

Suspected Childhood Apraxia of Speech: Part I



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Disclosure

Financial Disclosure: Cari Ebert owns Summit Speech Therapy, LLC (dba Cari Ebert Seminars) and receives a salary. She receives royalties from book sales and cariebertseminars.com product sales. Ms. Ebert receives compensation for presenting this seminar.

Nonfinancial Disclosure: Cari Ebert has a son with autism and apraxia and shares personal experiences in her seminars and webinars.

Our New Book...



Overview of Apraxia

Helping Professionals and Families Make Sense of an Abstract Concept

Root Word: Praxis

- Praxis: Greek word which means *movement*.
- Components of praxis include: imitation, initiation, grading of force, sequencing, timing, and motor planning.

General Definition of Apraxia

“Apraxia is a neurological disorder characterized by the inability to perform learned movements on command, even though the command is understood and there is a willingness to perform the movement. Both the desire and the capacity to move are present, but the person cannot execute the act.”

Web MD

Types of Apraxia

- **Limb Apraxia:** Also referred to as *dyspraxia*. Refers to the inability to make precise movements with the fingers, arms or legs on command.
- **Non-Verbal Oral Apraxia:** Refers to the inability to coordinate and carry out oral/facial movements on command.
- **Verbal Apraxia:** Refers to the inability to coordinate & sequence sounds necessary for speech on command.

- A child may present with characteristics of just one type of apraxia, a combination of two types of apraxia, or a child may present with characteristics of all three types of apraxia (global apraxia).
- Apraxia may be the primary diagnosis or it may be a secondary diagnosis.
- When apraxia is a secondary diagnosis it may be more difficult for the SLP to detect.

ASHA's Technical Report (2007)

- ASHA's position is that *Childhood Apraxia of Speech* (CAS) is the preferred term for verbal apraxia in children.
- "Childhood apraxia of speech (CAS) is a neurological childhood speech sound disorder in which the precision and consistency of movements underlying speech are impaired in the absence of neuromuscular deficits (e.g. abnormal reflexes, abnormal tone)...the core impairment in planning results in errors in speech sound production and prosody."

Etiologies: CAS can occur in 3 clinical contexts

1. Neurologic Impairment (e.g. intrauterine or early childhood stroke, infection, trauma, brain cancer) – usually there are positive findings on MRI
2. Complex Neurobehavioral Disorders of known or unknown origin; genetic, metabolic, mitochondrial (e.g. autism, epilepsy, genetic syndromes)
3. Idiopathic Neurogenic Speech Sound Disorder (a disorder of unknown origin) – no neurologic abnormalities or neurobehavioral conditions

Explanation for Families

Avoid being too clinical...don't frighten them with a long, complex definition. Instead, explain what you suspect is going on.

"Your child seems to have some motor planning difficulties. He seems to know what he wants to say, but he can't get the message from his brain to his mouth. His brain says speak but his mouth isn't responding."

Resources for Professionals & Families

- The SLP's Guide to Treating Childhood Apraxia of Speech by Dave Hammer & Cari Ebert
- Speaking of Apraxia: A Parents' Guide to Childhood Apraxia of Speech by Leslie Lindsay
- Apraxia Kids (used to be called CASANA)

Apraxia Kids (CASANA)

www.apraxia-kids.org

- Located in Pittsburgh, PA
- Apraxia Kids has a 3 day conference on CAS every year – this year it will be in Charlotte, NC from July 12-14
- Apraxia Kids offers 90 minute webinars (follow them on Facebook for more info) – May 15th I am presenting "Using Sign Language to Support Emergent Speech in Children with CAS"
- Boot Camp for SLPs (intensive 40 hour training)

Assessment

Practical Strategies for Assessing
Minimally Verbal Young Children

Terminology

- **Preverbal:** Term used to describe young children who are not yet talking.
- **Minimally Verbal:** Term used to describe young children with limited verbal output.
- **Nonverbal:** Term used to describe older children who are not verbal despite significant amounts of speech therapy. It is not likely that these children will become verbal communicators. (Consider using the term “essentially non-verbal.”)

Formal vs. Informal Assessment

- Formal vs. Informal Assessment Tools – quantitative vs. qualitative
- Formal/standardized language tests designed for the birth – 3 population do not assess the integrity of the motor planning system
- In order to administer a standardized apraxia test, the child must 1) have verbal imitation skills and 2) be a willing participant in the testing process

Informal Assessment

- It is critical for SLPs to assess the pre-linguistic stages as well as the early stages of speech and language development
- SLPs should be determining if the child is following a typical or atypical pattern of development (delay vs. disorder)
- Let’s review what typical looks like...

Typical Development of Pre-Linguistic Sounds

1. Phonation Stage: Birth – 2 months of age
natural/vegetative sounds (cry, cough, grunt, hiccup, sneeze)
2. Cooing & Gooing Stage: 2 – 3 months of age
primitive movements of the lips and tongue; beginning of vowel-like & consonant-like sounds
3. Expansion Stage: 4 – 6 months of age
beginning to produce fully resonant vowel sounds; squealing, yelling, growling, raspberries, laughter; marginal babbling (not word-like)

4. Canonical Babbling Stage: 6 – 10 months of age
produces sounds recognized as true syllables with mixed consonant and vowel sounds including reduplicated canonical babbling (“babababa” or “mamamama”) and non-reduplicated canonical babbling (“bamamaba” or “deedabeeda”)
5. Jargon Stage: 10 - 15 months of age
complex babbling plus prosody; may sound like gibberish; babble takes on the tones and inflections of adult speech
6. First words: begin to emerge by 15 months of age

According to ASHA’s Technical Report...

The three key diagnostic features of CAS include:

1. Inconsistent errors on consonants and vowels in repeated productions of syllables or words.
2. Lengthened and disrupted coarticulatory transitions between sounds and syllables.
3. Inappropriate prosody, especially in the realization of lexical or phrasal stress.

