RESOURCE PACKET

Assessment of Speech: Sound Production

SPEECH SOUND PRODUCTION SEVERITY RATING SCALE
Determination of Speech Impairment: Articulation

Student _____ School _____ Grade _____ Date of Rating _____ DOB _____ Age _____ SLT _____

	0	1	3	4
Sound Production	No sound/phonological process errors; errors consistent with normal development	Sound errors/ phonological processes less than one year below age	Sound errors/phonological processes one to two years below age	Sound errors/phonological processes two or more years below age
	0	**1**	**2**	**4**
Stimulability	Most errors stimulable in several contexts	Most errors stimulable in at least one context	Although not correct, most errors approximate correct production	No error sounds are stimulable for correct production
	0	**0**	**3**	**4**
Oral Motor and/or Motor Sequencing	Oral motor and/or sequencing adequate for speech production	Oral motor and/or sequencing difficulties are minimal and do not contribute to speech production problems	Oral motor and/or sequencing difficulties interfere with speech production	Oral motor and/or sequencing greatly interfere with speech production, use of cues, gestures or AD needed
	0	**2**	**4**	**6**
Intelligibility	Connected speech is intelligible	Connected speech is intelligible; some errors noticeable; more than 80% intelligible	Connected speech sometimes unintelligible when context is unknown; 50-80% intelligible	Connected speech mostly unintelligible; gestures/cues usually needed; less than 50% intelligible

Instructions:
1. Do not include regional or dialectal differences when scoring.
2. Circle the score for the most appropriate description for each of the four categories, i.e., *Sound Production*, *Stimulability*, *Oral Motor*, *Intelligibility*.
3. Compute the total score and record below.
4. Circle the total score on the bar/scale below.

Note: Disability standards for Phonological Processing require ratings at the Moderate, Severe, or Profound Levels of Severity.

3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
		Mild					**Moderate**					**Severe to Profound**			
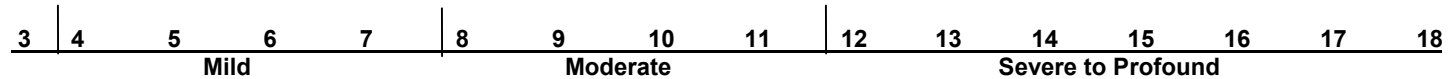
TOTAL SCORE _____

Based on compilation of the assessment data, this student scores in the *Mild*, *Moderate* or *Severe* range for Speech Sound Production on the rating scale for Speech Sound Production.   ❏ Yes ❏ No

There is documentation/supporting evidence of adverse effects of the Speech Sound Production on educational performance.   ❏ Yes ❏ No

Determination of eligibility as a student with a Speech and/or Language Impairment is made by the IEP Team.

Speech Sound Production Severity Rating Scale

ASSESSMENT GUIDELINES FOR SPEECH-SOUND PRODUCTION

SPEECH SOUND PRODUCTION CONSIDERATIONS

An articulation impairment is the "atypical production of speech sounds…that may interfere with intelligibility" (ASHA, 1993, p. 40). Problems with sound production result from *organic* (a known physical cause) or *functional* (no known physical cause) etiologies. Organically based production errors may be related to Hearing Impairment, cleft lip or palate, cerebral palsy, ankyloglossia (tongue-tie) and others. The accompanying articulation deficits are the direct result of structural or neurologic anomalies and are not developmental in nature. Children with functional sound production problems present with adequate hearing acuity and intellectual abilities. They show no signs of significant structural abnormalities or neurological dysfunction. The specific errors vary from one child to the next and are not as readily predictable as those found in organically based disorders.

The IEP team may not identify a child as speech impaired who exhibits any of the following:

- mild, transitory, or developmentally appropriate sound production difficulties that students experience at various times and to various degrees,
- speech difficulties resulting from dialectal differences, learning English as a second language, temporary physical disabilities or environmental, cultural or economic factors,
- a tongue thrust which exists in the absence of a concomitant impairment in speech sound production,
- elective or selective mutism or school phobia without a documented speech sound production impairment, and
- the errors do not interfere with educational performance.

Production of sounds in connected speech is a series of complex maneuvers. Oral communication requires exact placement, sequencing, timing, direction and force of the articulators. These occur simultaneously with precise airstream alteration, initiation or halting of phonation and velopharyngeal action. Consequently, assessment of speech sound production is a multi-faceted procedure requiring a good deal of skill and knowledge.

Components for a comprehensive assessment include:
- articulation assessment and/or phonological processes assessment,
- developmental information/profile,
- stimulability probe of errors,
- oral peripheral examination,
- analysis of intelligibility (may include a combination or all items listed below),
  - analysis of errors
    - number of errors/percentage of consonants correct (PCC)
    - error types (substitutions, omissions, distortions, additions)
    - form of errors, error patterns (phonological processes)
    - consistency of errors
    - frequency of errors
  - rate of speech
- documentation of adverse effect on educational performance, and
- hearing screening.

Each of these components is discussed in greater detail in the following section.

CONDUCTING A SPEECH EVALUATION FOR ARTICULATION OR PHONOLOGICAL PROCESSES

- Conduct hearing and vision screenings.
- Obtain relevant information from the parents (i.e., concerns about communication skills, developmental history, etc.)
- Obtain information from teachers related to progress in the general curriculum, communication skills, behavior and social interactions. Information must be gathered from two educators: the student's classroom teacher as well as another professional. For preschoolers, obtain this information from child care providers or adults who see the child outside the family structure.
- Review school records, e.g., grades, test scores, special education records, documentation of prereferral strategies/interventions and discipline and attendance records.
- Complete an oral-peripheral examination.
- Administer an articulation test and/or a test of phonological processes. If a preschooler is unable to participate in assessment using standardized measures, document the attempt and obtain a phoneme inventory from a speech sample.
- Conduct stimulability probes to determine how well the student can imitate correct production of error sounds. Stimulability refers to the student's ability to produce a correct (or improved) production of the erred sound given oral and visual modeling. Most articulation tests include this step on the test form.
- Obtain and analyze a speech sample to determine intelligibility of conversational speech and consistency of error patterns.
- Document how sound production errors adversely affect the student's educational performance in the general education classroom or the learning environment.
- Complete the *Speech Sound Production Severity Rating Scale* using data from the assessment.
- Finalize and submit to the IEP team a *Speech and Language Evaluation Report* .

COMPONENTS OF THE ASSESSMENT

Articulation or Phonological Processes Assessment
Generally, errors in sound production are classified as either motor-based or cognitive/linguistic-based (Bernthal and Bankson, 1988).

Articulation Errors
Articulation errors (substitutions, distortions, omissions, and/or additions) are typically considered motor-based errors. Articulation, which refers to the actual movements of the articulators during speech production, is subsumed under the generic term phonology. An articulation problem may be defined as difficulty in producing a single or a few sounds with no pattern or derivable rule. It is considered to be the result of phonemic, rather than phonological inadequacy (i.e., the problem results from the student's not having "learned" all of the sounds). Articulation testing is concerned primarily with identifying those sounds that the student has difficulty producing. Intervention is focused on correcting individual error sounds, one by one.

<u>Phonological Processes</u>
Phonological process deviations are considered to be cognitive/linguistic-based. Students with phonological process problems demonstrate difficulty in acquiring a phonological system, not necessarily in production of the sounds. The phonological system of a language governs the ways in which sounds can be combined to form words. A phonological process is a systematic sound change that affects classes of sounds or sound sequences and results in a simplification of production. Errors have logical and coherent principles underlying their use. The errors can be grouped on some principle and thus form patterns. The student's patterns of "simplification" of sound usage severely affect intelligibility. In contrast to articulation testing, phonological assessment is concerned not only with production skills, but also with the way sounds are sequenced and used in contrast to signal meaning differences. Philosophy, assessment, and method of intervention addressing phonological processes must necessarily differ markedly from traditional approaches to either functional or organic articulation problems. The goal of phonological intervention is not to perfect individual sounds, but rather to eliminate phonological processes. It aims at a reorganization of the student's phonological system, thereby improving intelligibility.

Some SLTs, as well as some of the professional literature, classify phonological process errors as a language-based impairment. However, for purposes of these guidelines, phonological process errors are included, along with articulation errors, under the category of *Speech Sound Production.* The decision to administer an articulation test versus a phonological process analysis is based on the examiner's professional judgment. If the errors are non-organic (i.e., not due to structural deviations or neuromotor control problems) the most discriminating factor to aid in the decision is that of ***intelligibility –*** the more unintelligible the student's speech, the greater the need for phonological process analysis. When evaluating students whose intelligibility factor is moderate to severe or profound, tests of phonological processes will prove more diagnostically valuable than traditional articulation tests.

In some cases the examiner may complete a process analysis after first administering an articulation test. Some phonological processes can be detected from the results of traditional articulation tests. For example, when most of the phonemes in the final position column of the articulation test form show a deletion symbol, perceptive examiners can recognize the pattern of final consonant deletion. Most substitution and deletion processes can be identified in this manner, particularly if the examiner is familiar with phonological process terminology and descriptions. For example, the student who produces /p/ for /f/*, /*b/ for /v/, /t/ for /s/, and /d/ for /z/ is replacing a fricative with a stop, a process commonly known as *Stopping*. Other error patterns, however, are not as easily identified from traditional articulation test results. Depending upon the complexity of the student's errors, a more in-depth phonological analysis may be indicated in order to identify all processes used by the student. This in-depth analysis becomes particularly important in determining the hierarchy of intervention targets.

The advantage of identifying phonological error patterns is that those patterns can then be targeted for remediation, thereby affecting more than one sound at a time. For example, if a student exhibits a final consonant deletion pattern, you may choose to target final consonants in general rather than focus on each and every sound that is omitted at the end of words.

It should be noted that an articulation assessment and phonological process analysis can be derived without the use of a published standardized assessment instrument.

Developmental Information/Profile
Norms are helpful for estimating approximately how well a student's sounds are developing. Although norms are extremely useful, there are limitations to over-relying on or using them exclusively to identify a sound production impairment. Several factors limit their value. An age norm is only an average age at which a behavior occurs. Most norms do not reflect normal and acceptable developmental variability. Certain errors are developmentally appropriate while others are not. Different norms are rarely in agreement with each other. The differences are caused by many factors, including when the study was conducted, where the study was conducted, the size and characteristics of the sample, the research design followed, and the mastery criteria used.

Articulation tests usually elicit phonemes in only one phonetic context within a pre-selected word. There may be other contexts and words in which the student can/cannot produce the target sound correctly. Most tests elicit phonemes at the word level for the assessment of initial, medial and final position production. Conversational speech, however, is made up of complex, co-articulated movements in which discrete initial, medial, and final sounds may not occur. Thus, sound productions in single words may differ from those in spontaneous speech. Keep in mind that normative data tell only part of the story when assessing for a speech sound production impairment.

Phonological Processes
The following are *minimal requirements* for qualifying a sound change error as a phonological process:
1. A process must affect more than one sound from a given sound class. For example, the omission of [t] from the end of words does not necessarily signal the process of final consonant deletion. Deletion of at least one additional plosive [p, b, d, k, g] must also be observed.
2. The sound change or process must occur at least 40% of the time. An inconsistent sound change indicates only a potential phonological process. In other words, if the student uttered ten words containing final consonants, s/he must delete the consonant in at least four of those words in order for the pattern to be considered as that of final consonant deletion. An inconsistent sound change may also signal that the student is in a transition phase of development, i.e., the student is gradually eliminating the process on his/her own as sound productions become more developmentally appropriate.

Stimulability Probe of Errors

Stimulability refers to the student's ability to produce a correct (or improved) production of the erred sound given oral and visual modeling. Most articulation tests include this step on the test form. It is not necessary to assess stimulability for sounds produced correctly, only those in error.

