occur statistically (statistical learning).
- Both cooccur with lexical learning (child learns phonological information as more words are learned).
- Both require the use of memory, creativity and coordination.
- In both cases, children learn more by what they observe, or pick up, from the linguistic environment than what is actually taught formally to them.

Acquisition loop

Speech sounds enter ear.



Brain parses the signal into sounds and words (meaning).



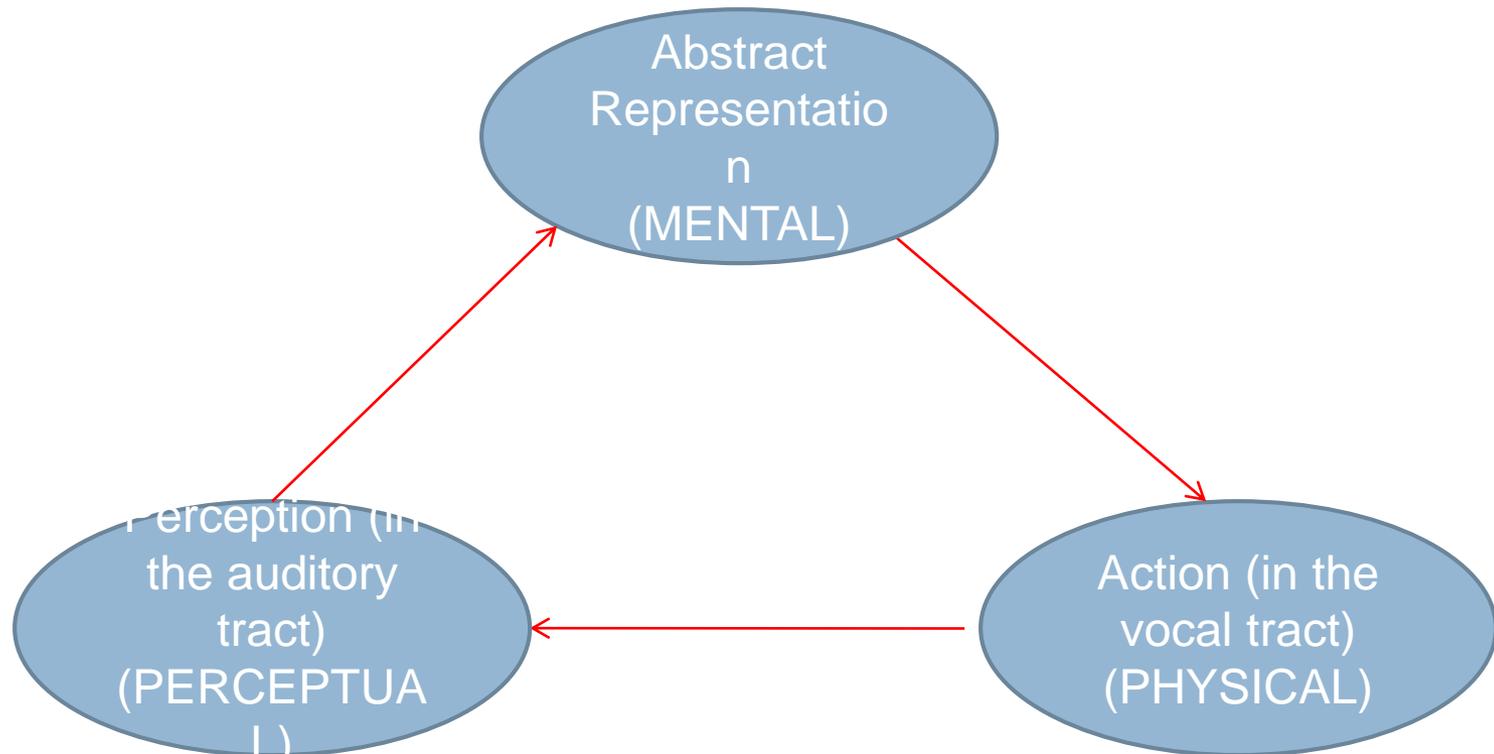
Child speaks utterance and uses her hearing to calibrate her pronunciation



We're all speakers and listeners at the same time!