Informal Assessment of Suspected CAS

- Many young children we evaluate and treat aren't verbal enough to detect those 3 key diagnostic features – so we have to identify key characteristics of very young, minimally verbal children with suspected CAS
- One of these symptoms alone does not mean the child has CAS
- Clinically, we are looking for that large cluster of symptoms that suggests the child presents with motor planning difficulties/atypical development

Characteristics of Minimally Verbal Children with Suspected CAS

- History of being an unusually quiet baby – limited cooing, babbling, and jargon – often described as “such a good baby” or “such a content baby”
- May not have gone through typical oral exploration phase as a baby
- Limited vocal play as a baby
- Late to say first word
- Limited repertoire of consonant & vowel sounds (limited sound inventory)

- Receptive language skills are often greater than expressive language skills/large gap
- Overuse of neutral vowel sounds “uh, eh, ah”
- Limited or absent verbal imitation skills
- Limited syllable & word shapes (speech lacks syllableness)
- History of saying a word or phrase clearly one time and never repeating it (pop out words/pop out phrases)
- Voicing errors may occur (voiced for voiceless)
- Use of one syllable for all words (“go-to” sound or default word)

- Highly inconsistent speech sound errors
- Atypical speech sound errors
- Significant difficulty with coarticulatory transitions (sequencing sounds and syllables)
- Ability to produce a speech sound in one word, but not in others
- Doesn't add new words to expressive vocabulary on a regular basis—replaces words
- Inappropriate prosody/melody of speech (prosody consists of rate, rhythm, loudness, pitch, intonation, stress); choppy sounding speech due to ineffective coarticulatory transitions

- Inability to maintain correct production of a sound or syllable in context of the actual word – movement between sounds causes substitution or deletion
 - May have acquired some later mastered sounds while missing earlier mastered sounds = atypical acquisition of speech sounds
- **Typical acquisition of speech sounds****
- 97 % of vowels are mastered by age 3 (the rhotic vowels are the ones that are mastered later)
 - Pollock & Berni, 2003
 - order of consonant acquisition:
 - p, m, h, n, w, b, k, g, d, t, ng, f, y, r, l, s, ch,
 - sh, z, j, v, th, zh

- Backing and initial consonant deletion may be prevalent (these processes are rare in children with a phonological impairment; these atypical processes are more difficult to correct in therapy—indicative of a more severe and persistent speech sound disorder)
- May reverse sounds or syllables (“kitchen” produced as “chicken” or “sock” produced as “kos”)
- Difficulty producing multisyllabic words such as *butterfly* or *watermelon*
- Vowel errors
- Limited success talking with new people or in new situations/increased pressure = decreased success

- May avert eye gaze & miss key information from speakers on how they move their articulators
- Dislikes watching self in a mirror
- Vowel addition to end of words (“up-uh”)
- Speech appears effortful (posturing/groping)
- Demonstrates a strong desire to communicate – evidenced by elaborate gesturing skills
- Plays silently—even during high energy activities
- Lack of progress with speech/response to intervention is slow (PAINFULLY SLOW!)

Research by Overby & Caspari (2013, 2015)

Examined speech of 0-24 month old babies later diagnosed with CAS

Findings of early speech characteristics

- Limited canonical babbling
- Lack of diversity in place, manner & voicing
- Difficulty with voiceless productions
- Difficulty with fricatives
- Reduced syllable shapes (mostly V & CV)

Suspected Childhood Apraxia of Speech: Part 2



Formal Assessment Tools

Once the child is more verbal, a standardized test can be administered to accurately diagnose CAS

- Kaufman Speech Praxis Test for Children (2-5 years)
- Verbal Motor Production Assessment for Children (3-12 years)
- The Apraxia Profile (3-13 years)
- Moving Across Syllables/Test of Syllable Sequencing Skills (Pre-K to 5th grade)
- LAT (Linguistics Articulation Test) has a built-in CAS screener (3-21 yrs)
- The Dynamic Evaluation of Motor Speech Skills (DEMSS) by Edyth Strand (not released yet)

Later Academic Difficulties & CAS

- Academic issues related to spelling, reading & writing may become evident as child with CAS gets older
- “A child who demonstrates communication delays as a toddler and during preschool is at greater risk for later language-based learning disabilities.” Agin 2004
- “The speech processing system is not only the basis for speech and language development but also the foundation for literacy development; ‘written language’ being an extension of ‘spoken language’.”
Stackhouse www.apraxia-kids.org

- May continue to produce “telegraphic” speech & omit little grammatical words such as *the, and, a*
- Expressive language may be impaired - grammatical errors, problems with word order (Yoda speech), pronoun errors
- May have poor phonemic awareness skills (rhyming, sound segmentation, sound blending, beginning & ending sounds) **precursors to reading
- “Between 40% and 75% of children who have trouble with language development present with reading difficulties later in life.” (Aram, Bashir)

Co-Existing Conditions

A child with suspected Childhood Apraxia of Speech may have one or more co-existing conditions such as:

- Oral Apraxia
- Limb Apraxia
- Oral-motor weakness/Dysarthria
- General Hypotonia
- Sensory Processing Disorder
- Language Impairment

Informal Assessment

1. *List child's overall use of intentional vocalizations and verbalizations.*

Vocalizing refers to the act of turning the voice on and does not imply the use of true words.

Verbalizing refers to the act of talking and implies the use of true, meaningful words or word approximations.

Differentiate between the two – many children are vocal but not yet verbal!

2. *Assess child's desire to communicate and use of gestures to express self*

Does the child use an elaborate gesturing system to convey information to others?

Does the child have a strong desire to communicate and interact with others? (This helps us with differential diagnosis/helps rule out autism)

3. *Assess child's awareness of his articulators/amount of vocal play*

3. Determine which consonants are in the child's repertoire

Are sounds produced consistently or inconsistently?

4. Assess child's ability to produce a wide variety of vowel sounds

Vowels serve as the foundation for the words we speak & determine how intelligible a child's speech is

The human ear is able to interpret a child's speech when the consonants are produced incorrectly, but it is much more challenging to interpret a child's speech when there are vowel errors

Interpret the following utterances...
Which ones are most intelligible? Why?