<u>Directions for assessing stimulability</u>

1. Ask the student to watch, listen carefully, and say what you say. Do not give special instructions on the correct production.
2. Model the production of each selected phoneme in isolation and ask the student to imitate. Begin modeling for consonant blends at the syllable level.
3. If the student is successful, go on to the syllable level, modeling for each position (initial, medial, and final).
4. If the student is successful at the syllable level, proceed to the word level, modeling for each position.
5. If the student is successful at the word level, you may wish to proceed to the phrase/sentence level, modeling for each position.
6. If the student fails to imitate a stimulus correctly at any level (isolation, syllable, or word), ask the student to watch and listen carefully to the following directions:
- Say the stimulus three times (*multiple stimulations*).
- Have the student try again.
- If the student repeats successfully, continue to the next level of complexity.
- If the student cannot imitate the stimulus correctly after multiple stimulations, discontinue stimulation with that sound.

The assessment of stimulability provides important prognostic information. Moreover, those behaviors that are most easily stimulated can provide excellent starting points for intervention. They often lead to intervention success quicker than other, less stimulable behaviors.

INTERPRETING AND REPORTING EVALUATION RESULTS

When assessing articulation skills, the sound in question must be in error in at least two positions (initial, medial, or final). Information gathered from the formal/informal assessment instrument(s) regarding sound production errors is to be compared to the developmental norms or charts:
- *Sound Development Norms* chart – The cut-off point is one year beyond the reported age of acquisition for each sound position.
- All other developmental norms or charts – The cut-off point is the exact age as reported for each phoneme.

Analysis of Intelligibility – Phoneme Production in Conversational Speech

By three years of age, a child's spontaneous speech should be at least 50% intelligible to unfamiliar adults. By four years of age, a child's spontaneous speech should be intelligible to unfamiliar adults, even though some articulation and phonological differences are likely to be present.

There are many factors that can negatively influence intelligibility, including:

- *Number of errors* (Generally, the greater the number of sound errors, the poorer the intelligibility.)
- *Types of sound errors* (Phonological process errors affect intelligibility to a greater degree than simple articulation errors.)
- *Inconsistency of errors*
- *Vowel errors*
- *Rate of speech* (especially if it is excessively slow or fast)
- *Atypical prosodic characteristics of speech* (i.e., abnormal intonation or stress)
- *Length and linguistic complexity of the words and utterances used*
- *Student's anxiety about the testing situation and/or fatigue* (Fatigue particularly affects very young children.)
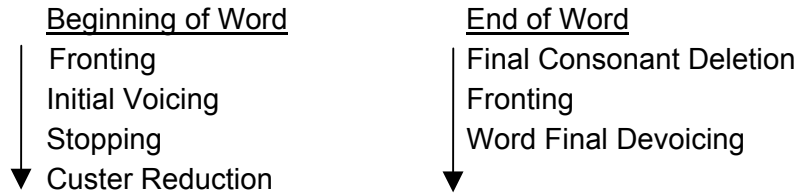
Almost all published test instruments provide guidelines to help evaluate information obtained during test administration. While this information is helpful, it is certainly not an all inclusive analysis. A comprehensive examination of speech sound production would generally include some of the bulleted items listed in "Analysis of Errors" below. Much of this information is gathered through speech sampling. This type of analysis can be time consuming. Depending on the severity, scope, and impact of the speech sound production problem, an in-depth and detailed analysis will not be warranted for all students referred for formal evaluation. The examiner should use professional judgment when determining which measures are appropriate for the student being evaluated.

Information is included here for each of the subsections listed in the *Speech Sound Production Considerations* segment earlier in this section. In any case, the evaluation must necessarily include observation and/or data related to speech intelligibility since this item is specifically addressed in the *Eligibility Standards for Speech Impairment*, i.e., "*Evaluation of articulation abilities shall include…analysis of phoneme production in conversational speech*". Intelligibility is also specifically addressed on the *Speech Sound Production Severity Rating Scale.*

Analysis of Errors
- *Error Types* – The types of errors identified by traditional articulation tests generally fall into four major categories: (1) Substitutions (2) Omissions (3) Distortions, and (4) Additions. Typically, the presence of omissions and additions affect intelligibility to a greater degree than substitutions and distortions. In addition to providing descriptive information as to the problem, analyzing error types also helps to select, prioritize and plan intervention targets.
- *Form of Errors/Error Patterns* – An inventory of phonological processes is most valuable when evaluating students who have poor speech intelligibility due to multiple articulation errors. Phonological processes describe what children do in the normal developmental process of speech to simplify standard adult productions. When a student uses many different processes or uses processes that are not typically present for his/her developmental age, intelligibility will be affected. The following list of error patterns is arranged in descending order from most to least effect on intelligibility.

Assessment Guidelines for Speech-Sound Production

	Beginning of Word		End of Word
	Fronting		Final Consonant Deletion
	Initial Voicing		Fronting
	Stopping		Word Final Devoicing
	Custer Reduction		

- *Consistency of Errors* – The assessment data and/or speech sample should be analyzed for consistency of errors between the speech sample and the articulation test/phonological process assessment within the same speech sample and between different speech samples. A student may be able to produce a designated sound correctly at the single word level, yet correct productions may break down as the length and complexity of utterances increase. Typically, more sound errors will be identified during the connected speech sample.

- *Frequency of Occurrence* – Frequency of occurrence refers to the relative frequency or percentage of occurrence of a sound in continuous speech. It should be noted that the sounds [n, t, s, r, d, and m], cumulatively represent nearly one-half of the total consonants used. When misarticulated, these sounds will have a greater negative effect on speech intelligibility than the less frequently occurring sounds such as /zh/, /ch/, /j/, and voiceless /th/.

Rate of Speech

Occasionally a student's speech rate can directly affect articulation and intelligibility. Speech rates vary tremendously among normal speakers, making it difficult to assign a standard word-per-minute (WPM) index. Purcell and Runyan (1980) measured the speaking rates of students in the first through fifth grades and found a slight increase in their average rate at each grade level. The first graders averaged 125 words per minute, and the fifth graders averaged 142 words per minute. It is imperative to recognize that some people who speak exceedingly fast or slow still have excellent intelligibility and control of their speech, while others exhibit significant communication problems due to their rate.

The importance of measuring rate of speech does not lie in comparing it with pre-established norms, which only indicate whether the speech rate is normal, faster than normal, or slower than normal. The value of assessing rate of speech is that it allows evaluation of its effect on the student's communication abilities. Will the use of a faster or slower rate result in better communication? Can a better speech rate be elicited? Can it be maintained? These are important questions to consider when assessing the implications of speech rate on intelligibility.

Intelligibility, although a critical concept in the evaluation of articulation and phonological process disorders, is notoriously difficult to measure objectively. In most cases there are multiple factors that influence overall intelligibility. Keep the following tips in mind when rating/determining intelligibility:

- Identify factors that affect intelligibility.
- View the intelligibility rating as being approximate, rather than absolute or definitive. Report intelligibility in ranges (e.g., 65-75%), particularly when intelligibility varies. A student may be 90-100% intelligible when speaking in utterances of one to three syllables. The same student, however, may be only 50% intelligible in utterances of four or more syllables.
- Take more than one conversational sample and seek varied environments when possible.

USING THE SPEECH SOUND PRODUCTION SEVERITY RATING SCALE

The *Speech Sound Production Severity Rating Scale* is to be used as a tool after a complete assessment of the student's sound production performance. The scale is designed to assist the examiner with interpretation and documentation of the results of assessment findings in terms of severity or intensity. This is not a diagnostic instrument and should not be used in the absence of assessment data.

In order to be identified as a student with a speech impairment in articulation, the deviation(s) in sound production must be determined to have an "adverse effect on educational performance." The rating scale serves three purposes:

1. to document the absence or presence of a speech sound production deviation and to what degree (*Mild, Moderate* or *Severe*).
2. to indicate the absence or presence of "adverse effect on educational performance."
3. to determine whether or not the student meets eligibility standards for a Speech Impairment in Articulation.

"Educational performance" refers to the student's ability to participate in the educational process and must include consideration of the student's social, emotional, academic, and vocational performance. The presence of any deviation in speech sound production does not automatically indicate an adverse effect on the student's ability to function within the educational setting. The deviation must be shown to interfere with the student's ability to perform in the educational setting before a disability is determined. The effect on educational performance is, therefore, best determined through classroom observations, consultation with classroom and special education teachers, and interviews with parents and the student. Teacher checklists are useful for determining specifically how the sound production problem affects educational performance.

Assessment Guidelines for Speech-Sound Production

TEACHER INPUT – SPEECH SOUND PRODUCTION

Student: _____ School: _____ Teacher: _____ Grade: _____

Your observations and responses concerning the above student will help determine if a sound production problem which adversely affects educational performance. Please return the completed form to the Speech-Language Teacher

	Yes	No	Sometimes	N/A
Is this student's intelligibility reduced to the extent that you find it difficult to understand him/her? If Yes, check appropriate description: ❑ Occasional Difficulty ❑ Frequent Difficult ❑ Considerable Difficult	——	——	——	——
Student's speech is intelligible even though some sound errors may be present.	——	——	——	——
Check one.	❑50% ❑70% ❑80% ❑90% ❑100%			
Does this student appear frustrated or embarrassed because of his/her production errors?	——	——	——	——
Does the student avoid speaking in class or in other situations because of his/her production errors?	——	——	——	——
Has this student ever expressed concern about his/her production errors?	——	——	——	——
Does the student's speech distract listeners from what the student is saying?	——	——	——	——
Does the student have age-appropriate awareness of sounds in words and ability to rhyme, segment, and manipulate sounds in words?	——	——	——	——
Does the student make the same errors when reading aloud as s/he does when speaking?	——	——	——	——
Does the student have difficulty discriminating sounds and/or words from each other?	——	——	——	——
Does the student make spelling errors that appear to be associated with speaking errors?	——	——	——	——
Does the student self-correct articulation errors?	——	——	——	——
Does the student have reading problems due to articulation problems?	——	——	——	——
Does the student mispronounce during reading of words containing error sounds?	——	——	——	——
Rate the impact of the student's speech errors on his/her social, emotional, academic and/or vocational functioning. Check one: ❑ does not interfere ❑ minimal impact ❑ interferes ❑ seriously limits				

Do you have any other observations relating to the articulation skills of this student? _____
_____

It is my opinion that these behaviors adversely affect the student's educational performance. ❑ YES ❑ NO

If yes, provide explanation: _____
_____
_____
_____

_____   _____
Classroom Teacher Signature   *Date*

Teacher Input – Speech Sound Production

GFT SOUND DEVELOPMENT NORMS

AGE	INITIAL POSITION	MEDIAL POSITION	FINAL POSITION
2	/b/, /d/, /h/, /m/, /n/, /p/	/b/, /m/, /n/	/m/, /p/
3	/f/, /g/, /k/, /t/, /w/	/f/, /g/, /k/, /ŋ/, /p/, t/	/b/, /d/, /g/, /k/, /n/, /t/
4	/kw/	/d/	/f/
5	/tʃ/, /dʒ/, /l/, /s/, /ʃ/, /ʝ//, /bl/	/tʃ/, /dʒ/, /l/, /s/, /ʃ/, /z/	/l/, /ŋ/, /tʃ/ /dʒ/ /s/, / ʃ/ /r/, /v/, /z/
6	/r/, /v/, /br/, /dr/, /fl/, /fr/, /gl/, /gr/, /kl/, /kr/, /pl/, /st/, /tr/	/r/, /v/	
7	/z/, /sl/, /sp/, /sw/, /ŏ/, /Ө/	/ŏ/	/Ө/
8		/Ө/	

This information was obtained from the *Goldman-Fristoe Test of Articulation-2*. The data is based on the age at which 85% of GFTA-2 standardization sample correctly produced consonant and consonant cluster sounds. The above data includes the 38 consonants and consonant clusters assessed in the Sounds-in-Words portion of the GFTA-2.

