

Module 2A: Introduction to Motor Based Speech Assessment

I. Assessment – Foundational Elements

From ASHA Practice Portal on Childhood Apraxia of Speech (retrieved April 3, 2023)

Children who are suspected of having CAS on the basis of screening results should be referred to an SLP for a comprehensive assessment.

- *A comprehensive oral mechanism examination includes a **motor speech assessment**. This is critical for differentiating CAS from childhood dysarthria and other speech sound disorders and for identifying both oral apraxia and apraxia of speech—either of which may occur in the absence of the other.*
- *A key consideration in the **motor speech assessment** is an evaluation of movement accuracy. Using a variety of tasks, the SLP looks for the presence of consensus features and other clinical characteristics of CAS to help identify the presence of motor-based planning and speech difficulties.*

While the agreement on the consensus or hallmark features of CAS (“The ASHA 3”) are still in relative infancy, both they, and the Mayo 10 characteristics help drive our assessment.

The differential diagnosis of CAS is a clinical art. It requires dynamic clinical skill as well as master clinician judgment of the multi-faceted components of diagnostic procedures.

II. What does the research say about assessment?

Findings Murray et al. (2021) who reviewed 53 articles.

- a. Major issues with assessment protocols:
 - significant variability among tools in the behaviors assessed and how they were assessed
 - research did not adequately describe participants nor their criteria for diagnosing them as having CAS.
 - psychometric aspects varied greatly and there is a lack of a reference test to compare results against
 - no test met criteria for test-retest or inter-examiner reliability.
 - no markers that meet specificity and sensitivity to differentiate CAS from other SSD
- b. Critical difficulties in having a good, standardized test include:
 - lack of clearly defined features and information on the degree and frequency of criterion to diagnose MSD
 - reliance on subjective perception of features by SLPs with varying levels of training
 - overlapping symptoms across all SSD
 - high rates of comorbidity
 - variability of features of CAS across time and children

- c. Recommended a combination of measures:
 - complete initial comprehensive assessment (discussed below)
 - find articles where the included subjects are similar to the child you are seeking a diagnosis and use those tasks, following their guidelines as much as possible.
 - Tasks/criteria that met quality criteria included:
 - Inconsistency on repeated trials of phrase “buy Bobby a puppy” (Iuzzini-Seigel et al., 2017)
 - lower scores on stress matches and syllable segregation on PPC and a test of polysyllables, and accuracy of DDK. (Murray, McCabe, Heard & Ballard. 2015)
 - lower scores on syllable discrimination task (bog vs dog) (Zuk et al. 2018)
 - low articulation/phonology/expressive language scores and average to above average receptive language and timing accuracy scores (Peter, 2006)
 - lower scores on PVC in pseudowords. (Ziethel et al. 2013)
 - lower scores on voice onset time and vowel space when auditory feedback was attenuated. (Iuzzini-Seigel et al. 2015)
 - There were other measures that showed promise but didn’t quite meet the guidelines set out by Murray that should be studied further including the DEMSS, Shriberg’s Pause Marker, and SRT.

- d. different languages info (see end of handout for more multilingual assessment info)
 - Some language such as Dutch and French do not rely on stress as much as English
 - Language neutral tasks such as rapid syllable repetition (DDK) seem to assess the underlying motor impairment regardless of the outward expression of it (syllable stress or syllable organization)
 - Consider the LAMS (when readily available): Language-neutral Assessment of Motor Speech is a play-based assessment tool for children motor speech skills, including both non-speech and speech abilities (Velleman, Andrianopoulos & Rupela, 2017).

There is no “gold standard” assessment for CAS

III. Components of a Motor Speech Assessment

There are several key elements of a speech sound diagnostic. At the very foundation of a differential diagnosis of CAS is a thorough assessment of speech production. The following components of a diagnostic are essential to consider, though the precise tools may vary.