Child 1: "I wa too-tee"

Child 2: "I wa kuh-kuh"

Child 1: "I wa mo"

Child 2: "I wa ma"

Crisp, clear vowel sounds lead to increased speech intelligibility

Explain why most articulation tests only assess consonant sounds

Artic Tx: We fix consonants (focus on articulation)

Motor Planning Tx: We focus on coarticulation of consonants and vowels

There are more than a dozen vowel sounds in the English language—some are simple and some are complex

Pure Vowels

- "ee" as in *me*
- "i" as in *sit*
- "eh" as in *yes*
- "a" as in *bag*
- "aw" as in *ball*
- "ah" as in *watch*
- "u" as in *put*
- "oo" as in *boo*
- "uh" as in *up*
- "o" as in *no*
- "ay" as in *day*

Diphthongs

- "eye" as in *bye*
- "ow" as in *now*
- "oy" as in *boy*

Informal Assessment

- 5. *Assess child's ability to coarticulate a variety of consonant and vowel combinations. Looking for vowel differentiation.*

We want "bay - bee - buy - bo - boo" not just "buh."

- 6. *Assess child's ability to produce animal sounds, vehicle sounds, exclamations and other sound effects during play time, making note of prosodic features.*

- 7. *Assess child's use of syllable shapes*

Young children with suspected CAS may reduce words to one syllable to make the motor plan as simple as possible

V and CV are the most common syllable shapes used by young children with suspected CAS

Child's speech often lacks syllableness

Informal Assessment

3 levels of syllableness to assess early on:

1. Reduplication
baba dada boo boo mama
2. 2 syllable words with same consonant, changing vowels:
mommy puppy daddy baby
3. 2 syllable words with changing consonant & changing vowels:
monkey panda doggie hippo

8. *List spontaneous use of words/word approximations (functional vocabulary)*
9. *Assess child's ability to say words on command (requires motor planning!)*
10. *Make note if child watches speaker's mouth for visual cues*
11. *Determine if speech production errors are consistent or inconsistent across different trials*
12. *Assess gross and fine motor imitation skills*
13. *Determine if any co-existing conditions are present (oral or limb apraxia, general hypotonia, dysarthria, sensory processing disorder, language impairment)*

15. *Make note if talking appears effortful for the child (as evidenced by groping, silent posturing, facial grimacing, moments of silence)*
16. *Compare receptive and expressive language skills, documenting if there is a significant gap*
17. *Describe how the communication impairment is affecting the family's interactions with their child*
18. *Comment on how the communication impairment affects the child (has tantrums, withdraws from social situations, is passive, gets frustrated, etc.)*

Diagnosis

Who Diagnoses CAS?

- CAS is a speech sound disorder, therefore, it is diagnosed by a speech-language pathologist
- The SLP should document the atypical speech development (motoric) and explain how this differs from a developmental language delay (linguistic)
- There may be supporting documentation by a pediatrician or pediatric neurologist to support the neurologic or neurobehavioral component of CAS (remember the etiologies of CAS)

Primary reasons to refer to a neurologist:

- Presence of “soft” neurological signs such as hypotonia, gross and fine motor coordination problems, sensory issues
- Presence of tremors, balance issues, difficulty crossing midline
- Potential seizure activity

Primary reason to refer to a developmental pediatrician:

- To rule out complex neurobehavioral disorders as potential etiologies for the speech disorder

If the SLP refers to a neurologist or a developmental pediatrician, it is not for an apraxia diagnosis – it is to identify the **etiology**

The SLP makes the diagnosis of CAS

The Scope of Practice document by ASHA states, “It is recognized that levels of experience, skill, and proficiency...vary among individual providers.”

The ASHA Code of Ethics specifies that SLPs may only practice in areas where they are competent based on their education, training, and experience. Therefore, not all SLPs may be equipped to differentially diagnose CAS. To expand their level of competence in diagnosing and treating CAS, it may be necessary for SLPs to pursue continuing education and training to expand their personal scope of practice.

ICD-10 Codes

The ICD-10 went into effect on 10/1/15

- Childhood Apraxia of Speech (CAS): R48.2
- Phonological and Articulation Disorders: F80.0
- Expressive Language Disorder: F80.1
- Mixed Receptive-Expressive Language Disorder: F80.2
- Dysarthria (in children/non post CVA): R47.1
- Dyspraxia (limb apraxia, clumsy child syndrome, developmental coordination disorder): F82

Should We Diagnose CAS In Very Young, Minimally Verbal Children?

Reasons why it can be difficult to give a firm diagnosis of CAS prior to age 3

1. There is still a lot of brain development occurring prior to age 3
2. SLPs cannot formally diagnose CAS until the child is verbal (in early intervention, most of our kids are preverbal or minimally verbal)

Making a Diagnosis

“The complexity of diagnosis in young children under age 3 is that the child must be able to participate sufficiently in the assessment. Unless the child can attempt to imitate utterances that vary in length and phonetic complexity it is very difficult to make a definitive diagnosis.”

Dr. Strand

Working Diagnosis

When a child is minimally verbal the SLP should use a working diagnosis of ***suspected childhood apraxia of speech***

sCAS

CAS is a Dynamic Speech Disorder

“We need to remember that classifications or labels may change over time with neural maturation and appropriate treatment. For example, children with CAS often progress to the point at which speech characteristics are more appropriately labeled phonologic impairment or residual articulation errors.”

Strand & McCauley

Differential Diagnosis

Differential Diagnosis

Differential diagnosis is the process of “ruling out” some disorders to ensure proper treatment

Ongoing diagnostic therapy is a crucial component of the therapeutic process

So, as professionals we must be comfortable with and skilled at diagnostic therapy in order to make a differential diagnosis by identifying specific characteristics to validate our diagnosis of suspected CAS in young children

Suspected CAS or Autism?