SOUND DEVELOPMENT CHART – FEMALES

Listed below are the recommended ages of acquisition for phonemes and clusters, based generally on the age at which 90% of the children correctly produced that sound. These recommended ages are for phonetic acquisition only.

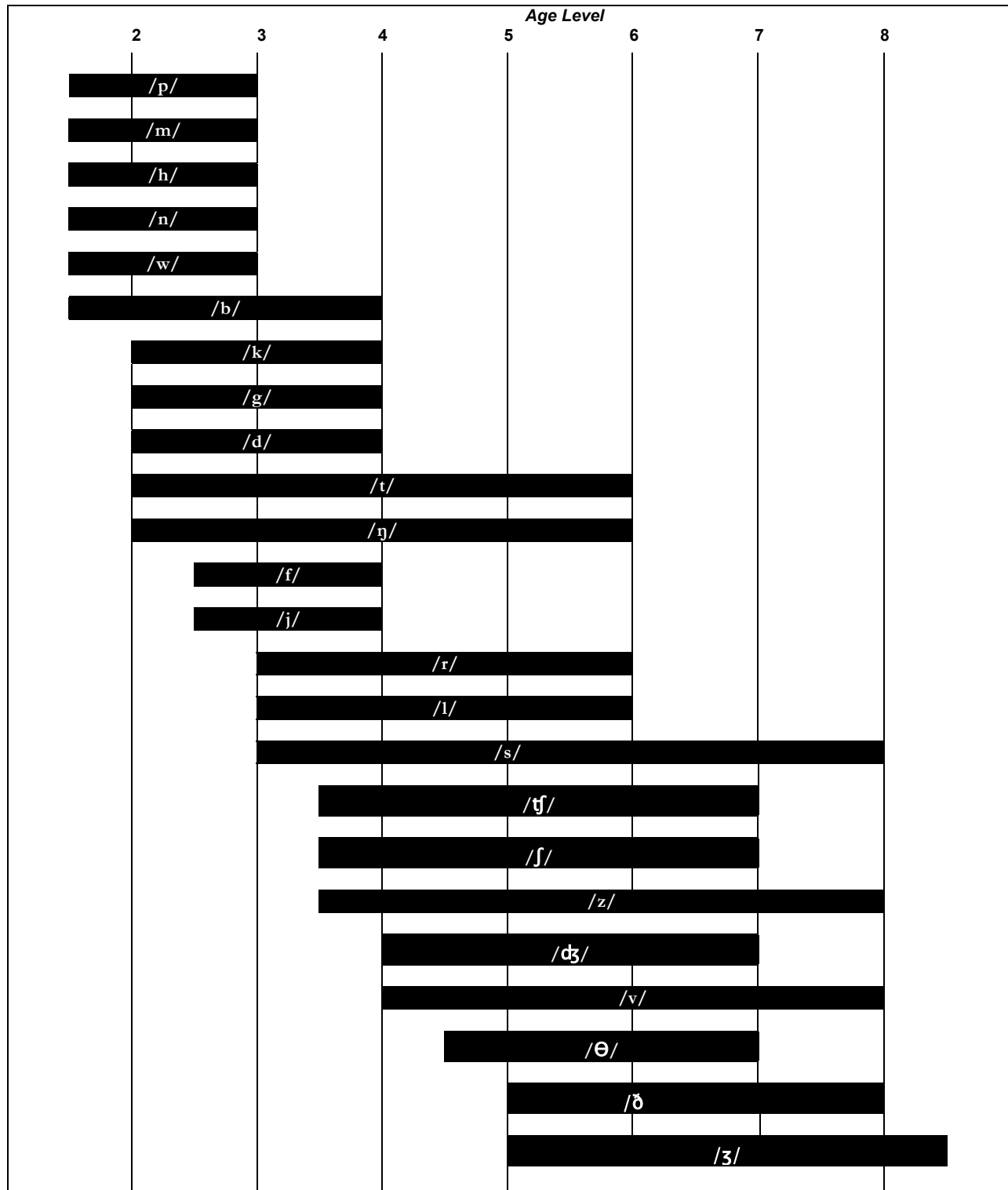| Phoneme	yrs:mo	3:0	3:6	4:0	4:6	5:0	5:6	6:0	6:6	7:0	7:6	8:0	8:6	9:0
m	▨													
h initial	▨													
w initial	▨													
p	▨													
b	▨													
d	▨													
f	▨	▨												
k	▨	▨												
g	▨	▨												
n	▨	▨												
j initial	▨	▨	▨											
t	▨	▨	▨											
th voiced	▨	▨	▨	▨										
l	▨	▨	▨	▨	▨									
f final	▨	▨	▨	▨	▨	▨								
v	▨	▨	▨	▨	▨	▨								
sh	▨	▨	▨	▨	▨	▨	▨							
ch	▨	▨	▨	▨	▨	▨	▨							
l final	▨	▨	▨	▨	▨	▨	▨							
th	▨	▨	▨	▨	▨	▨	▨							
dz	▨	▨	▨	▨	▨	▨	▨							
r	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨				
r final voiced	▨	▨	▨	▨	▨	▨	▨	▨	▨					
ng final	▨	▨	▨	▨	▨	▨	▨	▨	■	■	■	■		
s	▨	▨	▨	▨	▨	▨	▨	▨	■	■	■	■		
z	▨	▨	▨	▨	▨	▨	▨	▨	■	■	■	■		
Word-initial clusters	**3:0**	**3:6**	**4:0**	**4:6**	**5:0**	**5:6**	**6:0**	**6:6**	**7:0**	**7:6**	**8:0**	**8:6**	**9:0**	
tw kw	▨	▨	▨											
pl bp kl gl fl	▨	▨	▨	▨	▨									
pr br tr dr kr gr fr	▨	▨	▨	▨	▨	▨	▨	▨	▨					
sp st sk	▨	▨	▨	▨	▨	▨	▨	▨	■	■	■	■		
sm sn	▨	▨	▨	▨	▨	▨	▨	▨	■	■	■	■		
sw	▨	▨	▨	▨	▨	▨	▨	▨	■	■	■	■		
sl	▨	▨	▨	▨	▨	▨	▨	▨	■	■	■	■		
skw	▨	▨	▨	▨	▨	▨	▨	▨	■	■	■	■		
spl	▨	▨	▨	▨	▨	▨	▨	▨	■	■	■	■		
spr str skr	▨	▨	▨	▨	▨	▨	▨	▨	■	■	■	■		
thr	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨		

Source: Iowa-Nebraska Articulation Norms

SOUND DEVELOPMENT CHART – MALES

Listed below are the recommended ages of acquisition for phonemes and clusters, based generally on the age at which 90% of the children correctly produced that sound. These recommended ages are for phonetic acquisition only.

Phoneme	yrs:mo	3:0	3:6	4:0	4:6	5:0	5:6	6:0	6:6	7:0	7:6	8:0	8:6	9:0
m	▓													
h initial	▓													
w initial	▓													
p	▓													
b	▓													
n	▓													
d	▓	▓												
f	▓	▓												
k	▓	▓												
t	▓	▓												
g	▓	▓	▓											
j initial	▓	▓	▓	▓	▓									
f final	▓	▓	▓	▓	▓	▓								
v	▓	▓	▓	▓	▓	▓								
l	▓	▓	▓	▓	▓	▓	▓							
sh	▓	▓	▓	▓	▓	▓	▓	▓	▓					
ch	▓	▓	▓	▓	▓	▓	▓	▓	▓					
l final	▓	▓	▓	▓	▓	▓	▓	▓	▓					
th voiced	▓	▓	▓	▓	▓	▓	▓	▓	▓					
dz	▓	▓	▓	▓	▓	▓	▓	▓	▓					
th	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓			
r	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓			
r final voiced	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓			
ng final	▓	▓	▓	▓	▓	▓	▓	▓	▓	█	█	█	█	
s	▓	▓	▓	▓	▓	▓	▓	▓	▓	█	█	█	█	
z	▓	▓	▓	▓	▓	▓	▓	▓	▓	█	█	█	█	

Word-initial clusters		3:0	3:6	4:0	4:6	5:0	5:6	6:0	6:6	7:0	7:6	8:0	8:6	9:0
tw kw	▓	▓	▓	▓	▓									
pl bp kl gl fl	▓	▓	▓	▓	▓	▓	▓							
pr br tr dr kr gr fr	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓			
sp st sk	▓	▓	▓	▓	▓	▓	▓	▓	▓	█	█	█	█	
sm sn	▓	▓	▓	▓	▓	▓	▓	▓	▓	█	█	█	█	
sw	▓	▓	▓	▓	▓	▓	▓	▓	▓	█	█	█	█	
sl	▓	▓	▓	▓	▓	▓	▓	▓	▓	█	█	█	█	
skw	▓	▓	▓	▓	▓	▓	▓	▓	▓	█	█	█	█	
spl	▓	▓	▓	▓	▓	▓	▓	▓	▓	█	█	█	█	
spr str skr	▓	▓	▓	▓	▓	▓	▓	▓	▓	█	█	█	█	
thr	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	

Source: Iowa-Nebraska Articulation Norms.

ED –4075 / 2003: Speech: Sound Production Resource Packet
Department of Education

AGE RANGES OF NORMAL CONSONANT DEVELOPMENT[1]

