

# Speech Sound Development Chart

*based on Crowe and McLeod Norms (2020)*

*age of mastery based on 90% criterion*

<i>Consonant</i>	<i>age of mastery</i>	<i>6 month delay</i>
<b>b</b>	2 yrs, 7 mos	<b>3 yrs, 1 mos</b>
<b>p</b>	2 yrs, 9 mos	<b>3 yrs, 3 mos</b>
<b>m</b>	2 yrs, 9 mos	<b>3 yrs, 3 mos</b>
<b>n</b>	2 yrs, 9 mos	<b>3 yrs, 3 mos</b>
<b>w</b>	2 yrs, 11 mos	<b>3 yrs, 5 mos</b>
<b>h</b>	2 yrs, 11 mos	<b>3 yrs, 5 mos</b>
<b>d</b>	3 yrs, 0 mos	<b>3 yrs, 6 mos</b>
<b>g</b>	3 yrs, 1 mos	<b>3 yrs, 7 mos</b>
<b>k</b>	3 yrs, 2 mos	<b>3 yrs, 8 mos</b>
<b>f</b>	3 yrs, 2 mos	<b>3 yrs, 8 mos</b>
<b>t</b>	3 yrs, 3 mos	<b>3 yrs, 9 mos</b>
<b>ŋ</b> as in 'sing'	3 yrs, 4 mos	<b>3 yrs, 10 mos</b>
<b>j</b> as in 'yellow'	3 yrs, 10 mos	<b>4 yrs, 4 mos</b>
<b>v</b>	4 yrs, 3 mos	<b>4 yrs, 9 mos</b>
<b>s</b>	4 yrs, 3 mos	<b>4 yrs, 9 mos</b>
<b>dʒ</b> as in 'judge'	4 yrs, 3 mos	<b>4 yrs, 9 mos</b>
<b>tʃ</b> as in 'child'	4 yrs, 6 mos	<b>5 yrs, 0 mos</b>
<b>l</b>	4 yrs, 6 mos	<b>5 yrs, 0 mos</b>
<b>ʃ</b> as in 'shoe'	4 yrs, 7 mos	<b>5 yrs, 1 mos</b>
<b>z</b>	4 yrs, 9 mos	<b>5 yrs, 3 mos</b>
<b>r, ɹ</b>	5 yrs, 7 mos	<b>6 yrs, 1 mos</b>
<b>ð</b> as in 'that'	5 yrs, 9 mos	<b>6 yrs, 3 mos</b>
<b>ʒ</b> as in 'garage'	5 yrs, 11 mos	<b>6 yrs, 5 mos</b>
<b>θ</b> as in 'thing'	6 yrs, 5 mos	<b>6 yrs, 11 mos</b>

Crowe, K., & McLeod, S. (2020). Children's English consonant acquisition in the United States: A review. *American Journal of Speech-Language Pathology*, 29(4), 2155–2169.

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<i>Consonant</i>	<i>age of mastery</i>	<i>6 month delay</i>
<b>Plosives</b>		
<b>p</b>	2 yrs, 9 mos	3 yrs, 3 mos
<b>b</b>	2 yrs, 7 mos	3 yrs, 1 mos
<b>t</b>	3 yrs, 3 mos	3 yrs, 9 mos
<b>d</b>	3yrs, 0 mos	3 yrs, 6 mos
<b>k</b>	3 yrs, 2 mos	3 yrs, 8 mos
<b>g</b>	3 yrs, 1 mos	3 yrs, 7 mos
<b>Nasals</b>		
<b>m</b>	2 yrs, 9 mos	3 yrs, 3 mos
<b>n</b>	2 yrs, 9 mos	3 yrs, 3 mos
<b>ŋ</b> as in 'sing'	3 yrs, 4 mos	3 yrs, 10 mos
<b>Fricatives</b>		
<b>f</b>	3 yrs, 2 mos	3 yrs, 8 mos
<b>v</b>	4 yrs, 3 mos	4 yrs, 9 mos
<b>θ</b> as in 'thing'	6 yrs, 5 mos	6 yrs, 11 mos
<b>ð</b> as in 'that'	5 yrs, 9 mos	6 yrs, 3 mos
<b>s</b>	4 yrs, 3 mos	4 yrs, 9 mos
<b>z</b>	4 yrs, 9 mos	5 yrs, 3 mos
<b>ʃ</b> as in 'shoe'	4 yrs, 7 mos	5 yrs, 1 mos
<b>ʒ</b> as in 'garage'	5 yrs, 11 mos	6 yrs, 5 mos
<b>w</b>	2 yrs, 11 mos	3 yrs, 5 mos
<b>h</b>	2 yrs, 11 mos	3 yrs, 5 mos
<b>Glides</b>		
<b>r, ɹ</b>	5 yrs, 7 mos	6 yrs, 1 mos
<b>j</b> as in 'yellow'	3 yrs, 10 mos	4 yrs, 4 mos
<b>l</b>	4 yrs, 6 mos	5 yrs, 0 mos
<b>Affricates</b>		
<b>tʃ</b> as in 'child'	4 yrs, 6 mos	5 yrs, 0 mos
<b>dʒ</b> as in 'judge'	4 yrs, 3 mos	4 yrs, 9 mos