Some young children with childhood apraxia of speech may be misdiagnosed as having autism spectrum disorder because there are 4 primary overlapping symptoms that commonly occur in both disorders including:

1. child is minimally verbal
2. has social deficits
3. has sensory issues
4. has poor eye contact

Differential Diagnosis

Suspected CAS vs. Autism Spectrum Disorder

Suspected CAS

- Receptive language stronger than expressive language
- Communicates wants and needs effectively – just not verbally
- Strong desire to interact and communicate with others
- Exhibits typical play time interests (limb apraxia may interfere with execution of play skills)

Autism Spectrum Disorder

- Impaired receptive language skills
- Does not communicate effectively either verbally or non-verbally
- Limited desire to interact and communicate with other people
- Exhibits atypical, absent or aberrant play skills

Differential Diagnosis

Suspected CAS vs. Autism Spectrum Disorder

Suspected CAS

- Strong social referencing/ averts eye gaze when pressured to talk
- Limited speech production attempts because child anticipates failure based on past talking experiences and is therefore NOT a communication risk-taker
- May have sensory issues

Autism Spectrum Disorder

- Lacks social referencing/ poor overall eye contact
- Limited speech production because child lacks understanding that words have power/inappropriate speech production (use of echolalia & scripted phrases)
- Likely has sensory issues

Differential Diagnosis

Suspected CAS vs. Autism Spectrum Disorder

Regarding sensory processing disorder... it is important to remember that while most kids with autism have sensory processing disorder, not all kids with sensory processing disorder have autism

Kids with poor body awareness due to sensory issues often have motor planning difficulties as well (if you can't feel the food in your mouth, you stuff too much in and then you can't figure out how to swallow it...better to avoid the mushy food that confuses you)

Differential Diagnosis

Suspected CAS vs. Dysarthria

- "Dysarthria manifests as disrupted or distorted oral communication due to paralysis, weakness, abnormal tone, or incoordination of the muscles used in speech." Strand & McCauley
- Dysarthria results from disruption of muscular control due to damage of the CNS and/or PNS
- All motor processes of speech can be disrupted including: respiration, phonation, resonance, articulation and prosody

Differential Diagnosis

Suspected CAS vs. Dysarthria

Suspected CAS

- Difficulty planning the movements necessary to produce and combine speech sounds – often a lack of consonants and vowels
- Difficulty motor planning articulatory movements
- Not associated with muscular dysfunction (e.g. weakness, abnormal tone)

Dysarthria

- Difficulty in the actual production of speech sounds – distortion of consonants and vowels
- Difficulty executing the previously planned articulatory movements
- Characterized by muscular dysfunction (e.g. weakness, paralysis, abnormal tone)

Differential Diagnosis

Suspected CAS vs. Dysarthria

Suspected CAS

- No difficulty with involuntary motor control for eating (unless there is also oral apraxia)
- Inconsistent speech errors
- Receptive language better than expressive language

Dysarthria

- Difficulty with involuntary motor control for eating due to muscle weakness and incoordination
- Articulation is imprecise, distorted, slurred - but errors are fairly consistent
- No significant difference between receptive & expressive language skills

Differential Diagnosis

Suspected CAS vs. Dysarthria

Suspected CAS

- Prosody is disrupted – rate, rhythm, inflection patterns & stress impaired – better control of pitch and loudness
- Voice quality is intact

Dysarthria

- Monotone voice is common - difficulty controlling pitch and loudness levels
- Voice quality may be impaired depending on type of dysarthria (spastic, flaccid, etc.) – voice may be hoarse, harsh, hypernasal, breathy

Differential Diagnosis

Suspected CAS vs. Dysarthria

Kids with CAS don't have strength issues, they have movement issues. "We don't need *strong* articulators, we need *agile* articulators." Dr. Lof 2007

Speech production requires rapid & accurate alternating movements of the articulators (i.e. speed & agility)

Diadochokinetic Rate (measures how accurately person can produce a series of rapid alternating sounds)

Differential Diagnosis

Suspected CAS vs. Dysarthria

- Both CAS and Dysarthria will result in poor speech intelligibility - determining the etiology of the unintelligible speech will guide our treatment methods
- CAS and Dysarthria can co-exist so some kids on our caseloads won't fit into a nice categorical box
- Weakness problems (Dysarthria) vs. Praxis problems (CAS)

Differential Diagnosis

Suspected CAS vs. Phonological Disorder

- A phonological disorder involves patterns of sound errors
- "Children with a phonological disorder consistently make the same sound substitutions and, when given auditory and visual cues, are able to imitate correct sounds or words." Agin 2004
- Common phonological processes young children use: final consonant deletion, cluster reduction, gliding, fronting, stopping, deaffrication, assimilation
- Atypical phonological processes include backing and initial consonant deletion

Differential Diagnosis

Suspected CAS vs. Phonological Disorder

Suspected CAS

- Motorically based
- Limited number of vowels & diphthongs produced
- Inconsistent /unpredictable speech errors
- Effortful speech
- Impaired prosody
- "On demand" speech most difficult / "automatic" speech is easiest

Phonological Disorder

- Linguistically based
- Vowels are intact
- Consistent patterns of errors that can be grouped into categories
- Speech is not effortful
- Prosody is intact
- No difference in how easily speech is produced based on the situation

Differential Diagnosis

Suspected CAS vs. Expressive Language Delay

- While children develop skills at different ages, the most important factor is that the milestones are achieved in a typical or sequential manner.
- Milestones may be achieved late, but if they are acquired in the correct developmental sequence, the child is likely exhibiting a delay. Delay = child follows a typical path of development, it just takes longer.
- If the developmental sequence is atypical then the child is more likely exhibiting a disorder (scattered skills, splinter skills).

Differential Diagnosis

Suspected CAS vs. Expressive Language Delay

Suspected CAS

- Makes slow, inconsistent progress
- Noticeable difficulty with the production of vowel sounds
- Limited or atypical babbling history

Expressive Language Delay

- Makes more rapid, consistent progress (If child presents with receptive language delay as well, progress with expressive language will be slower)
- Typically no difficulty with vowel sounds
- More typical babbling history

Differential Diagnosis

Suspected CAS vs. Expressive Language Delay

Suspected CAS

- Limited phonemic repertoire
- Presents with a disruption in the normal sequence of development – “atypical development”
- May have disordered prosody

Expressive Language Delay

- Wider variety of speech sounds in repertoire
- Mild lag in development - speaks like a child who is chronologically younger
- Typically no issues with prosody

Differential Diagnosis

When assessing very young minimally verbal children, SLPs should be differentially diagnosing between the following:

- speech/language delay
- suspected childhood apraxia of speech (motor planning)
- dysarthria (motor execution)
- autism (communicative intent)