Age Level

2　　3　　4　　5　　6　　7　　8

/p/

/m/

/h/

/n/

/w/

/b/

/k/

/g/

/d/

/t/

/ŋ/

/f/

/j/

/r/

/l/

/s/

/tʃ/

/ʃ/
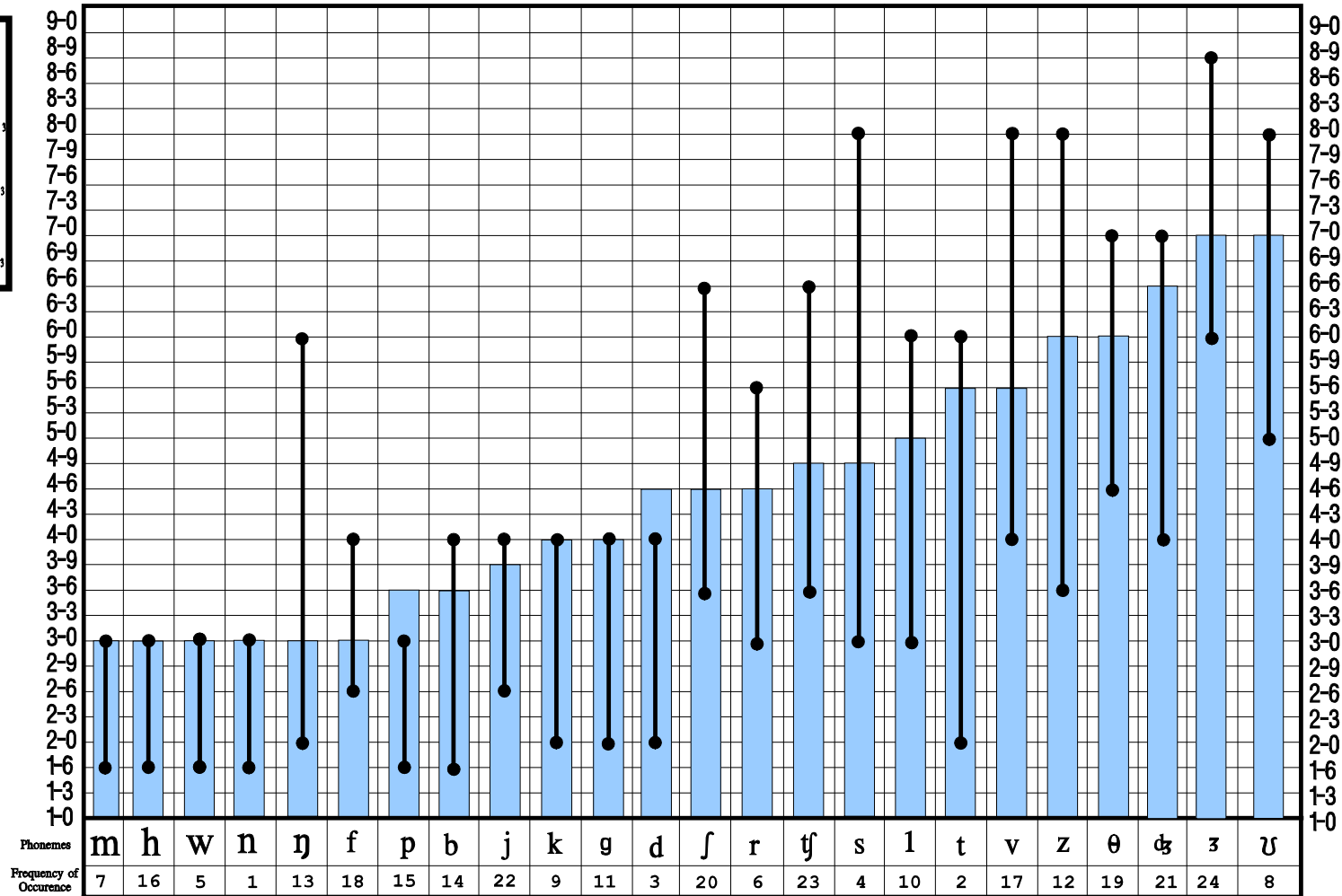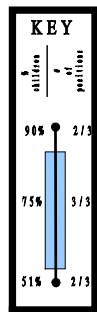
/z/

/dʒ/

/v/

/ɵ/

/ð/

/ʒ/

Average age estimates and upper age limits of customary consonant production.. The solid bar corresponding to each sound starts at the median age of customary articulation; it stops at age level at which 90% of all children are producing the sound (data from Templin, 1957; Wellman et al., 1931). From E. Sander (1972), "When Are Speech Sounds Learned? Journal of Speech and Hearing Disorders, 37, 55-63.

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[1]Assessment in Speech-Language Pathology CD ROM. Copyright © 1998 by Singular Publishing Group.

Age Ranges of Normal Consonant Development

Consonant Development Chart

Instructions: Draw a heavy horizontal line at the childs level for comparison purposes.

KEY

90%	2/3
75%	3/3
51%	2/3

Phonemes	m	h	w	n	ŋ	f	p	b	j	k	g	d	ʃ	r	tʃ	s	l	t	v	z	θ	dʒ	ʒ	ʊ
Frequency of Occurence	7	16	5	1	13	18	15	14	22	9	11	3	20	6	23	4	10	2	17	12	19	21	24	8

FIVE COMMONLY CITED NORMS FOR CONSONANT DEVELOPMENT

Consonant	Wellman et al.	Pool	Templin	Sander	Prather et al.
	1931	1934	1957	1972	1975
m	3	3 ½	3	before 2	2
n	5	4 ½	3	before 2	2
h	3	3 ½	3	before 2	2
p	4	3 ½	3	before 2	2
f	3	5 ½	3	3	2 – 4
w	3	3 ½	4	before 2	2 – 8
b	3	3 ½ 4	4	before 2	2 – 8
ŋ	4 ½	3	2	2	2
j	4	4 ½	3 ½	3	2 – 4
k	4	4 ½	4	2	2 – 4
g	4	4 ½	4	2	2 – 4
l	4	4 ½	4	2	2 – 4
d	5	4 ½	4	2	2 – 4
ʧ	5	4 ½	4		3 – 8
v	5	6 ½	6	4	4
z	5	5 ½	5	6	4
ʒ	6	6 ½	7	6	4
θ		7 ½	6	5	4
ʤ			7	4	4
ʃ		6 ½	4 ½	4	4 – 8
ð		6 ½	4 ½	4	3 – 8

Source: Reprinted with the permission of Merrill, an imprint of Macmillan Publishing Company from Assessment and Remediation of Articulatory and Phonological Disorders

Vowel Development Chart

Instructions: Draw a heavy horizontal line at the child's age level for comparison purposes.

Chronological
Age:
YR/MO

Left axis (top to bottom): 7-3, 7-0, 6-9, 6-6, 6-3, 6-0, 5-9, 5-6, 5-3, 5-0, 4-9, 4-6, 4-3, 4-0, 3-9, 3-6, 3-3, 3-0, 2-9, 2-6, 2-3, 2.0, 1-6, 1-3, 1-0

Right axis (top to bottom): 7-3, 7-0, 6-9, 6-6, 6-3, 6-0, 5-9, 5-6, 5-3, 5-0, 4-9, 4-6, 4-3, 4-0, 3-9, 3-6, 3-3, 3-0, 2-9, 2-6, 2-3, 2.0, 1-6, 1-3, 1-0

KEY

90% — Articulation Mastery

Midpoint

51% — ‹ Age

Symbols: i I e ɛ æ a u ʊ o ɔ ɝ/ɚ ʌ

Vowels

Diphthongs: aɪ aʊ ɔɪ ju
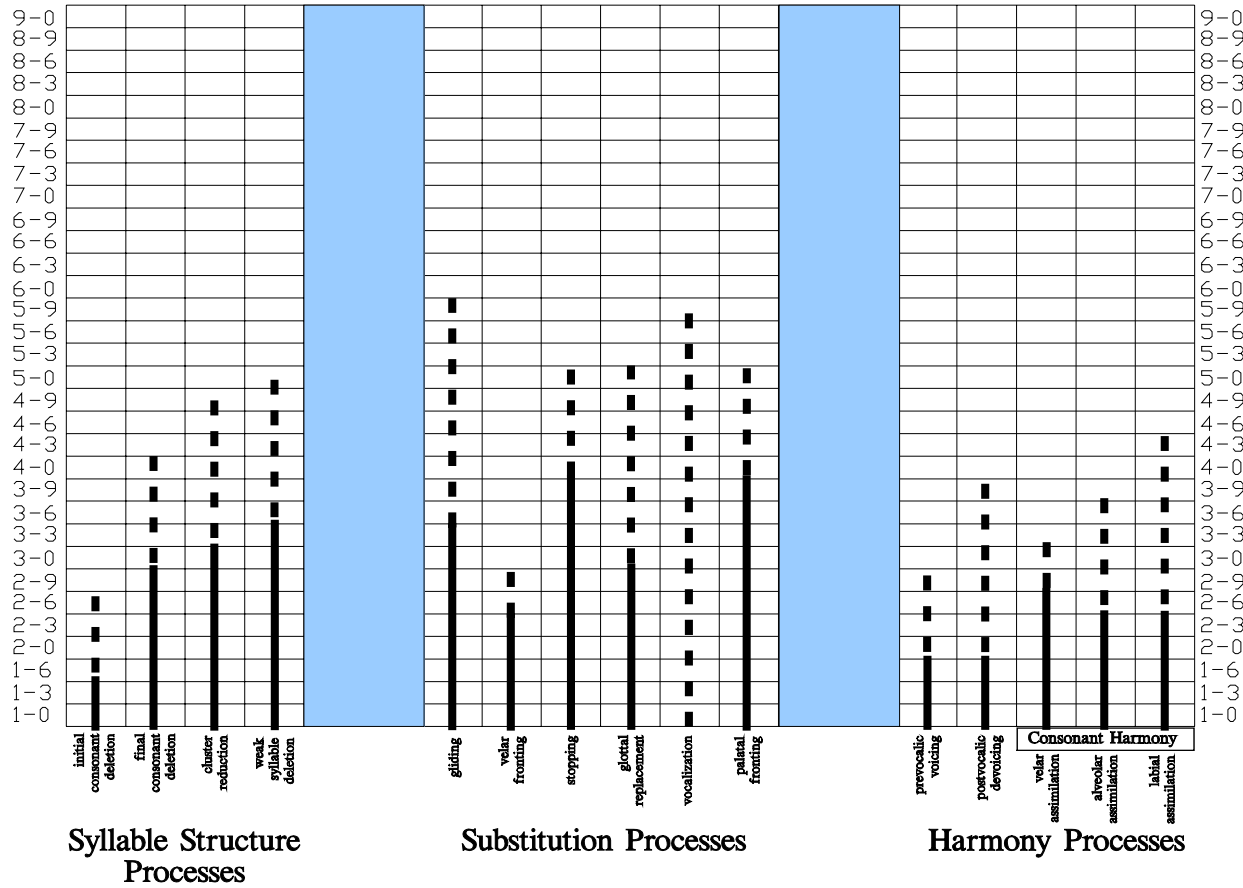
Diphthongs
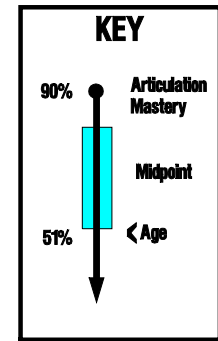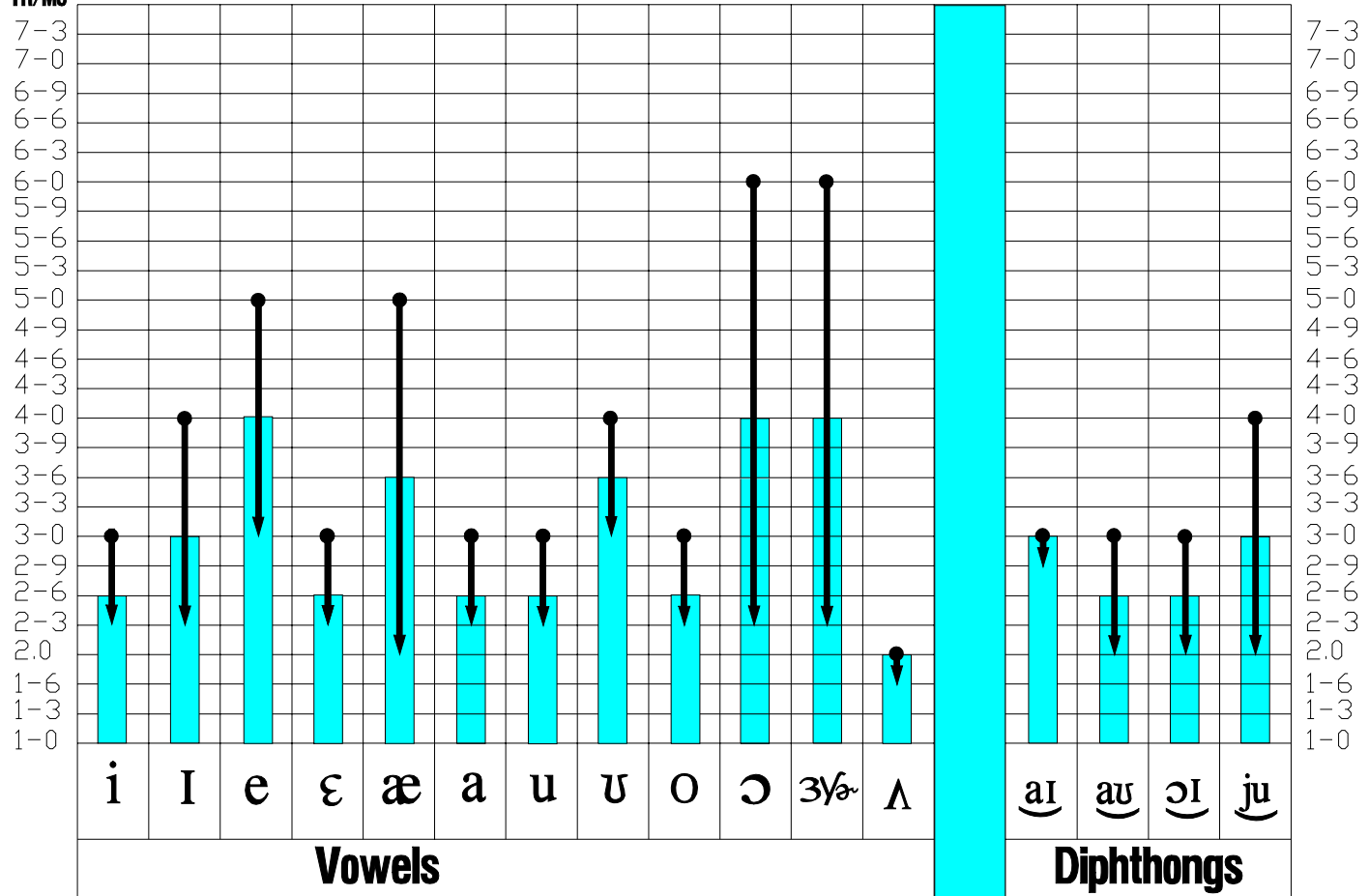
Source: Developmental Articulation and Phonology Profile. Academic Communication Associates (1997)