Crowe, K., & McLeod, S. (2020). Children's English consonant acquisition in the United States: A review. *American Journal of Speech-Language Pathology*, 29(4), 2155–2169.

# PHONOLOGICAL PROCESSES

**Phonological processes** are patterns of sound errors that typically developing children use to simplify speech as they are learning to talk. A **phonological disorder** occurs when phonological processes persist beyond the age when most typically developing children have stopped using them or when the process used are much different than what would be expected.

<b>SUBSTITUTION</b>	<b>Definition</b>	<b>Example</b>	<b>Age of Elimination</b>	<b>Age Based on 6 Month Delay</b>
<b>Backing</b>	When alveolar sounds, like /t/ and /d/, are substituted with velar sounds like /k/ and /g/	"gog" for "dog"	Usually seen in more severe phonologically delays	Not considered developmentally appropriate at any age
<b>Fronting</b>	When velar or palatal sounds, like /k/, /g/, and sh, are substituted with alveolar sounds like /t/.	"tootie" for "cookie"	3 yrs, 6 mos	4 yrs, 0 mos
<b>Vowelization/ Vocalization</b>	When /l/ or /er/ sounds are replaced with a vowel	"appo" for "apple" or "papuh" for "pape"	--- 3 yrs to 4 yrs	Not considered developmentally appropriate at any age
<b>Stopping</b>	When a fricative (like /f/ or /s/) or affricate (ch, j) is substituted with a stop consonant like /p/ or /d/	"pan" for "fan" or "dump" for "jump"	/t/, /s/ by 3; /v/, /z/ by 3 1/2; /sh/, /ch/, /dʒ/ by 4 1/2; /th/ gone by 5	/t/, /s/ delayed at 3-6 /v/, /z/ delayed at 4-0; /sh/, /ch/, /dʒ/ delayed at 5-0; /th/ delayed at 5-6
<b>Gliding</b>	When /r/ becomes a /w/, and /l/ becomes a /w/ or y sound	"wabbit" for "rabbit" or "yeyo" for "yello"	6yrs, 0 mos	6yrs, 6 mos
<b>Affrication</b>	When a nonaffricate is replaced with an affricate (ch or j)	"joor" for "door"	3 yrs, 0 mos	3yrs, 6 mos
<b>Deaffrication</b>	When an affricate, like ch or j, is replaced with a fricative or stop like sh or /d/	"ships" for "chips"	4yrs, 0 mos	4yrs, 6 mos
<b>Depalatalization</b>	When a palatal sound is substituted with a nonpalatal sound	"fit" for "fish"	5 yrs, 0 mos	5yrs, 6 mos
<b>Alveolarization</b>	When a nonalveolar sound is substituted with an alveolar sound	"tu" for "shoe"	5 yrs, 0 mos	5 yrs, 6 mos
<b>Labialization</b>	When a nonlabial sound is replaced with a labial sound	"pie" for "tie"	6yrs, 0 mos	6 yrs, 6 mos
<b>SYLLABLE STRUCTURE</b>	<b>Definition</b>	<b>Example</b>	<b>Age of Elimination</b>	<b>Age Based on 6 Month Delay</b>
<b>Reduplication</b>	When a complete or incomplete syllable is repeated	"baba" for "bottle"	3 yrs, 0 mos	3 yrs, 6 mos
<b>Initial Consonant Deletion</b>	When the initial consonant in a word is left off	"unny" for "bunny"	Usually seen in more severe phonological delays	Not considered developmentally appropriate at any age
<b>Final Consonant Deletion</b>	When the final consonant in a word is left off	"pick" for "pig"	3yrs, 0 mos	3 yrs, 6 mos
<b>Diminution</b>	Adding "ee" or consonant + "ee" to a word.	"cupee" for "cup"	---	---
<b>Cluster Reduction</b>	When a consonant cluster is reduced to a single consonant	"pane" for "plane"	Gone by 4 yrs without /s/, gone by 5 yrs mos with /s/	Delayed at 4-6 without /s/, Delayed at 5-6 with /s/
<b>Weak Syllable Deletion</b>	When the weak syllable in a word is deleted	"nana" for "banana"	4yrs, 0 mos	4 yrs, 6 mos
<b>Epenthesis</b>	When a sound is added between two consonants, typically the uh sound	"bu-lue" for "blue"	8yrs, 0 mos	8 yrs, 6 mos
<b>ASSIMILATION</b>	<b>Definition</b>	<b>Example</b>	<b>Age of Elimination</b>	<b>Age Based on 6 Month Delay</b>
<b>Denasalization</b>	When a nasal consonant like /m/ or /n/ changes to a nonnasal consonant like /b/ or /d/	"doze" for "nose"	2yrs, 6 mos	3 yrs, 0 mos
<b>Assimilation</b>	When a consonant sound starts to sound like another sound in the word	"bub" for "bus"	3yrs, 0 mos	3 yrs, 6 mos
<b>Coalescence</b>	When two phonemes are substituted with a different phoneme that still has similar features	"foon" for "spoon"	Usually seen in more severe phonological delays	Not considered developmentally appropriate at any age
<b>Final Consonant Devoicing</b>	When the final consonant in a word is left off	"pick" for "pig"	3 yrs, 0 mos	3 yrs, 6 mos
<b>Prevocalic Voicing</b>	When a voiceless consonant in the beginning of a word like /k/ or /f/ is substituted with a voiced consonant like /g/ or /v/	"gomb" for "comb"	6 yrs, 0 mos	6 yrs, 6 mos