Once the child becomes more verbal we will also have to differentially diagnose between CAS and phonological disorder

Case Studies

Case Study 1

Gabrielle – age 22 months

- Birth history unremarkable
- Started receiving OT & PT before age 6 months
- Started receiving speech-language therapy at 13 months
- Does not clap or bring hands to midline
- No consistent babbling
- Is silent most of the time
- Whines with a manipulative purpose
- Does not use gestures to communicate

- Started walking at age 16 months
- Excessive mouthing of toys starting at age 18 months
- Limited purposeful play with toys
- Good joint attention
- Difficulty with motor imitation skills
- No success with sign language
- Has difficulty with activities that require two hands
- Produces mainly neutral vowel sounds
- Limited facial expressions
- Follows 1 step commands
- No distal point established until age 20 months

- Strong desire to interact with others
- Skill acquisition rate is slow
- Did not start crawling until after her 2nd birthday
- Has an awkward gait
- Has responded favorably to a simple picture communication system

How do we categorize Gabrielle?

Dysarthria

Suspected Childhood Apraxia of Speech

Global Apraxia

Expressive Language Delay

Autism Spectrum Disorder

Global Developmental Delay

Case Study 2

Wyatt

- El evaluation at age 25 months
- Birth history unremarkable
- No hearing concerns
- Developmental milestones, with the exception of speech were met on schedule
- Said first true word at age 15 months
- Limited phonemic repertoire
- Starting to become highly frustrated
- Says 7 different single words including “hi, bye, up, ball, me, mommy, daddy”

- Not adding new words to expressive vocabulary
- No verbal imitation skills
- Per parents, he understands everything
- Produces an atypical nasal airflow sound as a replacement for words he is unable to say
- Pairs this nasal airflow sound with gestures to communicate wants and needs
- Did not qualify for early intervention program b/c he did not have a 50% delay overall
- Did one month of private speech therapy with focus on family education and training

- Able to elicit many single words by simplifying words, pausing and giving articulatory placement prompts
- Showed family how to be a good speech model (primarily got parents to stop saying “SAY...”)
- Both parents were present at every therapy session
- Excellent attention and time on task
- Appropriate play skills
- Within one month he was using new words both in imitation and spontaneously and starting to combine 2 words together
- Once the pressure to “say” words was removed, the atypical nasal airflow sound went away

How do we categorize Wyatt?

- Dysarthria
- Suspected Childhood Apraxia of Speech
- Global Apraxia
- Expressive Language Delay
- Autism Spectrum Disorder
- Global Developmental Delay

Case Study 3

Jill

- EI evaluation completed at age 18 months
- Birth history unremarkable
- Developmental milestones with the exception of speech were met on time
- Limited cooing and babbling as a baby
- Communicates wants and needs by pointing, grunting and pulling on adult
- Says only “mama” and “dada” but not regularly
- Produces mostly neutral vowel sounds
- No verbal imitation skills

- Silent child – rarely even vocalizes
- Did not qualify for EI services based on 50% delay, but got her services based on professional opinion
- Therapy started with helping Jill find her voice
- Lots of groping & silent posturing when attempting to talk
- Able to follow 2 step commands
- Significant difficulty learning to produce lip rounding vowels “o” and “oo”
- Difficulty co-articulating consonants and vowels
- Very slow and inconsistent progress
- Excellent eye contact and joint attention

How do we categorize Jill?

- Dysarthria
- Suspected Childhood Apraxia of Speech
- Global Apraxia
- Expressive Language Delay
- Autism Spectrum Disorder
- Global Developmental Delay

Case Study 4

Drake

- EI evaluation completed at age 23 months
- Birth history unremarkable
- HX of frequent ear infections with 2 sets of PE tubes placed
- Passed hearing eval after tubes placed
- Motor milestones: sat up at 8 months; crawled at 11 months; walked at 16 months
- Just recently started babbling
- Says “no, dada & mama/nana”

- Father was reportedly a “late talker”
- Qualified with a 50% delay in overall communication
- Started with speech/language therapy & OT
- Had some challenging behaviors which were interfering with his development (i.e. throwing, hitting, biting and avoiding any interaction in which demands were placed upon him)
- Thus, behavior therapy was brought on board
- Lack of imitation skills
- Resists hand over hand assistance
- Does not consistently follow 1 step commands
- Does not point to pictures on command

- Has said words, but loses them rapidly
- Uses others as a tool to get needs met
- Slow, inconsistent progress
- Limited joint attention, short time on task
- After behavior therapy started, compliance began to improve
- Vowel errors
- Effortful speech
- Began to elicit speech sounds in isolation which led to single word approximations (i.e. "o-puh" for "open" and "pu-duh" for "panda")

How do we categorize Drake?

Dysarthria
 Suspected Childhood Apraxia of Speech
 Global Apraxia
 Expressive Language Delay
 Autism Spectrum Disorder
 Global Developmental Delay

Case Study 5
Noah

- Age 2 years, 11 months
- Birth history unremarkable/no hearing concerns
- Wet chin/drools
- Significant difficulty with lingual lateralization
- Generalized oral weakness
- Poor overall speech intelligibility; Talks in 3 - 4 word sentences but words are often mumbled
- Receptive and expressive language skills within average range per PLS-4

How do we categorize Noah?

- Dysarthria
- Suspected Childhood Apraxia of Speech
- Global Apraxia
- Expressive Language Delay
- Autism Spectrum Disorder
- Global Developmental Delay

Understanding Kids on Your Caseload

- Speech characteristics:

- Co-existing conditions:

- Probable diagnosis:

Suspected Childhood Apraxia of Speech: Part 3



Therapy

The Journey to Becoming a Verbal Communicator

Getting Caregivers Involved

- Lots of practice is needed in order for motor learning to occur, so we must embed strategies into the child's daily routines
- Practice cannot only occur during the home visit (therapy session)
- Motor performance (changes obtained in the therapy session) vs. motor learning (generalization of skills outside of therapy)

- Caregivers will need guidance/coaching on how to embed the principles of motor learning into their everyday lives



Therapy and Intervention

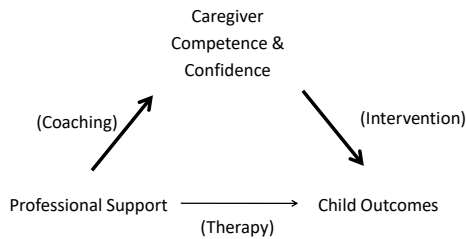
- Understanding and being able to explain the difference between therapy and intervention to families is crucial when working with the birth to three population.