# Composite Age of Normal Phonological Process Extinction

Instruction: Draw a heavy horizontal line at the child's age level for comparison purposes

KEY
– – –
Indicates age range during which processes are normally extinguished

Syllable Structure Processes

- initial consonant deletion
- final consonant deletion
- cluster reduction
- weak syllable deletion

Substitution Processes

- gliding
- velar fronting
- stopping
- glottal replacement
- vocalization
- palatal fronting

Harmony Processes

- prevocalic voicing
- postvocalic devoicing
- Consonant Harmony
  - velar assimilation
  - alveolar assimilation
  - labial assimilation

Composite Age of Normal Phonological Process Extinction

Age Ranges for Disappearance of Phonologic Processes
Age in Years
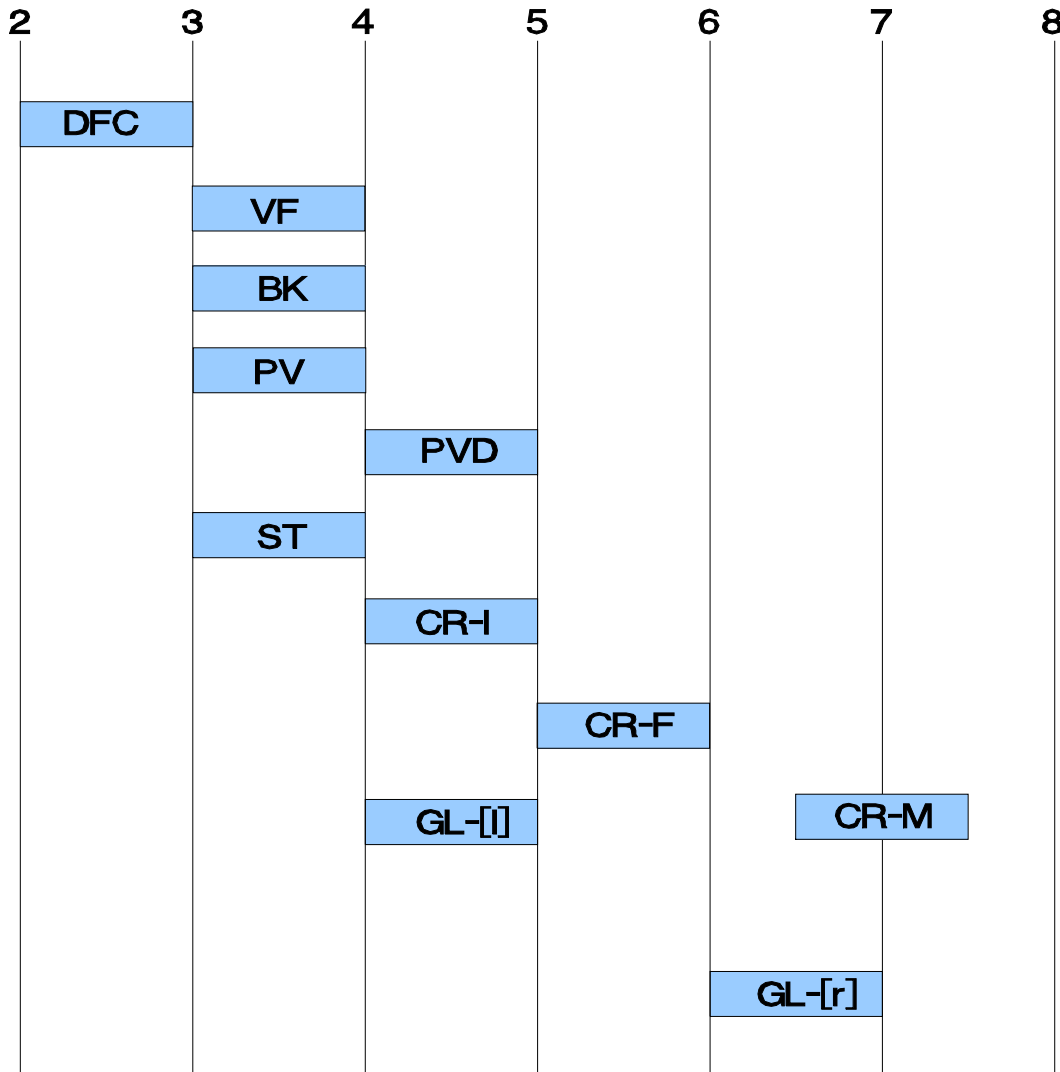
	DFC	Deletion of Final Consonants	ST	Stopping	GL-[l]	Gliding of Liquids - [l]
	VF	Velar Fronting	CR-I	Cluster Reduction - Initial	GL-[r]	Gliding of Liquids - [r]
	BK	Backing	CR-M	Cluster Reduction - Medial	PVD	Postvocalic Devoicing
	PV	Prevocalic Voicing	CR-F	Cluster Reduction - Final		

Normative Data: These guidelines for determining if a process should be a concern are reprinted with permission from *Rules Phonological Evaluation* (Webb and Duckett, 1990a). These guidelines are based on normative data collected from the literature and from field testing (Webb and Duckett, 1990b, 1992). Each horizontal bar in the chart above identifies the age ranges when phonological processes disappear in normally developing children

Age Ranges for Disappearance of Phonologic Processes

GRUNWELL's (1997) PROFILE OF PHONOLOGICAL DEVELOPMENT

STAGE I (0:9 – 1:6)	*Nasal* *Labial* *Lingual* *Plasive* *Fricative* *Approximant*	*First words tend to slury* *Individual varifaction in consonants used:* *Phumatic variables in pronounciation: and* *all simptifying processes applicable*	
STAGE II (1:6 – 2:0)	m n p b t d w	Reduplication Consonant Harmony FINAL CONSONANT DELETION CLUSTER REDUCTION	FRONTAL of velars STOPPING GLIDING /r/ ➡ [w] CONTEXT SENITIVE VOICING
STAGE III (2:0 – 2:6)	m n (ŋ) p b t d (k g) w h	Final Consonant Deletion CLUSTER REDUCTION	FRONTAL of velars STOPPING GLIDING /r/ ➡ [w] CONTEXT SENITIVE VOICING
STAGE IV (2:6 – 3:0)	m n ŋ p b t d k g	Final Consonant Deletion CLUSTER REDUCTION	STOPPING /v ʊ z ʧ ʤ/ /θ/ ➡ [f] FRONTING /ʃ/ ➡ [s] GLIDING /r/ ➡ [w] Context Sensitive Voicing

STAGE V (3:0 – 3:6)	f n
	    t d j h
	 w
		Clusters appear:
		 • obs. + approx. used;
		   /s/ clusters may occur
			STOPPING /v ʊ/ (/v/)
			 /θ/ ➡ [f]
			 FRONTING of
			 GLIDING /r/ ➡ [w]

STAGE VI (3:6 – 4:0) (4:0 – 4:6)	m n ʧ ʤ k ŋ
	 p b t d g
	 f v s z ʃ
	 w l(r) j h
		Clusters established:
		 • obs. + approx.: approx. "Immature"
		   /s/ clusters: /s/ ➡ type FRICATIVE
		 • obs. + approx.acceptable
		   /s/ clusters: /s/ ➡ type FRICATIVE
			/θ/ ➡ [f]
			 /ʊ/ ➡ [d] or [v]
			 (PALATALIZATION of /ʧ ʤ ʃ/
			 GLIDING /r/ ➡ [w]

STAGE VII (4:6 – ‹)	m n ʧ ʤ k ŋ p b t d g f v s z ʃ ʒ w ʃ r j h		/θ/ ➡ [f] /ʊ/ ➡ [d] or [v] /r/ ➡ [w] or /u/

KEY: Upper case letters = processes that are almost always present
 Lower case letters = gradual disappearances of a process

GRUNWELL'S (1987) CHRONOLOGY OF PHONOLOGICAL PROCESSES

	2:0 to 2:6	2:6 to 3:0	3:0 to 3:6	3:6 to 4:0	4:0 to 4:6	4:6 to 5:0	5:0 +
Weak Syllable Deletion							
Final Consonant Deletion							
Reduplication							
Consonant Harmony							
Cluster Reduction (Initial obstruent + approximant /s/ + consonant							
Stopping / f / / v / / θ / / ʊ / / s / / z / / ʃ / / tʃdʒ /							
Fronting /k, g, ŋ/							
Gliding /r/ ➡ [w]							
Context-Sensitive Voicing							

/θ/ ➡ (f)

/ʊ/ ➡ (d) or (v)

Fronting "(s) type"

Fronting (tʃdʒ)

Legend:
- Process use has been suppressed.
- Process use is fading

Grunwell's (1987) Chronology of Phonological Processes

PHONOLOGICAL PROCESSES

Definition: Systematic changes that affect entire phoneme classes or phoneme sequences. These changes are age appropriate up to the ages listed below.

Ages	DELETIONS	
2	1. Initial Consonant Deletion	at/hat
3	2. Final Consonant Deletion	no/noze
4	3. Consonant Cluster Reduction	tap/stop (deleting one or more)
	SUBSTITUTIONS	
3 ½ – 5	1. Stopping	ton/sun dus/juice
3	2. Voicing/Devoicing	die/tie crip/crib
3 – 6	3. Gliding	ju/shoe wef/leaf weed/read
4 – 5	4. Fronting/Backing	dum/gum sue/shoe/ cop/top
5 – 6	5. Affrication/Deaffrication	chew/shoe ship/chip
	ASSIMILATION	
3 – 4	1. Progressive	beb/bed dod/dog
3 – 4 or 3	2. Regressive	lellow/yellow fwim/swim
3	3. Velar Assimilation	gog/dog
3 – 4	4. Labial Assimilation	beb/bed fwim/swim
4	5. Alveolar Assimilation	lellow/yellow dod/dog
3	6. Nasal Assimilation	neon/pencil
	OTHER (infrequent)	
3 – 4	1. Vocalization (vowelization)	bado/bottle ka/cartefon/telephone
4	2. Weak Syllable Deletion	asks/ask
7	3. Transposition (Metathesis)	mud/mother
5	4. Vowel Naturalization	op/stop k/cats
2	5. CC Deletion	wawa/water d du/thank you
2	6. Reduplication	

Bennett (11/85: 9/87) Adapted from Hodson (1980); Ingram (1981); Shribert & Kwiakowski (1981); Kahn (1982).