OVERVIEW of COMPONENTS
1. Case History
2. Segmental Speech Production
a. Standardized assessments

<ul style="list-style-type: none"> b. Non-standardized speech elicitation tasks c. Phonetic inventories, intelligibility ratings, and analysis procedures d. Inconsistency measures e. Stimulability
3. Oral Motor Exam & Non-Speech Oral Motor Skills
4. Suprasegmental Speech Production <ul style="list-style-type: none"> a. Broad perceptual ratings b. Prosody-Voice Screening Profile (PVSP) and other tools
5. Language
6. Speech Perception
7. Phonological Awareness, Literacy
8. Voice, Resonance, Fluency, etc.
9. Social Language (attention, turn taking, interaction, imitation skills)

1. Case History – looking for red flags to determine the **relative contributions** of the disruptions with *motor planning and programming*

The quality of your question will yield the quality of the answer

- Family History
 - CAS cause largely unknown (Murray et al., 2015)
 - But often occurs in context of known neurodevelopmental disorders
 - a. Autism (prevalence 0%-63%)
 - b. Down syndrome (11%-15%)
 - c. Galactosemia (6.5%-24%)
 - d. 7q11.23 duplication syndrome (> 75%)
 - e. Others
 - 34 + genes associated with CAS (Chenausky & Tager-Flusberg, 2022)
 - “Genes of interest” include 2, 145 genes from every chromosome except 10 and Y
 - Many “de novo” (not passed down) (Kaspi et al., 2022)
 - Examples of genes in literature
 - a. FOXP2 on 7th chromosome (Morgan et al, 2017)

b. 16p11.2 on 16th chromosome (Demopoulos et al., 2018)

- Probably interaction of multiple genes and environmental factors
- Likely heterogeneous (due to one or more genetic differences and not just one cause)
- Do you refer for genetics?
 - Difficult answer. Tutorial by Pletcher et al. 2007 can help.
- Nursing/Feeding
- Babble and early sound production
- Soft neurological signs
- Hearing & vision
- Social engagement
- Play
- How well does your child sleep?
- Loss of words
- Pop-out words
- “Go to” all-purpose words
- Communicative intent
- Use of sign/gesture/pictures/non-verbal means to convey messages
- Consistency
- More difficulty in sentences than in single words
- Groping
- Inflection, variations (suprasegmentals)
- Automatic speech vs imitative speech
- Frustration
 - Healthy frustration can be a good thing. It lets us know that your child has the cognitive ability to understand what he/she can't do, and it provides motivation for therapy and home practice. Frustration can bring change.
- What things have you done to address his speech delay?
- Progress in therapy so far
- If the child has a diagnosis, who gave it and when? Do you (parent) think it's accurate?
 - If they don't already have a diagnosis, what diagnosis have you (the parent) thought about?
- On a worry scale of 1-10, 1 being that you feel your child will grow out of his/her speech problem and 10 that you are losing sleep over this speech issue, where you would put your worry level.
 - High amounts of worry → parent overinterpreting/jumping in to “save” or protect their child, no responsibilities given to child VS low amount of worry → parents disengaged with how much their child is struggling

2. Segmental Speech Production

a. Standardized Assessments > 3yrs

- Though there is currently no norm-referenced, standardized assessment for CAS

- available, there is definitely value to administering a standardized assessment tool.
- It is also important to consider that the contexts are often limited in the currently available assessments (i.e., mostly single words) and no single test is adequate for establishing a child's phonetic inventory (Eisenberg et al., 2010).
 - Additionally, it is important to remember that we are differentially diagnosing CAS and often the resulting data from an assessment will likely lead one to a diagnosis of a phonological disorder or other diagnosis. Therefore, an articulation and/or phonological assessment will assist with this process.