Therapy is the time spent in direct contact with the child each week. Provided by the therapist.

Intervention is what occurs the rest of the time between therapy sessions. Provided by family.

Support-Based Services Model

Triadic, not dyadic



by R.A. McWilliam – Vanderbilt Center for Child Development

Therapy and Intervention

- Specific, relevant suggestions should be made that allow the family to incorporate strategies into their daily activities (during bath time, meal time, riding in the car, when reading books, when watching t.v., etc).
- So...let's talk about those therapeutic strategies and activities that will help families help their child learn HOW to talk!

Fun and Effective Therapy Without Drill Work

Neural Pathways

Purpose of therapy is to build new neural pathways or fix existing ones & teach these children HOW to talk



Make Learning to Talk Fun & Functional

- Young children learn through play-based movement.
- Young children learn through multisensory experiences– they learn by doing, by experiencing.
- Young children learn best in the context of naturally occurring routines and activities with their families and caregivers.
- The challenge for the EI provider is to figure out how to embed motor-planning strategies into the family's day.

No More Drill Work!

- Gather common objects of target words and use in lieu of flashcards when working with young children.
- Collect small toys, dollhouse items, play food, puzzle pieces, empty food boxes, stuffed animals, Mr. Potato Head pieces, photos, etc.
- Turn drill work into play time using these common objects – young children love to manipulate objects – Put in, dump out and do it again is the premise of toddler play.

“Junk” Drawers



Sound Bags

Create *Sound Bags* of common objects for different speech targets in lieu of flashcards.

Reduplication Bag:

Target Sounds: “moo moo, hoo hoo, tweet tweet, neigh neigh, ho ho, waa waa, boo boo, choo choo, woo woo, beep beep, pee pee, wa wa, ba ba, mama, dada, papa, nana”

Objects: cow, owl, bird, horse, Santa, baby, band-aid, train, fire truck, car, potty, water, bottle, mom, dad, grandpa, grandma, banana



Reduplication Sound Bag

Ba-ba, Beep-beep, Neigh-neigh, Choo-choo, Papa, Moo moo, Boo-boo, Ho-ho



CVCV Sound Bag

Pony – Potty – Minnie – Monkey –
Woody – Dino – Table – Hippo



“oo” Sound Bag

shoe – boo – Blue – moo – Pooh – glue –
choo choo – two- boo boo – blue – roo

Look for Fun Containers/Receptacles

Identify some unique ways to present the objects from your sound bags

- Ned the fabric head
- Mailbox
- Bucket
- Pin toy
- Toy grocery cart

Therapy Strategies & Activities

For Use with Minimally Verbal
Young Children and Their
Families

General Strategies when CAS is Suspected

1. Increase functional communication through gestures, signs and/or pictures.
 - Sign language can provide beneficial visual cues to facilitate verbal output
 - Sign language can be a useful tool to establish functional communication skills
 - If the child has limb apraxia/limited motor imitation skills then sign language may be difficult to learn and use in a functional manner

Sign Language Strategies

- Goal is to provide the child with a consistent way to communicate until he is ABLE to talk
- Always say the word as you use the sign
- Follow the child's lead and be flexible – if the child develops his own sign go with it – there is no right or wrong way to sign b/c the child is not deaf– sign is being used to bridge the gap from non-verbal to verbal communication
- Use gentle hand over hand assistance to help the child be successful with learning new signs

- Begin to fade signs once the child starts pairing with verbal approximations of the desired words
- Fading is the most important step of sign language: Initially the child will use the sign by itself, next he will pair a sound with the sign, then he will pair the sign with the actual word and use them as equal partners, then he will drop the sign and use the word only (this is how we transition children from being non-verbal to verbal communicators)
- Teach functional, concrete signs and **avoid vague signs** (in other words, one sign = one item)

Avoid Vague Signs

“More” and “Please” are too vague to be used as first request words, yet they are the most commonly taught signs



Signing “more”

- One important context to teach the sign “more” is by giving a choice when the child’s behavior indicates he may be finished with an activity.

“Are you all done or do you want more?”

Picture Communication

- Sign language always has to be interpreted by somebody...so a picture communication system might be an easier way to allow the child a functional way to communicate basic wants and needs
- Deciding whether to use signs or pictures often depends on how many different caregivers the child is with AND the child’s motor imitation skills
- Use real photos when working with very young children

IFSP Outcome Example

Carlos will use signs, pictures and/or words to communicate what he wants to play during center time at daycare, 3 days per week, for 4 consecutive weeks.

**General Strategies when CAS is Suspected
(cont'd)**

2. Strategies should focus on improving the reliability and flexibility of the child's motor-speech system (traditional play therapy focusing on language stimulation strategies will not be effective in bringing about speech).
3. Provide opportunities for the child to talk, but without any pressure to do so. Adults should avoid instructing the child to say words (*say dog, say ball*) and limit the number of test-like questions.

4. Use multisensory cues to help children build new motor plans.
 - Visual cues (oral posturing, pair sign or gesture with talking, graphic cues, flashcards, mirror)
 - Verbal cues (you say...I say, say only the first sound, say target word in unison, verbal shaping, whisper or mouth the target word, prosodic cues)
 - Tactile cues (PROMPT, DTTC, TCM)
 - Body awareness and movement cues (Turtle Vowels, pair talking with play-based movement)
 - Semantic cues (sound metaphors, phrase completion, phonetic placement cues)

5. Become the child's voice and say the words you wish he would say. A child with sCAS is likely still in the "input" phase. He may not have any verbal output yet, so we become his voice until those first words emerge.
6. Expand the child's repertoire of sounds and use of different syllable shapes.
7. Address coarticulation of sounds and syllables.
8. Address prosody early on.
9. Teach the child to simplify words and accept these word approximations.

