

Functional Assessment of Speech

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Decision Tree



First: Assess auditory access.

1. What is the etiology? SNL? ANSD? Thin/absent auditory nerve?
2. How is the child hearing? Analyze his thresholds and speech acoustics.
3. How are the devices working? Are all devices programmed appropriately?
4. How long has the child had appropriate auditory access?
5. Could the issue be lack of experience? Is the child a new listener?
6. How much input is the child getting (at least 10 hours)? Is it appropriate input?
7. What was the previous educational experience? Is this habituation of old patterns?



Second: Identify the types of speech production.

1. Note any phonological processes and error patterns.
2. Is overall speech different in any way: vocal quality, exaggerated, speed too slow or too fast?
3. What are the speech error patterns? Evaluating speech is really about watching and listening to productions and noting error patterns, because you can see how she approaches speech.
 - a. What does she do to work around sounds she can't make?
 - b. What does she do with complex combinations?
 - c. What are the patterns of errors she's making? Does she avoid back sounds? Or does she back? Does she simplify? That provides more info to follow up in evaluation.
4. Are the patterns developmentally appropriate?

For example, a child has some vowels and a glide. She has early bilabials: b,m,w, meaning she can make a bilabial closure, which lessens concerns about oral-motor issues. And, she has an early fricative: h. All good. So, depending on developmental and listening age, she's doing ok.



Third: Rule out motor or neurological issues.

1. Is there any other diagnosis (dysarthria, oral-motor planning, apraxia, sensory processing disorder, CP, ADHD, LD, ASD, etc.)
2. How is muscle strength (oral-motor and feeding screening)?
3. How are feeding/eating skills?
4. How are *imitative* oral-motor skills? How are *spontaneous* oral-motor skills?
5. Are productions consistent and stable once a sound/word is learned?



Fourth: Rule out the common medical, physiological, or anatomical concerns.

1. Any other diagnoses (cleft palate, velopharyngeal port insufficiency, or VPI)?
2. For example, a child is making a plosive /b/ and a fricative /h/, so he's able to retain enough sub-glottal pressure without leaking out the nose--no cleft palate.
3. He's able to produce a nasal vs a plosive, so he's able to open and close the VP well enough. I would want to see if he could alternate between those two to see how well the VP is working: have him repeat /bamabamabama/.

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Child: _____ Date of Birth: _____ Age: _____ Date: _____

Phonologic Aspect	Evaluation (Circle Descriptors)	Observations
1. Vocalization Amount	Abundant Sporadic	
2. Intelligibility	Familiar Listeners: 100% 90% 75% 50% 25% 0% Unfamiliar Listeners: 100% 90% 75% 50% 25% 0%	
3. Voice Quality	<ul style="list-style-type: none"> ▪ Natural and relaxed ▪ Breathy: excessive breath release ▪ Nasalized: through the nose ▪ Falsetto: high-pitched ▪ Glottal Fry: pulsating, gravel voice ▪ Guttural: throaty, low-pitched ▪ Harsh: hard glottal attack ▪ Hoarse/Husky: two-toned voice ▪ Hollow: lack of resonance ▪ Monotone: lack of intonation contour ▪ Strident: high frequency, excessive effort ▪ Tense: increased effort ▪ Tremulous: quavering 	
4. Fluency (Duration)	Appropriate duration of vowel length and juncture/joining of phonemes in: <ul style="list-style-type: none"> ▪ Appropriate pausing ▪ Fluid rhythm ▪ Appropriate rate ▪ Choppy ▪ Hesitations ▪ Repetitions/Self-Corrections 	
5. Stress (Intensity)	<ul style="list-style-type: none"> ▪ Correct stress in syllables ▪ Correct stress in words ▪ Correct stress in phrases (contrastive stress) 	

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Child: _____ Date of Birth: _____ Age: _____ Date: _____