Single Word Articulation and Phonology Tests – a good starting place

- Goldman-Fristoe Test of Articulation (GFTA-3) is frequently used and can be used to examine phonological processes with the Khan Lewis Phonological Assessment (KLPA-3). It also assesses speech in sentence-level productions and can get an intelligibility rating. Ages 2 - 21 years.
- Diagnostic Evaluation of Articulation and Phonology (DEAP) is also frequently used - assesses articulation, phonology, vowels, multi-syllable words, and oral mechanism/sequenced oral movements. Ages 3 - 8-11 years
 - Consider using the Word Inconsistency subtest in conjunction with other testing, even if not using the entire DEAP (available in the back of the manual as a reproducible form)
- Photo Articulation Test (PAT-3) is useful, especially with older children and adolescents given the pictorial stimuli, though can make the activity more "game-like" with the use of cards. PAT-3 also includes analysis of vowels. Ages 3-8-11 years.
- Hodson Assessment of Phonological Patterns (HAPP-3) allows for analysis of vowels and is particularly useful for young children given the objects (vs. pictures) that are used as stimuli. This assessment is also thorough in its analysis and ability to lead target selection for phonological disorders in particular, and guide stimulability testing. Normed for ages 3-8-11 years.
- While the Kaufman Speech Praxis Test for Children (KSPT) is a standardized tool, it is best used informally to gather information for therapy. This tool examines syllable shape as well as sound repertoire and provides data you can use to assess organicity. Ages 2;5-11 years.

Tests of motor speech skills

- [Kaufman Speech Praxis Test for Children](#) (Kaufman, 1995)

- [Verbal Motor Production Assessment for Children - Revised](#) (VMPAC-R)(
Hayden & Namasivayam, 2021)
- [Oral Speech Mechanism Screening Examination-3](#) (St. Louis & Ruscello, 2000)
- [Dynamic Evaluation of Motor Speech Skills](#) (DEMSS) (Stand & McCauley 2019)

Assessment of sCAS under 3 years

- While most tests aren't normed for children under 3, you can still administer them (or portions of) to use as information gather and informal data to analyze. Observations and speech samples are vitally important with this age group
- Analyze phonetic inventories and word shapes as well as consistency, precision, and sound sequencing
- Speech sample can also provide insight into play and social skills, often important in considering differential diagnosis at this age, as well as receptive and expressive language and vocabulary skills
- PCC and Intelligibility ratings can also be collected from recorded speech samples
- Consider also: canonical babble ratio, mean babble level, age of babble onset, age of first consonant, as well as syllable and word shape, and phonetic inventory (see table 4 below)

What if they won't cooperate?

- Try receptive tasks or imitated tasks first (e.g. the DEMSS)
- Add reinforcements (include if these were used when reporting)
- Try real objects and toys instead of pictures (e.g. grab bag, minis, hide and find game, dig for treasures in sand/beans/rice)
- Use communication temptations to your advantage
- Use a visual schedule to decrease anxiety
- Free play to collect conversational sample first – get on the floor and be FUN!

b. Non-

Highman, C., Overby, M., Leiteo, S., Abbiati, C., & Velleman, S. (In press). Update on identification and treatment of infants and toddlers with suspected childhood apraxia of speech. *Journal of Speech, Language, and Hearing Research*.

Table 4. Early vocalization developmental expectations.

Variable	Age (mos) ^a	Findings	Selected sources
Babbling onset	6–12		Vihman (1996)
	7–10		Oller (1980)
	≤ 10		Eilers et al. (1993)
CBR ^b		0.15 (no. canonical babbles/total no. syllables)	Lynch et al. (1995)
		0.14 (no. canonical babbles/total no. syllables)	Nyman et al. (2021)
MBL ^c	9	1.3	Velleman (2016)
	15	1.58	
	18	1.65	
	23	1.9	
Syllable shape	0–12	Single C ^d , single V ^e	Velleman (2003, 2016)
	12	CV	
	18–24	CVC (same consonants)	
	24–30	CVC (different consonants)	
	36	CCV, CCVC, CVCC	
	Word shape	0–12	1 syllable, 2 syllables (same Cs and SW stress ^f)
	12–18	2 syllables (different Cs, SW stress)	
	36	2 syllables (WS ^g stress), 3 syllables	
Inventory ^h	9–18	4–6 consonants	McLeod & Baker (2017)
	24	10 initial consonants, 4 final consonants	
	12	Mean 4.4 consonants, median 4, range 0–16	McLeod (2009)
	24	9–10 initial phones in 3 places (labial, alveolar and velar), inclusive of stop(s), nasal(s), fricative(s), and glide(s) 5–6 final phones in 3 places, inclusive of nasal(s), fricative(s), and often a liquid	Stoel-Gammon (1987)

^aMonths. All ages are approximate. ^bCanonical babbling ratio. ^cMean babbling level. ^dConsonant. ^eVowel. ^fStrong–weak (i.e., first syllable is stressed). ^gWeak–strong (i.e., first syllable is unstressed). ^hNumber of different consonants. Findings should be considered a general (not absolute) guideline.