Use Speech Simplification to Teach Word Approximations

- Explain this strategy to parents and caregivers.
- Be sure to explain the difference between speech simplification and baby talk.
- We are teaching kids with sCAS to talk the same way typically developing children learn to talk by using simplifications (called phonological processes).

Simplification Examples: water
blue
butterfly
Spiderman

10. Incorporate play-based movement into activities to address attention and behaviors.
11. Focus on eliciting multiple repetitions of target words, in context.

Eliciting Multiple Repetitions

(Enhancing repetitive speech practice through play)

- One of the most important strategies we must focus on early on in the therapeutic process is repetition of target sounds and words (w/o drill work).
- In order to design activities to elicit multiple repetitions, we must select activities that have multiple, identical pieces or parts. # of available pieces = potential # of repetitions!

Activities for Eliciting Multiple Repetitions

1. When looking at counting picture books, count objects on the page repeating the object name instead of rote counting "1-2-3-4-5."



2. When walking up/down the stairs, say "up-up" or "down-down" instead of counting each stair.
3. Use predictable books with repeating phrases and have the child fill in the same word each time. For example, "Brown bear, brown bear what do you _____?"
4. Identify one person in family photos and repeat their name over and over while pointing to the pictures ("mama-mama-mama").

5. Use Velcro play food saying "cut" each time the child cuts with the toy knife



6. Use a muffin tin to elicit 12 repetitions of the target word. Have child place a small ball in each opening saying "ball" each time.



Larger muffin tin for younger kids



Lucky Ducks



7. Make boo-boo art by sticking band-aids on paper saying "boo-boo" each time.



8. Have toy animals walk, eat and sleep repeating key words "walk-walk walk, eat-eat-eat & night-night."



9. Throw small balls into a basketball hoop or laundry basket saying "ball" each time.



10. Hammer golf tees into Styrofoam saying "boom boom boom."



11. Anything that pops - bubbles, Moo Popper, bubble wrap, poppers saying "pop-pop-pop."

12. Roll balls down a slide saying "whee" each time.

13. Stack blocks or cups saying "up" each time a block is placed.

Suggestions for Eliciting Multiple Repetitions (cont'd)

14. Play the knock-knock game.
15. Say "bye-bye" repeatedly as you put blocks into a tub or "night-night" as you put stuffed animals to bed.
16. Look for games with multiple identical pieces, such as Mighty Monkey Pegs, Connect Four and Pop-UP Pirate.

Using Books to Bring about Speech

- Yummy Yucky
- Moo!
- Elmo Says
- Ready Set Go & Peek A Who
- Brown Bear Brown Bear
- The Big Book of Exclamations
- Noisy Stories (www.mayer-Johnson.com)
- Sight Word Readers

Suspected Childhood Apraxia of Speech: Part 4



Targeted Motor Speech Goals

Limit Screen Time

- Young children don't learn best from a screen.
- Explain to caregivers the difference between screen-based learning and relationship-based learning.
- Anything a child does with a screen is ALL input and requires no output—therefore it's not good for teaching speech!
- Chapter 9 in my new book outlines appropriate apps for use with older kids

Goal 1

Establish Attention to the Speaker

- If child avoids watching the speaker's mouth this must be addressed early on in the therapeutic process.
- Encourage speakers to hold desired items next to their mouth to elicit eye contact from the child.
- Use exaggerated facial expressions and an animated voice to draw attention to the speaker's face. The gasp can also be very effective.

- Sit face to face with child during play time.
- Seat child higher than adult to establish face to face interactions.



- Read books with child facing the adult.
- Play games that involve the child looking at your face (A-choo!, Peek-a-boo).
- Avoid instructing the child to say words. Increased pressure to speak may cause the child to avert eye gaze. Opportunity without pressure!
- Use a mirror to encourage eye contact—suggest a door mirror hung horizontally on the wall at the child’s eye level. Low to no pressure!



➤ Door mirror hung horizontally



➤ Non-breakable self-standing speech mirror (\$13.99) available at www.quill.com



Goal 2

Establish Gross & Fine Motor Imitation Skills

- Imitation is a foundation skill. It is essential for learning and developing new skills.
- Developmentally, children imitate what we do before they imitate what we say.
- Start by imitating what the child does and says.
- Encourage the child to imitate others during play time.
- Read books that encourage imitation.
- Introduce songs and finger plays.

Examples of Motor Imitation Targets

Clap hands	Stomp feet
Blow a kiss	Wave
Bang blocks	Knock on door
Fly a toy plane	Stick out tongue
Knock blocks down	Push toy car
A-choo game	Make toy animals walk
Stir with a spoon	Gestures/signs
Pound a hammer	Put on a hat
Roll a ball	Pat a baby doll

Suggested Songs and Finger Plays

- Teddy Bear, Teddy Bear
- Row, Row, Row Your Boat (with additional verses)
- Wheels on the Bus/Animals on the Bus
- If You're Happy & You Know It
- Baby Bumblebee
- Twinkle Twinkle Little Star
- Itsy Bitsy Spider
- Head, Tummy, Knees & Toes
- 5 Little Monkeys Jumping on the Bed

Teddy Bear

Teddy Bear Teddy Bear Turn Around
Teddy Bear Teddy Bear Touch the Ground
Teddy Bear Teddy Bear Show Your Shoe
Teddy Bear Teddy Bear That Will Do

Teddy Bear Teddy Bear Go Upstairs
Teddy Bear Teddy Bear Say Your Prayers
Teddy Bear Teddy Bear Turn Off the Light
Teddy Bear Teddy Bear Say Good-Night

Possible IFSP Outcome Example

Alexis will imitate five or more actions when singing her favorite songs and finger plays with her caregivers, by the end of summer.

Goal 3

Increase Articulator Awareness

- Introduce modified animal sounds (fish, dog, giraffe) to increase awareness of lips and tongue.
- Engage in mirror play, pairing silly sounds with funny faces and expressions.
- Use books that emphasize oral-facial movements.
- Offer lip balm.
- Play the "Blah" game.