Phonologic Aspect	Evaluation (Circle Descriptors)	Observations
6. Intonation (Pitch)	<ul style="list-style-type: none"> ▪ Natural and relaxed ▪ Pitch breaks ▪ Monotone: Low-pitched overall ▪ Monotone: High-pitched overall ▪ Context-dependent pitch (e.g., same vowel) 	
7. Vowels & Diphthongs Articulation Co-Articulation	<ul style="list-style-type: none"> ▪ Addition (epenthesis) ▪ Diphthongization ▪ Distortion ▪ Neutralization ▪ Nasalization ▪ Backing place cues ▪ Fronting place cues ▪ Omission ▪ Substitution 	
8. Consonants Articulation Co-Articulation	<ul style="list-style-type: none"> ▪ Addition (epenthesis) ▪ Distortion ▪ Omission ▪ Denasalization ▪ Glottal Replacement ▪ Backing ▪ Fronting ▪ Stopping ▪ Omission ▪ Substitution 	
9. Blends Articulation Co-Articulation	<ul style="list-style-type: none"> ▪ Addition ▪ Reduction ▪ Substitution 	

Speech Detective Process

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STEP 1: Identify the Error

What sound is the child trying to produce?
What sound did the child produce?

Check

1. Transcribe what child said
2. Transcribe accurate production desired
3. Note differences as targets

STEP 2: Categorize the Sound

Categorize the features of the sound(s) given
Categorize the features of the sound that is the target

Check:

1. Voice and/or DIP?
2. Vowel Place and Height?
3. Consonant Manner, Place, Voicing?
4. Blend?

STEP 3: Developmental or Remedial?

Developmental?

- Within age limits for typical development

Remedial?

- Beyond age limits for typical development

Check:

1. Sander Table on Consonant Mastery Age
2. CASLLS Checklist
3. Typical Phonological Processes

STEP 4: Choose Appropriate Sense Modality

Can child access the target sound through audition?

- Note features available through vision or taction

Check:

1. Audiogram: Unaided, Aided/CI, FM
2. Monitor Devices & Do Listening Check with Ling Six Sound Test
3. Apply 6 dB Rule, and Earshot/Auditory Bubble
4. Table 4A in Green Ling for Available Features

STEP 5: Work from the Known to the Unknown

What are the prerequisite skills needed for the target?

What prerequisite skills does child possess?

Check:

1. PLE Order
2. Assessment order = Teaching order

STEP 6: Choose a Facilitating Context

Set of Shared Features:

- Consonant Manner, Place, Voicing
- Vowel Place/Height

Acoustic or Articulatory

- Facilitating Context
- Anticipatory Set

STEP 7: Work through each Subskill in Order

1. Phonetic
Generalize consonants in *Vowel Wheel* order:

Single
Repeated
Alternated
Pitch

2. Phonologic

Carry over into real world use

Words
Phrases
Fluent Speech

STEP 8: Recycle Process

- Assess
- Teach
- Repeat



Speech Sheets

“DIP”

Adapted from Ling, D. (2002). Speech and the hearing-impaired child: Theory and practice. Washington, DC: A.G. Bell Association. With permission from A.G. Bell Association.

Suprasegmental: Duration

[Green Ling: 200-203; White Ling: 277-288]

DIP contributes to prosody—intonation, stress, and rhythmic grouping of sounds.

Auditory Elicitation

- Acoustic cues on vocal duration occur throughout the whole range of speech frequencies but are most salient below 1000 Hz.
- Always use audition (and auditory imitation) as the first sense modality, since direct vision gives no information about duration.
- Duration and intensity can be targeted simultaneously.

Visual Elicitation

- Vision provides no direct information on duration.
- Visual aids may be used to indicate differences in vocal duration. Using hand signals or objects of different lengths can indicate the differences in voicing long or short durations, or combinations of both.

Tactile Elicitation

- If necessary, have child feel the differences between a long and a short vocal duration with fingers on speaker's and on own chests.
- Associate light/heavy objects/pressure with corresponding voicing levels.
- If voice is too loud: Ensure optimal use of sensory aids or use touch for feedback.