Standardized Tools

Vowels

- Assessment of Vowels Summary (Watts, 2004) - free download - <https://www.speech-language-therapy.com/pdf/watts2004axvowels.pdf>
 - Australian but very usable in North America

Assessment of vowel production
 Nicole Watts, Logan Hospital
 NAME: _____ DATE: _____ DATE OF BIRTH: _____

Vowels

- /i/ _____
- key /ki/ _____
- sheep /ʃi:p/ _____
- spaghetti /spə'getti/ _____
- /ɪ/ _____
- fish /fɪʃ/ _____
- pig /pi:p/ _____
- caterpillar /kætə'pi:lə/ _____
- /e/ _____
- pen /pen/ _____
- bed /bed/ _____
- elephant /elə'fənt/ _____
- /æ/ _____
- cat /kæt/ _____
- tap /tæp/ _____
- apple /'æpl/ _____

- Various other tasks available online – Teachers Pay Teachers, Speech-Language-Therapy.com, etc.

Connected Speech Samples

- Conversation - the gold standard of assessment for SSDs, including CAS, is to best gauge an individual's speech production skills in a variety of speech tasks, especially spontaneous speech in a more natural context.
 - However, as important as analysis of spontaneous conversational speech is, it is often necessary that we analyze spontaneous speech in a more *controlled context*.
 - We can elicit spontaneous speech using controlled toys. (e.g., maintain more systematic questions and conversation based upon a play farm exchange across diagnostics) and controlled conversational topics (e.g., tell me about your last birthday party, tell me about did you do this morning before coming here, tell me about your favorite movie, etc.)
 - Example below from Stability of Measures From Children's Interviews: The Effects of Time, Sample Length, and Topic (John Heilmann, Lindsay DeBrock and T. Chris Riley-Tillman)
[https://doi.org/10.1044/1058-0360\(2012/11-0035\)](https://doi.org/10.1044/1058-0360(2012/11-0035))
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Introduction to Task

"We're going to talk for a little bit today about activities you do at school and about activities you do outside of school. I will ask you a few questions and then you can tell me about it. I want to remember what you say so I'm going to tape record our conversation. Then I will listen to it later.

Before I start asking you questions, I'm going to tell you a little bit about things that I like to do. If someone asked me what I like to do on weekends, I would tell them that I like to watch movies and hang out with my friends. If someone asked me to tell more about watching movies, I would say that usually we will all go over to someone's house in the evening and pick out a movie to watch. I like to watch funny movies and so do my friends. Sometimes my friends and I talk during the movies so we have to watch parts of the movie again so we don't miss anything. I like a lot of movies so I don't have a favorite. I also like to watch new movies that I haven't seen before.

Now I'm going to ask you some questions about things you like to do. After I ask you a question, I would like you to tell me as much as you can. When I ask you to tell me more about something, I would like you to continue telling me about the things you like to do. OK?"

Elicitation Protocol

Initiate the conversation

Ask first scripted question and allow 5 seconds for a response

If no response after 5 seconds, rephrase the question

If no response after 5 seconds, rephrase the question again

Extend the conversation

Allow child to talk about the activity

After a 3 second pause, elicit additional information with open-ended statement (e.g., Tell me a little more about...")

Use a total of 5 open-ended elicitation cues

After 5 extensions, move onto next question

Questions for School Activities

What kinds of things do you like to do in class?

What do you do at recess?

Can you tell me about your favorite part of the school day?

What kinds of things do you do during center time?

What do you do in gym class?

What do you do in music class?

What are you making in art class?

What kinds of things do you not like to do in class?

Can you tell me about your class pet?

Can you tell me about lunch time?

What are you learning about? (in math, reading)

What do you do when you get to school?

Tell me about your friends at school.

What books do you like to look at/read?

Tell me about your teacher.

Tell me about your school.

Questions for Non-school Activities

What can you tell me about your family?