Goal 4

Vocalizing

- We need to help silent kids find their voice.
- Reinforce any vocalizations produced by the child.
- Take turns vocalizing into an empty bucket, echo microphone or megaphone.
- Have child say “ahhh” while playing with a toy doctor kit and flashlight.
- Use kazoos to elicit intentional vocalizations.
- Encourage vocal play (blowing raspberries, clicking tongue, blalling, etc.)
- Sing additional verses to Row Row Row Your Boat.

Possible IFSP Outcome Example

Oscar will engage in vocal play by imitating 5 different non-speech movements and sounds when playing with his caregivers, 4 days in 1 week.

This is a great outcome for that silent child who rarely turns his voice on.

Additional Verses to Row Your Boat

Row, row, row your boat
Down the jungle stream
If you meet a crocodile don't forget to scream!
AAAHHHHHHHHHHH!!

Row, row, row your boat
Gently back to shore
If you meet a lion
Don't forget to roar! ROOOOAAARRR!

Goal 5

Establish Sound Effects

Sound effects are a fun and effective way to:

- elicit intentional sounds
- transition from prespeech to speech sounds
- develop vocal imitation skills
- develop prosody (the melody of speech)

Focus on: animal sounds, vehicle sounds, exclamations & other sounds effects during play time and when reading books

2 Checklists Available at www.cariebertseminars.com

1. Sound Effects Checklist
2. First Words Expressive Vocabulary Checklist

IFSP Outcome Example

Lupita will produce 10 different sound effects (animal sounds, vehicle sounds, exclamations) when looking at books with her mom or grandma, by her second birthday.

Goal

Increase Sound Repertoire

- This is not appropriate for kids who are already verbal, but it is a crucial step when working with minimally verbal toddlers. *****This goal is NOT supported in the literature*****
- We need to teach child how to use his jaw, lips and tongue to make speech sounds. The focus should be on eliciting new movements with the articulators.

Alphabet Soup Activity

- Toddlers love to put in, dump out and do it again
- Gather refrigerator magnet letters and a container with a lid – cut an opening in the lid so the letters will easily fit into the container (don't use the letters "Q" or "X")
- Dump all the letters into your lap, take one letter, hold it next to your mouth and say the speech sound (NOT the letter name), pause and allow opportunity for a response
- Allow the child to put the letter into the container
- Repeat with other letters as long as child is interested

Alphabet Soup for Eliciting Phonemes



Goal 7

Establish Vowel Differentiation

- Move rapidly from speech sounds in isolation to simple syllable shapes – speech sequences vs. individual sounds.
- We want “bay-bee-buy-bow-boo” not just “buh.”
- Do not inadvertently reinforce overuse of the neutral vowel (ex: “bu-bu-ball or “du-du-down”).
- Repeat the vowel sound before saying the word to establish correct vowel sounds (ex: “ow - down”).

- Being shaping single word approximations with consonants and vowels that the child has success with.
- *Speech Steps* and *Word Flips* are two programs available that focus on consonant vowel combinations. These materials can be adapted for use with very young children.
- Both products are available through www.superduperinc.com
- **These are not typically effective for use with toddlers and are not recommended for use in EI.**

Goal 8

Expand Syllable and Word Shapes

- Reduplicated utterances (mama, dada, papa).
- Two syllable words with same consonant and changing vowel (puppy, baby, daddy, mommy).
- Two syllable words with changing consonant and vowel (monkey, happy, dino, hippo, potty).
- Short phrases.
- Use sounds already in the child’s current repertoire.

Goal 9

Establish Functional Core Vocabulary

- Core vocabulary will not be the same for each child.
- The family should help identify the target words.
- Target words should not be chosen solely based on word shape (e.g. CV, CVC) or speech sound (/b/ words), but rather based on how functional they are.
- Early functional core vocabulary words include: child's name, "mama/dada," siblings' names, pets' names, friends' names, favorite foods, favorite toys, & other power words (e.g. *no*, *mine*, *help*).

- Print 4x6 pictures of core vocabulary words and keep them in a small photo album (\$1 at Wal-Mart). Add pictures as they become relevant. (Or create a core vocabulary box of objects to play with during therapy time)
- Picture This... is a CD of real photos that can be used to create core vocabulary cards for families (www.beyondplay.com).
- Teach child how to say approximations of these core vocabulary words during the home visit & show parents how to do this during routines that naturally occur.

IFSP Outcome Examples

Zachary will say an approximation of his name when asked "What's your name?" during story time at the library, 3 consecutive weeks in a row.

Michael will wave and say "bye-bye" when his dad leaves for work 4 mornings per week, by his second birthday.

Bilingual Core Vocabulary Books

- Picture This... can print labels in English, Spanish, German, Italian or French.
- Creating core vocabulary books can be helpful when working with bilingual families.
- Using the small photo albums, we can create bilingual books by placing the same photo on adjacent pages and using the English label on one side and the Spanish (or other language) label on the adjacent side.

Goal 10

Address Speech & Language Concurrently

- We must always work on speech **AND** language (even if there aren't specific language goals on the plan of care).
- We focus on moving language forward even though speech production skills remain significantly delayed.
- We don't "wait" for 50 single words before we start introducing phrases and sentences.
- We need to consider the importance of modeling simplified, but grammatically correct language.

- "When is Simplified too...Simple?" is an excellent article by Courtney Venker and Sheri Stronach, published in the January 2017 ASHA Leader.
- If we don't move language forward until the child has perfectly produced single words, the child could be in kindergarten & still at the single word level.

Prognosis

When Parents Ask About Their
Child's Future

When Families Ask About Prognosis

- We need to be honest and tell families that progress is often slow - that learning to talk is a marathon not a sprint. There is no "fast fix."
- Remember, that slow progress adversely affects parents' confidence in the therapy process.
- Duration of therapy for a toddler with suspected apraxia is likely to be 3+ years.
- Child with CAS is at risk for reading, spelling & writing difficulties as oral language problems often precede written language problems.

What Affects Prognosis for Becoming Verbal?

- Severity
- Cognitive skills
- Child's personality/temperament
- Age at which therapy was initiated
- Co-existing conditions
- Motivation – does child enjoy therapy?
- Appropriateness of the therapy
- Family involvement
- Etiology