Facilitating Contexts

- Ability to modify subglottal pressure and vocal fold function.
- Engage in abundant vocal play with neutral vowels.
- Do not overemphasize “taking a big breath” for longer durations, since it can cause tension.

A. Phonetic Subskills

1. Production of vocalizations sustained for a duration of at least 3 seconds

- Engage in natural situations (vocal play games) that encourage abundant vocalization and demand duration: exertion (pushing, pulling, tug-of-war, arm wrestling), intentionally extending a yawn or a laugh, extended crying and whining. Play vocal games: one person walks toward the child as long as the child vocalizes. Duration associated with actions: pouring water, sand, liquid, drawing lines on whiteboard, pulling out a measuring tape while vocalizing.

2. Imitation or approximation of separate syllables differing in duration, each on one breath.

- “Waking up the teacher (or baby doll)” The teacher pretends to sleep and will only “wake up” when the child produces a sufficiently long vocal duration. Adult models first so durational pattern becomes auditory input for the child.
- Child's differing vocal durations direct an adult to pull a wagon, or make toy cars go, or drink from a cup, dance, or any physical activity: “Goooooooooo!” vs. “Stop!” Vary the input so the adult's directions become auditory input for the child to differentiate between the long/short durations.
- Watch that the voice is not strained or harsh by adding /h/, if necessary, to soften the vocal attack. Pretend to be puppies panting “hahaha” or “haaaa.”

3. Imitation of up to four separate vocalizations differing in duration, each on one breath.

- Produce four long and short durational patterns on one breath. Pretend to be lions stalking their prey, vocalizing a continuous, long growl (“aaaaaaah”), and when they pounce, produce a short burst (“ah!”).
- String beads in varying duration patterns and match vocalizations to pattern.

B. Phonologic Subskills

1. Production of vocalizations sustained for a duration of at least 3 seconds

- Learning to Listen Sounds: moo, quack-quack, hop-hop-hop, aaaah
- Vocal Play: Knock, knock, knock! (opening a door), no-no-no! (exclamation), up-up-up! doooowwnn!
- Function: nooo!, not, on, and, in, under, stop! Uh-oh! Oh-no!
- Content: nose, eye, banana, airplane, round-and-round
- Songs: Itsy Bitsy Spider
- Books: No, David!
- Games: 1-2-3-GOOO!

Suprasegmental: Intensity

[Green Ling 203-206; White 277-288]

Modification of subglottal pressure and vocal fold function to produce quiet, loud voice, and stressed, unstressed syllables or words.

Auditory Elicitation

- Vocal intensity in normal speech usually involves variations over an intensity range of less than 30 dB.
- Acoustic cues on vocal intensity occur throughout the whole range of speech frequencies but are most salient below 1K.
- Imitation is the best strategy, since there are not visual cues.

Visual Elicitation

- Vision provides no direct information on intensity.
- Visual aids may be used to indicate differences in vocal intensity.
- Using hand signals or objects in different sizes can indicate differences in voicing- loud, normal, and whisper.

Tactile Elicitation

- Feel differences between loud, quiet, whispered voice with hands on speaker's and on child's chests.
- Associate light or heavy objects or pressures with corresponding voicing levels.
- Whispering elicited from blowing, then panting, or blowing flame, or feeling breath stream.

Facilitating Contexts

- Strong breath stream and abundant vocal play.

A. Phonetic Subskills

1. Production of brief, loud utterances.

- “Waking up the teacher (or baby doll)” The teacher pretends to sleep and will only “wake up” when the child produces a sufficiently loud voice. The child will raise her voice as distance between her and the listener is increased. Playing tug-of-war can elicit longer, louder utterances.

2. Production of brief, quiet utterances.

- Match physical actions to vocal intensity. Push hands together strongly with teacher and vocalize with a loud voice, then change to soft pushing with quiet voice, using a vowel or CV combination for simplicity.