PHONOLOGICAL PROCESSES

Phonological Process	Description	Example	Developmental Information
A. Syllable Structure Processes 1. Deletion of Final Consonant	Reduction of CVC words or syllables to CV form, not usually sound specific	book → /b ð/	Children who are developing language normally will begin to include final consonants by age 3[1].
2. Cluster Reduction	Simplification of clusters of consonants usually by deleting the one that is most difficult to produce	tree → /ti/	Most children (90%) do not use cluster reduction after age 4.[1]
3. Weak Syllable Deletion	Deletion of unstressed syllables	telephone → /t fon/	Process does not exist in speech of normally developing children beyond age 4[1]
4. Glottal Replacement	Replacement of final consonant of a syllable, usually in the intervocalic position, by a glottal stop; may mark the place of a consonant that is deleted.	kitchen → /kiʔən/	
B. Harmony Processes 1. Labial Assimilation	Substitution of a labial phoneme for a non-labial phoneme due to influence of a dominant labial phoneme contained within the word	thum → /wʌm/	
2. Alveolar Assimilation	Substitution of a phoneme which is produced with alveolar placement for a non-alveolar phoneme due to influence of a dominant alveolar phoneme within the word	yellow → /lɛlo/	
3. Velar Assimilation	Substitution of a phoneme which is produced with velar placement for a non-velar phoneme due to influence of a dominant velar phoneme within the word	dog → /gɔg/	
4. Prevocalic Voicing	Substitution of a voiced stop for its voiceless cognate due to influence of the following vowel	pig → /big/	
5. Final Consonant Devoicing	Substitution of a voiceless stop for its voiced cognate due to influence of the silence following the word	bed → /bɛt/	Devoicing of final consonants does not occur after age 3 in normal phonological development[1]

Source: From Speech *and Language Services in Michigan: Suggestions for Identification, Delivery of Service and Exit Criteria*, edited by Elizabeth Loring Lockwood and Kathleen Pistano. East Lansing: the Michigan Speech-Language-Hearing Association 1991. Used with permission.

[1]Phonological Disability in Children cited by Linda M. Laila Khan. "A Review of 16 Major Phonological Processes." Language, Speech, and Hearing Services in Schools. (April 1982). pp. 77-85.

Phonological Processes

PHONOLOGICAL PROCESSES

Phonological Process	Description	Example	Developmental Information
C. Feature Contrast Processes 1. Stopping	Substitution of a stop for a fricative	sun →/tʌη/	
2. Affrication	Substitution of affricatives for fricatives: usually occurs more often with sibilant fricatives than others	sun→/tsʌη/	Most fricatives should be correctly produced by age 4.[1]
3. Fronting	Substitution of phonemes by others which are produced anterior to the target phonemes; occurs commonly with velar stops	wago→/wadn/	Reported to no longer be evident by age 4 in normally developing children.[1]
4. Gliding of Fricatives	Substitution of glides for fricative phonemes	soap→/jop/	
5. Gliding of Liquids	Substitution of /w/, and /j/ for l/l or /t/, simplification process	red→/wed/	Majority of children reported to produce correct liquids by age 4.[1]
6. Vocalization	Substitution of vowels for syllable consonants, most frequently /ʊ/ and /o/	table→/tebo/	Syllabics are usually acquired by age 4[1].
7. Denasalization	Substitution of stops for nasals; usually affects word-initial and word-medial nasals more than word-final nasals	smoke→/bok/	

Source: From Speech *and Language Services in Michigan: Suggestions for Identification, Delivery of Service and Exit Criteria*, edited by Elizabeth Loring Lockwood and Kathleen Pistano. East Lansing: the Michigan Speech-Language-Hearing Association 1991. Used with permission.

[1]Phonological Disability in Children cited by Linda M. Laila Khan. "A Review of 16 Major Phonological Processes." Language, Speech, and Hearing Services in Schools. (April 1982). pp. 77-85.

Natural Process Analysis. cited by Linda M. Laila Khan, "A Review of 16 Major Phonological Processes." Language, Speech, and Hearing Services in Schools. (April 1982). pp. 77-85

Phonological Processes

Name _____   Age _____   Date _____

Examiner _____

<u>Testing Situation</u>

Stimuli (conversation, materials used, etc.) _____

Client's level of anxiety _____

Talkative/Not talkative _____

Prompts used _____

Representativeness of sample _____

Instructions

I.   Write out each word in each utterance (use phonetics if possible).

2.   Use a dash (—) to indicate each unintelligible word.

3.   An utterance is considered intelligible only if the entire utterance can be understood.

   4. Calculate intelligibility for words and utterances.

Example:

	#Intelligible Words	Total Words	#Intelligible Utterances	Total Utterances
1. hi w ɛ nt hɔrn	3	3	1	1
2. ar ju – tu go	4	5	1	1
3. - - ɵm	1	3	0	1
4. pwɪz pwe wrf mi	1	4	1	1
5. ɑr wɑnt to go hom	5	5	1	1
Totals	**14**	**20**	**4**	**5**

Intelligible words:	<u>14</u>	70%	Intelligible utterances:	<u>4</u>	80%
Total words:	20		Total utterances:	5	

[1]Assessnient in Speech-Language Pathology CD RUM, Singular Publishing Group

ASSESSING INTELLIGIBILITY WORKSHEET

Utterances	#Intelligible Words	Total Words	#Intelligible Utterances	Total Utterances
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				
13.				
14.				
15.				
16.				
17.				
18.				
19.				
20.				
21.				
22.				
23.				
24.				
25.				
26.				

Assessing Intelligibility Worksheet

ASSESSING INTELLIGIBILITY WORKSHEET

Utterances	#Intelligible Words	Total Words	#Intelligible Utterances	Total Utterances
27.				
28.				
29.				
30.				
31.				
32.				
33.				
34.				
35.				
36.				
37.				
38.				
39.				
40.				
41.				
42.				
43.				
44.				
45.				
46.				
47.				
48.				
49.				
50.				
TOTALS	_____	_____	_____	_____

FINDINGS

Average # Words per Utterance _____

% Intelligibility: Words _____

% Intelligibility: Utterances _____

Assessing Intelligibility Worksheet

STIMULABILITY WORKSHEETS

Name _____   School _____

Date _____   DOB/Age _____ /_____   Examiner _____

Instructions: Circle each sound checked for stimulability. Record results under the appropriate category using a check (√) or plus (+) for success and zero (0) or minus (-) for failure. If a sound requires multiple stimulation, indicate this with an asterisk (*) next to the plus or minus.

Sound Level	Syllable Level			Word Level			Word Level		
	I	M	F	I	M	F	I	M	F
p _____	___	___	___	___	___	___	___	___	___
b _____	___	___	___	___	___	___	___	___	___
t _____	___	___	___	___	___	___	___	___	___
d _____	___	___	___	___	___	___	___	___	___
k _____	___	___	___	___	___	___	___	___	___
g _____	___	___	___	___	___	___	___	___	___
f _____	___	___	___	___	___	___	___	___	___
v _____	___	___	___	___	___	___	___	___	___
ɵ _____	___	___	___	___	___	___	___	___	___
th _____	___	___	___	___	___	___	___	___	___
s _____	___	___	___	___	___	___	___	___	___
z _____	___	___	___	___	___	___	___	___	___
sh _____	___	___	___	___	___	___	___	___	___
zh _____		___	___		___	___		___	___
h _____	___			___			___		
ch _____	___	___	___	___		___	___	___	___
j _____	___	___	___	___		___	___		___
w _____	___	___		___	___		___	___	
y _____	___	___		___	___		___	___	
l _____	___	___	___	___	___	___	___	___	___
r _____	___	___	___	___	___	___	___	___	___
m _____	___	___	___	___	___	___	___	___	___
n _____	___	___	___	___	___	___	___	___	___
ng_____		___	___		___	___		___ ___	

WORDS AND PHRASES FOR ASSESSING STIMULABILITY

Age	Sound	Initial	Medial	Final
2	/p/	pin person pool Pie is good. Pete didn't go. Peggy is nice.	happy puppy soapy The hippo is big. What happened? It was a super effort.	sleep cup soup Let's move up. I found my cap. Get the soap.
2-8	/b/	bake bird boot Bill is very tall. Buy some milk. Bacon is good.	rabbit cupboard robin It's above the sink. The robber is quiet. The label was torn.	grab tub knob She has a robe. He needs a job. He hurt his rib.
2-8	/t/	tan touch tooth Tim went home. Taste this. Tony is nice.	guitar attend hotel The motel was full. No details are known. The cartoon is funny.	sat mutt got They were late. Here's the boot. It's a goat.
2-4	/d/	dim dump duty Do they know? Debbie went home. Dive right in.	ladder muddy soda He's hiding in there. The radio was loud. The wedding is fun.	need word food It's too loud. Plant a seed. She has a braid.
2-4	/k/	cat cup call Can I help you? Cake tastes good. Cut it out.	bacon bucket rocket He's making a mess. The pocket is full. He's looking for her.	music truck look He saw a duck. It is black. They like steak.
2-4	/g/	give gum ghost Go away. Get some more. Good job.	tiger again soggy Read the magazine. The sugar is sweet. It is foggy outside.	fig rug dog He found a frog. Sit on the rug. They like to dig.
2-4	/f/	fish fun fall Find the other one. Feel this paper. Food is good.	safety muffin coffee Go before dinner. It was safer inside. The café was full.	stiff rough goof Slice the loaf. Don't laugh. He likes beef.

WORDS AND PHRASES FOR ASSESSING STIMULABILITY

Age	Sound	Initial	Medial	Final
4	/v/	vase verdict vote Visit him. Value your time. Victory is sweet.	beaver oven over The movie was good. It's a heavy box. It's in the oval office.	have curve stove They will arrive. He wore a glove. He might move.
4	/ɵ/	thin third thought Think about it. Thank you. Thunder is loud.	bathtub nothing author The athlete won. Say something. The cathedral is big.	math earth tooth I need a bath. It's a myth. Tell the truth.
4	/ŏ/	that there those These are old. They didn't like it. This is not right.	feather mother bother I would rather go. The weather is hot. Her father is nice.	breathe bathe soothe He can breathe. It feels smooth. We sunbathe.
3	/s/	sand sunny soap Sip lemonade. Surprises are fun. Soup is good.	hassle mercy bossy Leave a message. They saw a castle. They are chasing us.	chase fuss moose It's a mess. She has a horse. His dog is loose.
4	/z/	zip zero zone Zip the coat. Zoo trips are fun. Zebras are big.	easy cousin closet They will visit us. The closet was full. The dessert was good.	peas does chose Touch the toes. He likes cheese. Hear the noise.
3-8	/ʃ/	ship shirt show Shall we go? Shoes get lost. Shells are pretty.	special brushes bushy The dises are dry. The ocean is near. The machine broke.	fish rush push He used cash. It is fresh. Make a wish.
4	/ʒ/		measure version fusion Bury the treasure. Wear casual clothes. His vision is good.	