What do you like to do when you're not in school?

What toys do you like to play with at home?

What do you like to do on the weekend?

Do you like to play any sports or games?

What do you like to do outside?

What do you do like to do with your brothers and/or sisters?

Tell me about where you live.

What does your family do for dinner?

Tell me about your pets.

What do you do on vacations?

What do you do when you visit your grandparents?

What do you do like to do in the summer?

What do you not like to do at home?



Who do you like to play with outside of school?

Prompts

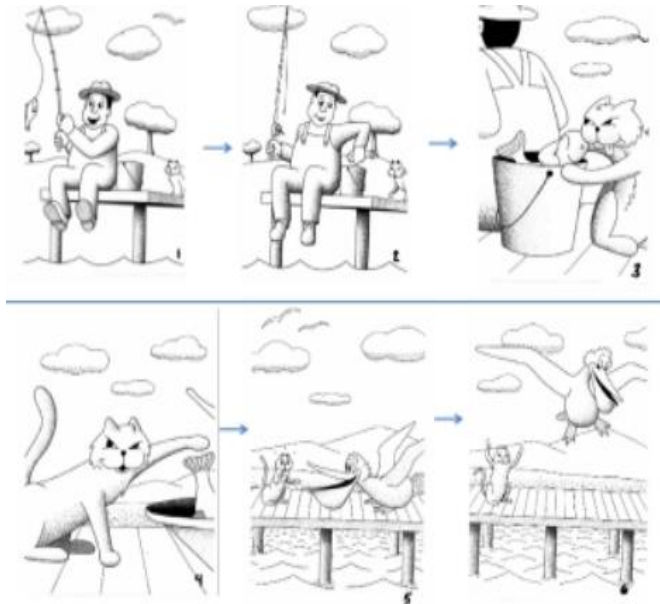
Can you tell me more about that?

That's interesting, tell me more.

- Narration-Picture Retell and Video Narration Tasks - Can also be valuable in eliciting spontaneous running speech. These tasks, especially when introduced via a digital medium, may increase compliance for children who are reticent to complete standardized testing and disinterested in spontaneous conversations.
- Video Narration Example: can show short video clips without sound (approximately 3 minutes in length, URL links below) played via a laptop. The first viewing of each clip will be in silence. The client will be instructed to tell the clinician as much as possible about the storyline of the clip and encouraged to use their hands if it helps them to tell the story. This task introduces a lengthier, yet still constrained context for a narrative production.
- https://www.youtube.com/watch?v=X_AfRk9F9w
- <https://www.youtube.com/watch?v=2ncb5o5RLuA>



- Story retell: can be from books or a controlled task like the ADOS



- Picture description tasks e.g., [Park Play Scene](#) (more child-friendly; available online) or the Cookie Theft Scene



Park Play Scene Scoring Sheet:		Participant ID: _____	Date: _____	
Articulation, Prosody, Rate of Speech		Examiner: _____		
Target		Pictured Words	+/-	Comments
Bilabial	p-Initial	Picnic, Potato		
	p-Medial	Apple, Caterpillar		
	b-Initial	Baby, Balloon, Banana, Bee, Bike, Bike, Boat, Boy, Butterfly		
Labiodental	m-Initial	Meow, Mom, Mouth		
	f-Initial	Foot, Football, Four, Five, Fighting, Fork		
	f-Medial	Butterfly		
	f-Final	Woof		
	v-Medial	Five, Seven		

- Reading passages for older children, adolescents, adults with persisting CAS (e.g. Caterpillar Passage)
 - The [Caterpillar Passage](#) was developed as a more varied and child-friendly version of the Grandfather Passage.

“The Caterpillar”

Do you like amusement parks? Well, I sure do. To am the Caterpillar, which is a gigantic rollercoaster high above the me. After waiting in line for thirty minutes, I made it to the my coins, asked for change, and jumped on the cart. Tick parking lot. Boy was I SCARED! I thought to myself, “The fast, fast, and faster along the tracks. As quickly as it st drive home. That night I dreamt of the wild ride on the Cate memorable moment ever!