3. Production of whispered speech.

- Formal remedial work can be based on auditory discrimination activities associated with representations of loud, normal, quiet, and whispered speech. Have child discriminate auditorily first, then child becomes teacher and provides stimulus to teacher.

4. Production of loud, quiet, or whispered utterances of at least three seconds' duration.

This subskill requires the integration of two sets of previously developed behaviors, one relating to voice level and the other to vocal duration. For example, the child can “make the teacher walk” a given distance only if the voice level (loud, quiet, or whisper) is maintained as long as a particular level of voice is produced.

5. Production on one breath of a series of vocalizations varying in intensity.

Produce both whispered and voiced sounds in one breath, for example, by pretending to be tiger stalking its prey, while stalking he whispers, and while pouncing he shouts.

Suprasegmental: Intensity

[Green Ling 203-206; White 277-288]

Modification of subglottal pressure and vocal fold function to produce quiet, loud voice, and stressed, unstressed syllables or words.

B. Phonologic Subskills

1. Produce intensity in familiar words.

- *Vocal Play*: Wake up doll, pretend play voicing baby (quiet) vs mother (loud) animal sounds in Learning to Listen Sounds.

2. Produce intensity in common phrases.

- No! Stop! Stop that! Don't touch! Sh! Be quiet! Oh, no! Uh-oh! Oh, dear! Wow!

3. Produce intensity in fluent speech.

- Songs: Itsy Bitsy Spider (sung quietly or whispered) vs Great Big Spider (sung loudly)
- Books: Goldilocks and the Three Bears (loud, quiet voices), Jack and Beanstalk" (giant vs child voice), No, David!
- Games: Mother May I played with directions in varying intensities, or Simon Says using various intensities

Suprasegmental: Pitch

[Green Ling 206-217; White]

Adequate breath and laryngeal control, and sufficient control to hold intensity constant to prevent confusion of high with loud, and quiet with soft voice.

Auditory Elicitation

- Most salient below 1K, so only low frequency hearing is required, at a minimum, at 300 Hz.
- Intonation patterns can extend over an octave (a doubling of the frequency of F0).
- Imitation through audition is the best strategy as there is only a gross approximation of any visual correlate (movement of larynx).

Visual Elicitation

- Visible speech indicators may be helpful after some differential pitch changes are produced, but only for gross changes.
- Similarly, visual cues are usually not helpful in initial teaching, but may be used after pitch changes are initiated.

Tactile Elicitation

- Decrease pitch: lower chin to chest, relax arms and shoulders.
- Cue vibration of low-pitches on chest; high pitches on top of head.
- Touch child's shoulder, elbow, and hand to indicate high-mid-low pitch while child's eyes are closed to eliminate visual distractions.
- Last resort: feel motion of the teacher's larynx, then child's own.

Facilitating Contexts

- Abundant vocalizations, stable duration patterns

A. Phonetic Subskills

1. Production of *discrete* vocalizations on separate breaths, approximating the highest and lowest points in the desired vocal range.

Develop a range of about 8 semitones between lowest and highest (like calling a name from a distance). Informally, use high/low pitches in role play, Learning to Listen Sounds, etc. In a formal activity, use auditory discrimination task to focus child's attention on gross differences first by associating one hand with high and the other with low pitch using CV syllable. Then have child become teacher where she must use differential pitches so teacher makes correct response.

2. Production of vocalizations *continuously* varying in pitch between low and high, high and low.

Informal play with cars or balls going down a ramp or a tube can be associated with CV productions varying in pitch as the object descends. Play with ambulance and make a siren sound, which has continuously varying pitch. Encourage child to ascend in pitch when asking to be picked "uuuuup," and to descend when asking to be put "doowwwwn." Formally, child can direct teacher's actions (bobbing up and down) by using ascending or descending pitch.