# ATYPICAL PHONOLOGICAL PROCESSES

**Phonological processes** are patterns of sound errors that typically developing children use to simplify speech as they are learning to talk. A **phonological disorder** occurs when phonological processes persist beyond the age when most typically developing children have stopped using them or when the process used are much different than what would be expected.

<b>SUBSTITUTION</b>	<b>Definition</b>	<b>Example</b>	<b>Age of Elimination</b>	<b>Age Based on 6 Month Delay</b>
<b>Apicalization</b>	When a labial /m, p, b/ is replaced by a tongue-tip consonant, such as /t/ or /d/.	“do” for “boo”	Atypical process seen in more severe delays.	Not considered developmentally appropriate at any age
<b>Atypical Cluster Reduction</b>	The deletion of the consonant that is usually retained.	“lack” for “black”	Atypical process seen in more severe delays.	Not considered developmentally appropriate at any age
<b>Backing of Stops &amp; Fricatives</b>	When you move front sounds like /t/ and /d/ to the back of the mouth like /k/ and /g/	“gime” for “time”	Atypical process seen in more severe delays.	Not considered developmentally appropriate at any age
<b>Fricative Replacing Stops</b>	When there is a substitution of a fricative for a stop.	“sis” for “sit”	Atypical process seen in more severe delays.	Not considered developmentally appropriate at any age
<b>Glottal Replacement</b>	The substitution of the glottal stop for another consonant. *Typically seen in children with cleft palate	“ba?” for “bat”	Atypical process seen in more severe delays.	Not considered developmentally appropriate at any age
<b>Medial Consonant Deletion</b>	The deletion of intervocalic consonants	“spier” for “spider”	Atypical process seen in more severe delays.	Not considered developmentally appropriate at any age
<b>Sound Preference Substitutions</b>	The overuse of one particular sound in place of many others	“oaps” for “soap”	Atypical process seen in more severe delays.	Not considered developmentally appropriate at any age
<b>Stops Replacing Glides</b>	When there is a substitution of a stop for a glide.	/f/ sound for stridents, clusters, and other types of sounds	Atypical process seen in more severe delays.	Not considered developmentally appropriate at any age
<b>Initial Consonant Deletion</b>	When a child consistently leaves off consonants from the beginning of words.	“des” for “yes”	Atypical process seen in more severe delays.	Not considered developmentally appropriate at any age
<b>ATYPICAL VOWEL ERRORS</b>	<b>Definition</b>	<b>Example</b>	<b>Age of Elimination</b>	<b>Age Based on 6 Month Delay</b>
<b>Backing</b>	When the tongue is retracted for a front vowel.	“cat” for “kit”	Atypical process seen in more severe delays.	Not considered developmentally appropriate at any age
<b>Fronting</b>	When the tongue moves forward for a back vowel.	“rock” for “rake”	Atypical process seen in more severe delays.	Not considered developmentally appropriate at any age