Challenging Word Tasks (CWT)

[[link](#) to 2018 study looking at available options]

- [T-POT 3](#) – Toddler Polysyllabic Test 3 (Baker, 2018)
- [Debbie James'](#) 10 long clinically useful words. James, D. G. H. (2009). The relationship between the underlying representation and surface form of long words
- The [Modified Word Complexity Measure](#) (Namasivayam et al. 2021) has a list of 10 words in each of 4 stages of Motor Speech Hierarchy (PROMPT) - Stages III, IV, V and VI. The complexity of each word is scored across 10 different features. It adequately identified 48 children with speech motor delay.

○

MSH stage	Number	Probe words	Syllable/word shape	Word patterns		Syllable structure				Sound classes			Movement trajectory		Sum	
				A	B	C	D	E	F	G	H	Labial: rounding/retraction	Lingual: anterior/posterior			
				I	J											
III	1	Ba	CV	0	0	0	0	0	0	0	0	0	0	0	0	0
III	2	Eye	V	0	0	0	0	0	0	0	0	0	1	0	0	1
III	3	Map	CVC	0	0	1	0	0	0	0	0	0	0	0	0	1
III	4	Um	VC	0	0	1	0	0	0	0	0	0	0	0	0	1
III	5	Ham	CVC	0	0	1	0	0	0	0	0	0	0	0	0	1
III	6	Papa	CV-CV	0	0	0	0	0	0	0	0	0	0	0	0	0
III	7	Bob	CVC	0	0	1	0	0	0	0	0	0	0	0	0	1
III	8	Pam	CVC	0	0	1	0	0	0	0	0	0	0	0	0	1
III	9	Pup	CVC	0	0	1	0	0	0	0	0	0	0	0	0	1

- Children's Production of Polysyllabic Words (Gozzard, Baker, McCabe, 2006)
 - The words are Australian so need some modifications!
 - [This study](#) determined that there was **not a significant difference between single word and connected speech production of multi-syllable words, so a single word production task was adequate.**

3 syllables: aeroplane, ambulance, animals, banana, broccoli, bulldozer, butterfly, capsicum, computer, crocodile, cucumber, dinosaur, echidna, elephant, hamburger, hospital, kangaroo, koala, medicine, microwave, mosquito, motorbike, octopus, platypus, policeman, potato, pajamas, rectangle, sausages, spaghetti, stethoscope, tomato, triangle, umbrella, vegemite, vegetables, zucchini

4 syllables: avocado, caterpillar, cauliflower, escalator, helicopter, Pinocchio, rhinoceros, television, thermometer, vacuum, cleaner, washing machine, watermelon

5 syllables: hippopotamus

c) Phonetic Inventories, Intelligibility Ratings and Analysis Procedures

Traditional analysis procedures would guide us to compare speech production data to age and gender expectations for phonetic and phonologic productions. Indeed, these comparisons are made for children with CAS, but it is also important to assess, analyze, and amalgamate other pieces of information from the data collected in the above speech elicitation tasks.

Speech samples

- How many utterances do I need? (Rvachew, S. & Brosseau-Lapre, F. (2012))
 - your purpose will determine how many words/utterances you need to gather:
 - percent consonants correct or percent vowels correct – 70 different words
 - intelligibility rating - 100 words
 - multiple productions of the same word - 200-250 words
 - production of all sounds in English several times in Initial Word Position and Final Word Position 200-250 words or multiple samples
 - 10-15 minutes should yield 200+ words in typical speakers
 - Clinician talk should be less than 50%

PCC & PVC

- Includes all error types (distortions, subs, omissions, additions)
 - PCC = total # correct consonants / total # of consonants
 - PVC = total # correct vowels / total # of vowels

Phonetic Inventory Form

Summary of speech development for _____.

INDEPENDENT ANALYSIS (PHONETIC INVENTORY)		
Consonants	Vowels	Word Shapes
Initial:	Monophthongs:	
Medial:	Diphthongs:	
Final:	Rhotics:	
Clusters:		
RELATIONAL ANALYSIS (ERROR INVENTORY)		
Consonants	Vowels	Word Shapes
Initial:	Monophthongs:	% Correct of Target

Building Speech & Quantifying Complexity Worksheet

BUILDING SPEECH

KATHY J. JAKIELSKI, PH.D., CCC-SLP

Worksheet developed by Lisa Mitchell, SLPD, CCC-SLP

CHILD'S PHONETIC INVENTORY

Circle phonemes in child's repertoire.