Stimulability Worksheets

WORDS AND PHRASES FOR ASSESSING STIMULABILITY

Age	Sound	Initial	Medial	Final
2	/h/	hiss hut hop Hurry for dinner. He is going. Have you done it?	behave rehearse forehead The playhouse is large. Go unhook it. Look behind you.	
3-8	/tʃ/	cheese chunk choose China is far away. Chuck is a friend. Chew your food.	matches merchant nachos The ketchup spilled. He is pitching. He's a natural.	beach much watch Sit on a couch. Strike a match. She ate a peach.
4	/dʒ/	jeep jug joke Jets are fast. Jump the fence. Jelly is good.	magic budget project The pigeon flew. The pajamas are red. It was raging fire.	age budget dodge Turn the page. Cross the bridge. She likes fudge.
2-8	/w/	well won wood Winter is here. Wake up now. Why did he do it?	freeway away mower The sidewalk is hot. The reward was paid. He has a power saw.	
2-4	/j/	yell yummy yacht Yellow is bright. Yogurt is good. You can now.	kayak royal coyote The tortilla was warm. He is a loyal friend. The lawyer called.	
3-4	/l/	leap learn loop Linda went home. Lay it on the table. Let me see.	jelly color pillow She is silly. The palace was large. The jello was good.	fell pearl ball It is full. We will. Walk a mile.

Stimulability Worksheets

WORDS AND PHRASES FOR ASSESSING STIMULABILITY

Age	Sound	Initial	Medial	Final
3-4	/ɾ/	rip run row Rake the leaves. Rub it in. Ruth is nice.	erase carrot borrow The parade is today. He is sorry about it. Her earring was lost.	steer hair car It was not far. He ate the pear. Go to the store.
2	/m/	make money moon Meet me later. Mark is nice. My dog is brown.	hammer summer human It's lemon pie. He's coming back. Let Jimmy see it.	same hum boom You are welcome. Play the drum. They like ham.
2	/n/	net nothing new Never do that. Nancy said yes. Nobody was home.	many sonny phony He's a piano player. We cannot go. The bunny is white.	mean learn soon David is his son. Did you win? She has grown.
2	/ŋ/		finger hungry longer The singer is short. Put the hanger away. It's a jungle animal.	ring hung song He was young. He was wrong. Play on a swing.

Blend	Word	Phrase	
/bl/	black blunt blue	a black shoe a blunt pencil a blue car	
/bɾ/	brave brush broke	the brave hero The brush fell. He broke it.	
/dɾ/	drink drum draw	Don't drink it all. the drum beat Let's draw a picture.	
/fɾ/	free front frog	set free in the front a big frog	

WORDS AND PHRASES FOR ASSESSING STIMULABILITY

Blend	Word	Phrase
/fl/	fly flurry float	a fly swatter the snow flurry a root beer float
/gl/	glad glow glue	a glad boy a glove box sticky as glue
/gr/	green grudge grow	the green tree hold a grudge They grow corn.
/kl/	clam club closet	a clam bake the club house the closet door
/kr/	cry crumb cruise	Do not cry. the crumb cake the cruise liner
/pl/	place plum plot	first-place ribbon plum pudding The plot thickens.
/pr/	price protect prove	The price was high. He will protect us. Can you prove it?
/sk/	sky scare scoop	The sky is blue. Don't scare me. a scoop of ice cream
/skr/	screen scrub scroll	a screen door He will scrub the sink. the scroll cards
/sl/	slam slush slow	a slam dunk The snow was slush. She should slow down.
/sp/	spy spurt spoon	the secret spy a spurt of energy a soup spoon
/spl/	split splurge splotch	a banana split They splurged for it. a splotch of ink

Stimulability Worksheets

WORDS AND PHRASES FOR ASSESSING STIMULABILITY

Blend	Word	Phrase
/spɹ/	spray sprung sprout	a spray bottle They sprung up. an alfalfa sprout
/sm/	smell smug smooth	a nice smell a smug look baby-smooth skin
/sn/	snack snuggle snow	The snack was good. a snuggle bear the snow shovel
/st/	stiff stunt stop	a stiff shirt a tricky stunt Don't stop yet.
/stɹ/	stray struggle strong	a stray dog a struggle to win a strong man
/ʃr/	shrimp shrunk shrewd	The shrimp was large. It shrunk in the wash. He was shrewd.
/tɹ/	tray trumpet true	the breakfast tray a trumpet solo her true colors
/ɵr/	three thrust throw	the three blind mice the initial thrust Let's throw the ball.

Stimulability Worksheets

CHARACTERISTICS OF APRAXIA OF SPEECH[1]

- The number of misarticulations increases as the complexity of the speech task increases.

- Misarticulations occur on both consonants and vowels. Articulation errors occur more frequently on consonant clusters than on singletons. Vowels are misarticulated less frequently than consonants.

- Sounds in the initial position are affected more often than sounds in the medial or final positions.

- The frequency of specific sound errors is related, at least in part, to the frequency of occurrence in speech. More errors are noted with less frequently occurring sounds.

- Sound substitutions, omissions, distortions, and additions are all observed. The most frequent misarticulations are substitutions and omissions.

- Articulation errors and struggle behaviors increase as the length and complexity of the target word, phrase, or sentence increases.

- Speech production is variable. It is common for a person with apraxia of speech to produce a sound, syllable, word, or phrase correctly on one occasion and then incorrectly on another. It is also common to observe several different misarticulations for the same target sound.

- Struggling behaviors (such as groping to position the articulators correctly) are observed in many patients with apraxia of speech.

- Automatic speech activities (such as counting to 10 or naming the days of the week) tend to be easier and more error-free than volitional speech. Reactive speech (such as "thank you" or "I'm fine") is also easier for students with apraxia of speech to produce.

- Metathetic errors (errors of sound or syllable transposition) are common. For example, the student may say *snapknack* for *knapsack* or *guspetti* for *spaghetti.*

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1 1Darley (1982); Darley, Aronson, and Brown (1975); Duffy (1995); Haynes (1985); Rosenbek 0985); Rosenbek. Kent, and LaPointe (1984);

Shipley. Recor. and Nakamura (1990). Assessment in Speech-Language Pathology CD ROM Copyright 0 1998 by Singular Publishing Group.

- "Syllable collapses" may occur. Syllable collapses are not commonly reported in the literature, but are a common characteristic. The student reduces and/or disrupts the number of syllables in motorically complex words or phrases. For example, a student might say *glost gers* for *Los Angeles Dodgers* or *be neers* for *Tampa Bay Buccaneers.* In both examples, the number of syllables is collapsed and the remaining syllables are inaccurately produced.

- Receptive language abilities are often, but not always, superior to expressive abilities. However, the language skills are separate from the apraxia.

- People with apraxia of speech are usually aware of their incorrect articulatory productions. Therefore, they may be able to identify many of their own correct and incorrect productions without feedback from the Speech-Language Therapist.

- Apraxia of speech can occur in isolation or in combination with other communicative disorders such as dysarthria, delayed speech or language development, aphasia, and/or hearing loss.

- Oral apraxia and/or limb apraxia may or may not be present with apraxia of speech. Frequently an individual with oral apraxia will also have apraxia of speech.

- Severity varies from student to student. Some students cannot volitionally produce a target vowel such as */a/,* and others exhibit speech that is fine until they attempt to produce motorically challenging phrases such as *statistical analysis* or *theoretical implications.*

Characteristics of Apraxia of Speech

IDENTIFYING APRAXIA OF SPEECH[1]

Name: _____ Age: _____ Date: _____ Examiner: _____

Instructions: Evaluate each behavior in automatic speech, spontaneous speech, and oral reading. Mark a plus (+) if the child has no difficulty. Use the severity scale if the child does exhibit problems with production. Add comments on the right-hand side as needed.

1 = mild difficulties
2 = moderate difficulties
3 = severe difficulties

Automatic Speech	Oral Reading	Spontaneous Speech	Comments
			• phonemic anticipatory errors (e.g., *kreen crayon* for *green crayon*) _____
			• phonemic perseravatory errors (e.g., *babyb* for *baby*) _____
			• phonemic transposition errors (e.g., *snapknack* for *knapsack*) _____
			• phonemic vowel errors (e.g., *Paul* for *ball*) _____
			• phonemic vowel errors (e.g., *might* for *meet*) _____
			• visible or audible search _____
			• numerous and varied off-target attempts _____
			• highly inconsistent errors _____
			• errors increase with phonemic complexity _____
			• fewer errors in automatic speech _____
			• marked difficulties initiating speech _____
			• intrudes a schwa sound / / _____
			• abnormal prosodic features _____
			• awareness of errors with reduced ability _____
			• receptive-expressive language gap _____

Characteristics of Apraxia of Speech

CHECKLISTS FOR LIMB, ORAL, & VERBAL APRAXIA[1]

Name: _____ Age: _____ Date: _____

Examiner: _____

Instructions: *Select several items from each section and ask the student to complete the task or repeat the utterance. Many items are provided to offer a wide range of tasks; you do not need to complete each item. Score each presented item as correct (+ or √) or incorrect (– or Ø). Transcribe errors phonetically on the right-hand side. Also note accompanying behaviors such as delays with initiation, struggling, groping, or facial grimacing. The diagnosis of apraxia is made by evaluating the nature and accuracy of movement, as well as the type and severity of error patterns present.*

Limb Apraxia   Comments

_____ wave hello or goodbye _____

_____ make a fist _____

_____ make the "thumbs up" sign _____

_____ make the "okay" sign _____

_____ pretend you're zipping your coat _____

_____ pretend you're combing your hair _____

_____ pretend you're petting a dog _____

_____ pretend you're turning a doorknob _____

_____ pretend you're hitting a baseball (or golf ball) _____

_____ pretend you're tying a shoe _____

_____ pretend you're using scissors to cut a piece of paper _____

_____ pretend you're knocking on the door _____

_____ pretend you're writing _____

_____ pretend you are going to make a fire _____

_____ pretend you are going to make coffee _____

_____ pretend you are going to drive a car out of a driveway _____

Oral Apraxia   Comments

_____ smile _____

_____ open your mouth _____

_____ blow _____

_____ whistle _____

[1]Duffy (1995), Darley, Aronson, and Brown (1975). CD ROM, 1998 by Singular Publishing Group.

_____ puff out your cheeks _____

_____ show me your teeth _____

_____ chatter your teeth as if you are cold _____

_____ pucker your lips _____

_____ bite your lower lip _____

_____ smack your lips _____

_____ lick your lips _____

_____ stick out your tongue _____

_____ touch your nose with the tip of your tongue _____

_____ move your tongue in and out _____

_____ wiggle your tongue from side to side _____

_____ click your tongue _____

_____ clear your throat _____

_____ cough _____

_____ alternately pucker and smile _____

Verbal Apraxia   **Comments or Transcription**

_____ love—loving—lovingly _____

_____ jab—jabber--jabbering _____

_____ zip—zipper—zippering _____

_____ soft—soften—softening _____

_____ hope—hopeful—hopefully _____

_____ hard—harden—hardening _____

_____ thick—thicken—thickening _____

_____ please—pleasing—pleasingly _____

_____ sit—city—citizen—citizenship _____

_____ cat—catnip—catapult—catastrophe _____

_____ strength—strengthen—strengthening _____

_____ door—doorknob—doorkeeper—dormitory _____

_____ tornado _____

_____ radiator _____

_____ artillery _____

_____ linoleum _____

_____ inevitable _____

_____ delegation _____

_____ probability _____

_____ cauliflower _____

_____ declaration _____

_____ refrigeration _____

_____ unequivocally _____

_____ thermometer _____

_____ parliamentarian _____

Checklists-Limb, Oral, & Verbal Apraxia

Verbal Apraxia   **Comments or Transcription**

_____catastrophically _____

_____disenfranchised _____

_____statistical analysis _____

_____alternative opinion _____

_____regulatory authority _____

_____ruthlessly malicious _____

_____barometric pressure _____

_____indescribably delicious _____

_____Mississippi River _____

_____Tallahassee, Florida _____

_____Kalamazoo, Michigan _____

_____Boston, Massachusetts _____

_____Sacramento, California _____

_____Madison Square Garden _____

_____Minneapolis, Minnesota _____

_____Chattanooga, Tennessee _____

_____Encyclopedia Britannica _____

_____Saskatchewan, Saskatoon _____

_____Philadelphia, Pennsylvania _____

_____Oakland-Alameda Coliseum _____

_____Vancouver, British Columbia _____

_____Nuclear Regulatory Commission _____

Checklists-Limb, Oral, & Verbal Apraxia

DIFFERENTIAL CHARACTERISTICS OF DYSARTHRIA AND APRAXIA OF SPEECH[1]

Dysarthria:
- All processes of speech are affected (including respiration, phonation, resonance, articulation and prosody).