This is what's known as the

- Action/perception/representation triangle in Cognitive Science:



Let's look at it this way....

- Think of skiing.
- When you hear the word skiing, you understand it because you have a mental representation of what it is.
- That mental representation will help you when you actually go to ski (physical activity).
- You already know for example that it's a sport you do standing up, in the snow, on a mountain.
- We do the same thing with sounds.

All sounds are stored as representations in our memory.

- These representations are what make us capable of understanding speech in noisy situations.
- Let's say you're at a bar and are having a conversation. You might not HEAR every single sound, but you still understand because your mind fills in the missing sounds.
- These representations are also what make us capable of reading.
- Reading is the act of matching **AN ORTHOGRAPHIC SYMBOL WITH A MENTAL REPRESENTATION OF A SOUND**. No mental representation, no match.

That mental representation...

- Is filled with all sorts of information: how long it should last, what part of the vocal tract is the sound produced in, whether your vocal folds vibrate or not, how those movements coordinate with the other sounds in the word.
- The brain activates those muscles in the vocal tract to produce the sound.

As we produce a sound....

- We also hear (perceive) the acoustic consequence of that sound, which also aids in representing that sound.
- Until about 7, children constantly use their hearing to calibrate and modify the sounds they produce until they sound perfect, or like the sounds an adult speaker produces.
- L2 speakers do it much longer than 7 years. That's why L2 speakers often have different pronunciations in noisy situations as compared to quiet situations. They can't hear their own speech, and thus can't calibrate their pronunciation. It's also why children with hearing impairment have non-native like pronunciations (auditory tract distorts acoustic input).

L2 acquisition

- Differences with L1:
 - ▣ Child doesn't start from zero (which can be good and bad: good part, child already knows how to form consonants and vowels: bad part, they shift some knowledge from L1 to L2, 'estop').
 - ▣ Child already has a sound system encoded in their memory with developing rules (also can be good and bad).
 - ▣ Not learned in the same context, and often not learned in a natural context.
 - ▣ L1 input is **UNSTRUCTURED**. 90% of everything they hear is way above them cognitively (they have no way of understanding input).
 - ▣ L2 input (in a class) is **STRUCTURED**. 60%-80% of input is designed (artificially) to coincide with their cognitive capacity to understand concepts.
 - ▣ Although no specific instruction is needed to acquire L2, certain activities can expedite process.

Minimally, a student needs to have the following phonological awareness before finishing infantil.

- Can distinguish all English vowels (there are around 15) and distinguish minimal pairs: pin/pen, den/done, bat/but, etc.
- Can distinguish all English consonants and distinguish minimal pairs: ten/den, bit/pit, ket/get, etc.
- Consonant sequences that can pattern in onsets: st, sp, sk, sm, sn, sl, sw, str, spr, spl, skr, skl, pl, pr, tr, kl, kr, bl, br, dr, gl, gr, fl, fr....
- Consonants sequences that can pattern in rimes: kt, sp, sk, st, sm....
- Basic intonation patterns.
- Basic rhythm.
- (and a passive vocabulary of around 200-500 words).

Phonological awareness

- So how do we know how much phonological knowledge a student has?
- Phonological awareness tests!
- <https://www.youtube.com/watch?v=uY8XlgL6d-g>
- <https://www.youtube.com/watch?v=MTymtZr0tTw>
- You see why you can't teach a kid to read if they don't have enough phonological awareness to be cognitively ready.

So to recap...

- Acquisition is a multi-modal process involving auditory and visual information that gets integrated into a system.
- Acquisition takes about 7 years for native speakers, and much longer for non-native speakers depending on amount of input (hours exposed to language), and the age they start receiving input.
- For both L1 and L2, around 85% of the phonological system has to be acquired before the child can start reading.