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# Considerations for Speech Articulation Disorder Eligibility Determination

This worksheet can be used by IEP teams when considering eligibility determination for Speech Articulation Disorders. For each area, circle the the level of impact that best represents the student's performance. Students must demonstrate the presence of a delay in communication skills that also has an **educational impact** in order to be identified with a Speech or language Disorder. Additionally, the student must also demonstrate the **need for specialized instruction**. When a valid comparison to a normative sample cannot be made or a student has complex communication needs, consider alternative options for assessment purposes.

<b>Phonological Process Abbreviations</b>	<b>ICD</b> -initial consonant deletion	<b>BACK</b> -backing
<b>CR</b> -cluster reduction	<b>WSD</b> -weak syllable deletion	<b>FR</b> -fronting
<b>Gliding</b> -gliding of liquids	<b>DEP</b> -depalitization of singletons	<b>FCD</b> -final consonant deletion

	<b>Educational (Academic and Social/Emotional) Activities, Tests and Measures</b>		<b>Speech-Language Pathology Probes, Tests and Measures</b>			
	(e.g., writing samples, reading running record, observations in natural settings, participation in groups or class discussions)	Intelligibility ratings across settings and listeners (e.g. (ICS)	Speech Sound Production  Using SFSD Artic Norms 2024 Edition based on Crowe & McLeod 2020  Norm-Referenced Tests	Phonological Process use (check only those not developmentally appropriate that occur in 40% or more opportunities)	Stimulability (e.g. Miccio Probe)	Percentage of Consonants Correct (PCC) Imitative or Spontaneous
<b>No Apparent Impact</b>	Performs similarly to peers in most areas	ICS 4 or 5  Age 3: >75% Age 4: >85% Age 5+: >90%	Meets norms for mastery  Test score: mean to -1 SD >85 SS # > 17th %ile	No significant error processes	Error sounds are developmentally appropriate or are more than 50% stimulable	PCC value more than 95%
<b>Minimal Impact</b>	Evidence of struggles with one or more areas when compared to peers	ICS 3 or lower  Age 3: 65-75% Age 4: 75-85% Age 5+: 81-90%	1-2 sounds do not meet norms for mastery  Test score: -1 to -1.5 SD 84 to 77 SS# 16th-7th %ile	1 or more occur: Gliding CR with /s/ Vowelization post-vocalic /r/ or /l/	Error sounds are developmentally appropriate or are more than 30% stimulable	PCC value of 85-94%
<b>Moderate Impact</b>	Evidence of struggles in most areas when compared to peers	ICS 3 or lower  Age 3: 50-64% Age 4: 65-74% Age 5+: 70-80%	3-4 sounds do not meet norms for mastery  Test score: -1.5 to -2.0 SD 76-70 SS# 6th-3rd %ile	1 or more occur: WSD DEP initial CR /l/, /r/, /w/ Velar fronting	Error sounds are not developmentally appropriate or are less than 30% stimulable	PCC value of 50-84%
<b>Substantial Impact</b>	Evidence of very limited ability in most areas	ICS 3 or lower  Age 3: <50% Age 4: <65% Age 5+: <70%	5 or more sounds do not meet norms for mastery  Test score: -2.0 or greater SD 76-70 SS# 6th-3rd %ile	1 or more occur: ICD BACK FCD Stopping DEP final	Error sounds are not developmentally appropriate or are less than 30% stimulable	PCC values of less than 50%