Stops p b t d k g

Nasals m n ŋ

Glides w j

Fricatives f v θ ð s z ʃ ʒ h

Affricates tʃ dʒ

Liquids l ɹ

Monophthongs i ɪ e ε æ ʌ/ə u ʊ o ɔ a

Diphthongs aɪ aʊ ɔɪ

Rhotics ɜ̃/ə̃ ɪ̃ə̃ ε̃ə̃ ũə̃ ɔ̃ə̃ ãə̃ aɪ̃ə̃ aʊ̃ə̃

POTENTIAL TARGETS

Pattern 1: CV
voiced stop or nasal + monophthong or diphthong

Pattern 2: CVCV
reduplicated syllables from Pattern 1

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[Motor Speech Evaluation Analysis Form](#) by M. Fish (2016)

An incredible worksheet to help SLPs capture all the relevant information during a thorough motor speech evaluation. Covers oral mech, DDK, phonetic and word shape inventories, intelligibility, stimulability, inconsistency, & stress pattern inventory, as well as cues to perform dynamic assessment and report it. A very valuable tool.

[Phonetic vs Phonotactic Repertoire Form](#) in Velleman (2003)

An excellent worksheet with data compiled by various authors to help identify phonetic versus phonotactic repertoires

Intelligibility

- Intelligibility Indexes: number of intelligible words/total number of words (both intelligible and unintelligible)

Shriberg, Austin, Lewis, McSweeny, & Wilson, 1997- also see Flipsen, 2006

Intelligibility Levels (Fudala and Reynolds, 1994)	
Level 6	Sound errors are occasionally noticed in continuous speech
Level 5	Speech is intelligible, although noticeably in error
Level 4	Speech is intelligible with careful listening
Level 3	Speech intelligibility is difficult
Level 2	Speech is usually unintelligible
Level 1	Speech is unintelligible

Age	Intelligibility Level
19-24 months	25%-50%
2-3 years	50%-75%
4-5 years	75%-90%
5+ years	90%-100% (a few errors may persist)

- [Intelligibility](#) in Context Scale (McLeod, Harrison & McCormack, 2012)

Intelligibility in Context Scale (ICS)					
(McLeod, Harrison, & McCormack, 2012)					
Child's name: _____					
Child's date of birth: _____ Male/Female: _____					
Language(s) spoken: _____					
Current date: _____ Child's age: _____					
Person completing the ICS: _____					
Relationship to child: _____					
The following questions are about how much of your child's speech is understood by different people. Please think about your child's speech over the past month when answering each question. Circle one number for each question.					
	Always	Usually	Sometimes	Rarely	Never
1. Do you understand your child ¹ ?	5	4	3	2	1
2. Do immediate members of your family understand your child?	5	4	3	2	1
3. Do extended members of your family understand your child?	5	4	3	2	1
4. Do your child's friends understand your child?	5	4	3	2	1
5. Do other acquaintances understand your child?	5	4	3	2	1
6. Do your child's teachers understand your child?	5	4	3	2	1

4. Suprasegmental speech production

A hallmark characteristic of CAS are prosodic characteristics that are atypical in part due to the breakdown in motor planning and resulting effects on the sequential movements required for speech production. Evidence continues to emerge for "lengthened and disrupted coarticulatory transitions between sounds and syllables particularly in contexts of increased phonetic complexity" (Rusiewicz & Rivera, 2018, p. 1238) and "Inappropriate prosody, predominantly characterized by excess, equal, and misplaced stress" as important diagnostic markers for CAS that are not bound to phonemes.

Typically, suprasegmental characteristics of speech are examined in a cursory, broad manner in the diagnostic session (see independent/relational analysis form above). Indeed, there are a lack of prosody assessment tools available and even fewer empirical studies of the assessment and treatment of prosodic differences for individuals with CAS, or really any communication disorder.