3. Production of *discrete* vocalizations on separate breaths, approximating high, low, and mid points of vocal range.

Informal play with pitch changes come with books or songs modified to highlight different pitch patterns (e.g., Alligator Song: "hahaha, can't catch me"). Formal work might include child listening to different pitch patterns and associating them with printed cards, or blocks representing the pattern. Child repeats pitch patterns after identifying them.

Suprasegmental: Pitch

[Green Ling 206-217; White]

Adequate breath and laryngeal control, and sufficient control to hold intensity constant to prevent confusion of high with loud, and quiet with soft voice.

A. Phonetic Subskills

4. Production of vocalizations *continuously* varying between the high, mid, and low points in the child's pitch range.

Similar to sub-skill 2, but the child now continuously varies the pitch from high to medium, medium to high, and medium to low, for finer tone control. This skill may not be necessary as a separate skill if the child uses high, low, and medium tones in informal contexts, such as in sub-skill 2. If necessary, the teacher can associate the tone with the position on the arm of the child (shoulder, elbow, hand). First the auditory discrimination task, with the child tapping points on his arm to match the stimulus, then the child can be a teacher, instructing him to touch his arm according to the child's tones.

5. Production of *discrete* vocalizations on one breath, approximating each of the three established points independently varying in vocal intensity

Similar to subskill 4, but adding the production of intensity and pitch together. The child must discriminate different combinations of intensity and pitch (quiet + low; quiet + mid; quiet + high; loud + low, etc.). Formally, cards may be drawn with different combinations that the teacher produces and the child imitates. Child can then become teacher. This skill helps the child separate pitch from intensity. By this point, child can be matching pitches in simple song tunes.

B. Phonologic Subskills

1. Use of different pitch patterns meaningfully (e.g., rising inflection for question).

- *Vocal Play*: Learning to Listenx Sounds with different pitches (baby vs mama animals, small vs large vehicles, sirens)
- *Songs*: Itsy Bitsy Spider (high pitch), Big Fat Spider (low pitch), Alligator Song (hahaha, can't catch me), The Witch Song (hee,hee,hee), The Airplane Song (aaaah)
- *Books*: Three Billy Goats Gruff, Goldilocks and the Three Bears
- *Games*: Simon Says "Sing a song with low or high pitch," Mother May I gives directions in different pitches

Interview transcript

Interview 1: Nerea's Story

Let's listen to Rafa and Lorena as they recount Nerea's complicated history

Nerea's history is complex and marked by many difficulties and constant errors that we have had to resolve with a lot of work and a lot of effort. Always looking for solutions to errors and against the clock. When Nerea was born, she did not pass the otoacoustic emissions tests that were done in the hospital. The protocol was skipped. The same test was repeated up to 4 times. They did not measure the emissions, and they told us that our child was typically hearing. They told us to be calm, but months passed and she did not babble and did not react to certain sounds. We would tell the pediatrician and the pediatrician would always reassure us, saying that there are children in whom that was normal and that he saw her very alert. At 12 months, already very nervous, we decided to take her to a private ENT. He measured her emissions, and told us that our child had a hearing problem--that she was not hearing well. That was the first moment when we felt very lost, because we didn't expect that. We were not prepared at that time to listen to that, and especially to realize that mistakes had been made with her in the past.

Interview 2: Concerns

Listen as Nerea's parents begin to share their concerns with their professionals

On the one hand, we already knew where to go or what we wanted to look for, but on the other hand, we had tremendous anguish from knowing that we were already late since our child was 13 months old. We found an ENT who completed all the tests in two months and did the implant at 16 months of age. Activation was done at 18 months, but it was a slow activation. Our child's first responses didn't appear until one month after activation.

At 6 months we had already started language habilitation therapy and months after activation we began to feel that things were not going well, because Nerea began to emit a very robotic and choppy voice.