- There is a change in muscle tone secondary to neurologic involvement that results in difficulty with voluntary and involuntary motor tasks (such as swallowing, chewing, and licking).

- Speech errors result from a disruption in muscular control of the central and/or peripheral nervous system.

- Errors of speech are consistent and predictable. There are no islands of clear speech.

- Articulatory errors are primarily distortions and omissions.

Apraxia of Speech:
- The speech process for articulation is primarily affected. Prosody may also be abnormal.

- There is a change in motor programming for speech secondary to neurologic involvement, but muscle tone is not affected. Involuntary motor tasks typically are not affected.

- Speech errors result from a disruption of the message from the motor cortex to the oral musculature.

- Errors of speech are inconsistent and unpredictable. Islands of clear, well-articulated speech exist.

- Articulatory errors are primarily substitutions, repetitions, additions, transpositions, prolongations, omissions, and distortions (which are least common). Most errors are close approximations of the targeted phoneme. Errors are often perserveratory or anticipatory.

Assessments in Speech-Language Pathology CD ROM 1998 by S

Differential Characteristics: Dysarthria and Apraxia of Speech

[1] Durley, Aronson, and Brown (1975), LaPointe and Wentz (1974), Weiss, Gordon, and Lillywhite (1987), and Wertz, LaPointe, and Rosenbek (1991)

Dysarthria:

- Consonant productions are consistently imprecise; vowels may be neutralized.

- The speech rate is slow and labored: strain, tension, and poor breath support may be apparent.

- Speech intelligibility is reduced as the speaking rate increases.

- Increases in word/phrase complexity result in poorer articulatory performance.

Apraxia of Speech:

- Consonants are more difficult than vowels; blends are more difficult than singletons; initial consonants are more difficult than final consonants; fricatives and affricates are the most difficult consonants. Errors increase as the complexity of the motor pattern increases.

- A prosodic disorder may occur as a result of compensatory behaviors (stopping, restarting, and difficulty initiating phonation and/or correct articulatory postures).

- Speech intelligibility sometimes increases as the speaking rate increases.

- Increases in word/phrase complexity result in poorer articulatory performance.

Differential Characteristics: Dysarthria and Apraxia of Speech

IDENTIFYING DYSARTHRIA[1]

Name: _____ Age: _____ Date: _____

Examiner: _____

Instructions: Identify the speech characteristics noted during the speech sample.

Flaccid Dysarthria (lower motor neuron involvement)

_____ Hypernasality

_____ Imprecise consonants

_____ Breathiness

_____ Monopitch

_____ Nasal emission

Spastic Dysarthria (upper motor neuron involvement)

_____ Imprecise consonants

_____ Monopitch

_____ Harsh voice quality

_____ Monoloudness

_____ Low pitch

_____ Slow rate

_____ Hypernasality

_____ Strained-strangled voice quality

_____ Short phrases

Mixed Dysarthria (upper and lower motor neuron involvement)

_____ Imprecise consonants

_____ Hypernasality

_____ Harsh voice quality

_____

[1]From J. C. Rosenbek and L. L. LaPointe, "The Dysarthrias: Diagnosis, Description, and Treatment." In D. F. Johns (Ed.), Clinical *Management of Neurogenic Communication Disorders* (2nd ed., p. 100). Boston: Little, Brown and Co.

Identifying Dysarthria

_____ Slow rate

_____ Monopitch

_____ Short phrases

_____ Distorted vowels

_____ Low pitch

_____ Monoloudness

_____ Excess and equal stress

_____ Prolonged intervals

Ataxic Dysarthria (cerebellar involvement)

_____ Imprecise consonants

_____ Excess and equal stress

_____ Irregular articulatory breakdowns

_____ Distorted vowels

_____ Harsh voice

_____ Loudness control problems

_____ Variable nasality

Hypokinetic Dysarthria (Parkinsonism)

_____ Monopitch

_____ Reduced stress

_____ Monoloudness

_____ Imprecise consonants

_____ Inappropriate silences

_____ Short rushes of speech

_____ Harsh voice

_____ Breathy voice

Hyperkinetic Dysarthria (Dystonia and Choreathetosis)

_____ Imprecise consonants

_____ Distorted vowels

Identifying Dysarthria

DIFFERENTIATING THE SIX DYSARTHRIAS[1]

Primary Type	Cite of Lesion	Possible Causes	Speech Characteristics
Flaccid	Lower motor neuron	Viral infection Tumor CVA Congenital condition Disease Palsies Trauma	Hypernasality Imprecise consonants Breathiness Monopitch Nasal emissions
Spastic	Upper motor neuron	CVA Tumor Trauma Congenital condition	Imprecise Consonants Monopitch Harsh voice quality Monoloudness Low pitch Slow rate Hypernasality Strained-strangled voice Short phrases
Mixed (flaccid and spastic)	Upper and lower motor neuron	Amyotrophic lateral Sclerosis Trauma CVA	Imprecise consonants Hypernasality Harsh voice quality Slow rate Monopitch Short phrases Distorted vowels Low pitch Monoloudness Excess and equal stress Prolonged intervals
Ataxic	Cerebellar system	CVA Tumor Trauma Congenital condition Infection Toxic effects Loudness/control problems	Imprecise consonants Excess and equal stress Irregular articulatory breakdowns Distorted vowels Harsh voice Variable nasality
Hypokinetic	Extra pyramidal system	Parkinsonism Drug-induced	Monopitch Reduced stress Monoloudness Imprecise consonants Inappropriate silences Short ruses of speech Harsh voice Breathy voice
Hyperkinetic	Extrapyramidal system	Chorea Infection Gilles de la Tourette Syndrome Balism Anthetosis Infection CVA Tumor Dystonia Drug-induced Dyskinesia	Imprecise consonants Distorted vowels Harsh voice quality Irregular articulatory breakdowns Strained-strangled voice Monopitch Monoloudness

Differentiating the Six Dysarthrias

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[1] Information is based on materials presented in Darley, Aronson, and Brown (1975). This table is from R.T. Wertz,

"Neuropathologies of Speech and Language: An Introduction to Patient Management." In D.F. Johns (Ed.), Clinical Management of Neurogenic Communication Disorders (2nd ed., pp. 76-77). Boston: Little, Brown and Co.

CHECKLIST FOR THE ASSESSMENT OF CHILDREN WITH CLEFTS[1]

Name: _____ Age: _____ Date: _____

Primary care physician: _____

Type of cleft: _____

Date of surgery: _____

Other conditions and medical history: _____

_____

_____

Examiner: _____

Oral-Facial Examination

Instructions: Administer a standard oral-facial examination. Additionally, make observations about the following oral-facial features. Check and circle each item noted. Include descriptive comments in the right-hand margin

Comments

_____ Type of cleft: lip/palate/lip and palate (describe) _____

_____ Adequacy of cleft repair: good/fair/poor _____

_____ Other facial abnormalities: absent/present (describe) _____

_____ Submucosal cleft: absent/present _____

_____ Labial pits in lower lip: absent/present _____

_____ Labiodental fistulas: absent/present _____

_____ Alveolar fistulas: absent/present _____

_____ Palatal fistulas: absent/present _____

_____ Velar fistulas: absent/present _____

_____ Perceived length of velum: normal/short/long _____

_____ Shape of the alveolar ridge: notched/cleft/wide/collapsed _____

Notes from standard oral-facial examination _____

_____

_____

_____

_____

_____

_____

_____

Checklist – Assessment of Children with Clefts

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[1] Assessment in Speech-Language Pathology. Singular Publishing Group

CHECKLIST FOR THE ASSESSMENT OF CHILDREN WITH CLEFTS

Assessment of Voice

Instructions: Evaluate the child's voice, paying particular attention to possible cleft-related problems. Check deficits that are present and indicate severity. Record additional notes in the right-hand margin.

1. = mild
2. = moderate
3. = severe

Comments

_____ Pitch variation is reduced. _____

_____ Vocal intensity is reduced. _____

_____ Vocal quality is hoarse/harsh/breathy (circle). _____

_____ Vocal quality is strangled. _____

_____ Child produces glottal stops in place of plosives and fricatives. _____

_____ Child attempts to mask hypernasality and nasal emission. _____

_____ Child strains voice to achieve adequate pitch change and loudness. _____

_____ Child strains voice in attempt to increase speech intelligibility. _____

Assessment of Resonance and Velopharyngeal Integrity

Instructions: Evaluate the child's voice, listening for the following qualities of resonance. Check each characteristic the child exhibits and indicate severity. Record additional notes in the right-hand margin.

1 = mild
2 = moderate
3 = severe

Comments

_____ Hypernasality _____

_____ Nasal emission_____

_____ Cul-de-sac resonance _____

_____ Hyponasality _____

Checklist – Assessment of Children with Clefts

CHECKLIST FOR THE ASSESSMENT OF CHILDREN WITH CLEFTS

(Continued-pg.3)

Instructions: Instruct the child to complete the Modified Tongue Anchor Procedure. Check your observation below:

_____ Velopharyngeal function is adequate (no nasal omission).

_____ Velopharyngeal function is adequate (nasal emission present).

_____ Further testing using objective instrumentation is necessary.

Instructions: Ask the child to produce the pressure /p/, /b/, /k/, /g/, /t/,/d/, /f/, /v/, /s/, /z/, /ʃ/, /ʒ/, /tʃ/, /ɵ/, and / ð / (see *The Pressure Consonants* for suggested stimulus words and phrases), and listen for hypernasality and nasal emissions. Check the appropriate observations below.

_____ Velopharyngeal function is adequate (no nasal emissions or hypernasality).

_____ Velopharyngeal function is inadequate (nasal emissions or hypernasality present).

_____ Further testing using objective instrumentation is necessary.

_____ Nasal emissions and hypernasality are consistent.

_____ Nasal emissions and hypernasality are inconsistent.

Assessment of Articulation and Phonology

Instructions: Listen to the child's articulatory accuracy. Pay particular attention to the child's production of stop-plosives, fricatives, and affricates, which are most likely to be negatively affected by a cleft. Indicate severity and make additional comments in the right-hand margin.

1. = mild
2. = moderate
3. = severe

Comments

_____ Stop-plosive errors _____

_____ Fricative errors _____

_____ Affricate errors _____

_____ Glide errors _____

_____ Liquid errors _____

_____ Nasal errors _____

_____ Vowel errors _____

_____ Error patterns are consistent _____

_____ Error patterns are inconsistent _____

_____ Further assessment is recommended _____

Checklist – Assessment of Children with Clefts

Instructions: Check the following compensatory strategies the child uses during speech production and indicate severity. Make additional comments in the right-hand margin.

_____ Glottal stops _____

_____ Pharyngeal stops _____

_____ Mid-dorsum palatal stops _____

_____ Pharyngeal fricatives _____

_____ Velar fricatives _____

_____ Nasal fricatives _____

_____ Posterior nasal fricatives _____

_____ Nasal grimaces _____

Summary

Instructions: Check areas that require further assessment. Make additional comments in the right-hand margin.

Comments

_____ Articulation—Cleft-related _____

_____ Articulation—Non-cleft-related_____

_____ Cognition _____

_____ Hearing _____

_____ Language _____

_____ Velopharyngeal integrity _____

_____ Voice _____

Checklist – Assessment of Children with Clefts