The [Prosody-Voice Screening Profile](#) (PVSP) is the most widely used assessment tool in the study of CAS and other SSDs. Indeed, the PVSP is the origin of the term "excess, equal, misplaced stress". A modified version to use with spontaneous speech samples can be found [here](#)

6. Speech Perception

? It might be a marker (Shriberg et al., 2012):

<https://pubmed.ncbi.nlm.nih.gov/22489736/>

- speakers with CAS have speech processing deficits in encoding, memory AND transcoding
- CAS is better explained by this multiple domain account than as a transcoding-only deficit
- Might help explain the deficits in suprasegmentals we see in CAS

? It's not a marker of CAS but underlying language deficits co-occurring in CAS (Zuk et al., 2018):

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6195067/>

? Stay tuned for the work of Emily Wang, NYU

[The Locke Task](#)

- A good [tool](#) for assessing speech perception

7. Phonological Awareness

- Age dependent
 - Younger - informal screenings, CELF2 screener
 - without visuals, with visuals if needed (keep it dynamic)
 - rhyme ID, production
 - sound ID - initial & final
 - does these sounds/words sound the same/different
 - segmentation & blending of syllable level
 - compound word syllable deletion
 - Older
 - Phonological Awareness Test (PAT-2) 5-9;11 years
 - Test of Phonological Awareness (TOPA-2) + 5 - 9 years
 - Emerging Literacy & Language Assessment (ELLA) 4;6 - 9;11 years

IV. Assessment of Multilinguals

1. Preparing for Assessment

- Investigate features of the language(s)
- Comparison of phonetics
 - Inventory of consonants, vowels, diphthongs, etc
 - Which sounds are in common vs. similar vs. novel
 - Meaningfully contrasting sounds in each language
- Comparison of phonotactics
 - Rules for sound sequences and sound occurrence in context
- How would these features influence the presentation of CAS (what is complex, motorically, about each language)

2. Assessment Process

- Most assessment tasks must be completed bilingually
 - Speech and language sample
 - Single word elicitation/dynamic motor speech exam
 - Oral mech exam can be done in stronger language only
- If the L2/English is not yet spoken by child, no need to assess (or treat) L2 right away
- If the SLP does not speak the language(s), they still need to be assessed
 - Research language features
 - Make use of interpreter

CAS features and multilingualism

- Languages mark complexity differently, so key/common CAS features across languages may differ in type or presentation
- Example: English
 - Many vowels → vowel errors
 - Many clusters, many closed syllables (often monosyllabics)
- Be careful with CAS features lists
 - These are heavily influenced by English properties of complexity
 - Consider segmental, suprasegmental, coarticulatory demands of the language to infer which aspects CAS might impact bilingually

Assessment Tasks

- Diadochokinesis or MPT
 - Adapt using appropriate consonants for the language and a neutral vowel
- Syllable repetition task
 - To an extent, this is language neutral
 - Be careful with using it in speakers of tonal languages

- DEMSS (or similar dynamic motor speech assessment task)
 - Use increasingly complex syllable shapes, relatively early acquired consonants, range of vowels

Analyzing results of bilingual CAS assessment

- Phonetic inventory
 - L1 and L2
 - Shared sounds, similar sounds, unique sounds
- Syllable shape inventory
- Suprasegmental skills
 - Which skill(s) from one language can support skills in the other?
 - Which skill(s) needed in one language might require specific support/practice?

CAS Checklist: Both Languages

- Contrast suprasegmentals. Is there volitional control of
 - Intonation
 - Stress variation
 - Loudness
 - Rate
 - Pitch
- Compare words, and sounds in syllables and words that increase in complexity
 - Phonetically
 - Phonotactically
 - Word length
- Compare repetitions of multisyllabic words.
 - Are the errors and motor plans similar?

Gildersleeve-Neumann, Michel, Beltran, and Heath, 2023

Resources from Portland State University

- FCPQ – Functional Communication Parent Questionnaire
- Handout on CAS in multilingual individuals
- MultiCSD – features of various world languages

Resources from Charles Sturt University

- Intelligibility in Context Scale (multiple languages)
- World language features
- Assessment tools for speech production in multiple languages