Interview 3: Confusion

Nerea's parents are thrown into confusion by other possible diagnoses

Sometime later, almost a year after therapy, her therapist said that there was a problem, but thought it might not be an auditory issue. I told her that I was concerned that Nerea was not well programmed. I really wanted to make sure I was understanding. Nerea had a perfect audiogram, the tonal response was within what is expected. The problem was that her production was not at all similar to what was expected. It was confusing that she was understanding everything, but her expressive language had not advanced. She only produced 2 vowels and 2 consonants. The therapist began to think about other causes for the lack of progress. We asked the ENT if Nerea had a cleft palate. Then he began to wonder if it was auditory neuropathy or central deafness. We went through considering many diagnoses in a very short amount of time. Every time a type of diagnosis was posed to us, it was another emotional blow. We did audiograms every 3 months. The professionals also began to wonder if Nerea had a neurodevelopmental problem. We did not see or agree with that idea. They recommended we go to sensory integration sessions, and we decided to also take her to speech therapy to see if articulation might also be a problem, but always thinking that Nerea might not be listening correctly.

Interview 4: Empathy

Nerea's parents find a professional who listens to their concerns

We were stuck and our daughter was not moving forward. There was a great discrepancy between what the therapist thought and what we thought. Then we had the great opportunity to see Joan Hewitt. Joan came to Spain, and we asked her to review our daughter's programming. She observed that she was being overstimulated, and we dismissed all the theories we had been pondering. It was the second opinion we had been looking for. Joan reprogrammed our child, and in that same session, we already began to see changes in her. Later, we found out that Fer was in Spain and we went to meet her. We explained the situation to her and asked her to please take Nerea's case and start working with her.

Interview 5: Hope

We had arrived at that moment distrusting everyone. We had no hope. We were deciding whether to use a more traditional speech therapy or even a more traditional work system, because we no longer trusted or knew where to go. So Fer gave us the opportunity to be assessed with her and her at Aurea, and beginning that summer, we started sessions with Brianda. They focused all their attention on working on the challenges that Nerea presented in fluency, voice, articulation, prosody, organization of her speech, etc.

Interview 6: Our Speech Team!

Rafa: About the speech work we did with Aurea Lab and Mary--myself, I was a bit skeptical of being able to work on Nerea's voice remotely through teletherapy. But we saw that, little by little, everything that they were suggesting to us weekly was working.

Lorena: Yes, the idea was to have a very well-defined plan with very clear goals. Mary, through Fer and Brianda, was sending us the strategies. We incorporated them in a very natural way. Maybe playing or moving from one part of the house to another. When combing her hair, when playing in the corridors of the house. It was in a very natural way. Then we made videos (of her speech) and then they shared their feedback with us.

Rafa: It was a very easy sequence. Things were very easy for both us and our daughter, and it was very motivating for everyone.

Lorena: And it worked!

Interview 7: What's important

Let's listen to the wisdom of Rafa and Lorena advice to professionals

We understand that all the daily work of applying the strategies must fall on the parents. We have the full weight of therapy and habilitation. It is also very important that it is our responsibility to coordinate the work we do at home with the work that the therapists do. Coordination needs to take place among the therapists with each other, with the audiologists who do the testing and who review their results with the programmer. It has to be a team effort and they all have to be coordinated. This is essential for everything to progress as expected and as it should be. We hope our daughter's case will serve a purpose. We believe that as long as professionals have a true vocation and love for what they do, following up conscientiously, things are achieved.

Interview 8: Parents' Pride

Today Nerea is a very happy and a very mischievous girl. Very expressive. As far as her language goes, she has a tremendous wealth of vocabulary. She loves to read. Thanks to the left cochlear implant being well programmed, she has been able to develop her language. She has caught up to what she had not achieved in the previous two and a half years. We realized that programming has been vital so that she can develop the potential that we see in her and that now, her teachers see in her as well. What has given us peace of mind throughout this journey is that Nerea is a very determined girl. She does not need any kind of school support. She enjoys music and English very much. She is fully equipped to be with her peers. And all these expressive qualities in communication that she presents now would not have been possible if it were not for the auditory input, for listening well.