CAS Goals for Older Students

Kay J Giesecke, MS, CCC-SLP

Childhood Apraxia of Speech Specialist since 1996

Disclosure Statement

- I am the owner of a private practice called Apraxia Austin, the creator of the Childhood Apraxia of Speech Checklist, the provider of Apraxia Ranch Camps, three day intensive, residential CAS summer camps, and the developer of a set of in depth training videos on using co-articulation in apraxia therapy for children.

- I am volunteering my time and talents to record and teach this complimentary workshop offered by Apraxia-Kids instead of teaching it at their national conference.

- I have no other relevant financial or nonfinancial relationships in products or services described, reviewed, evaluated or compared in this presentation.
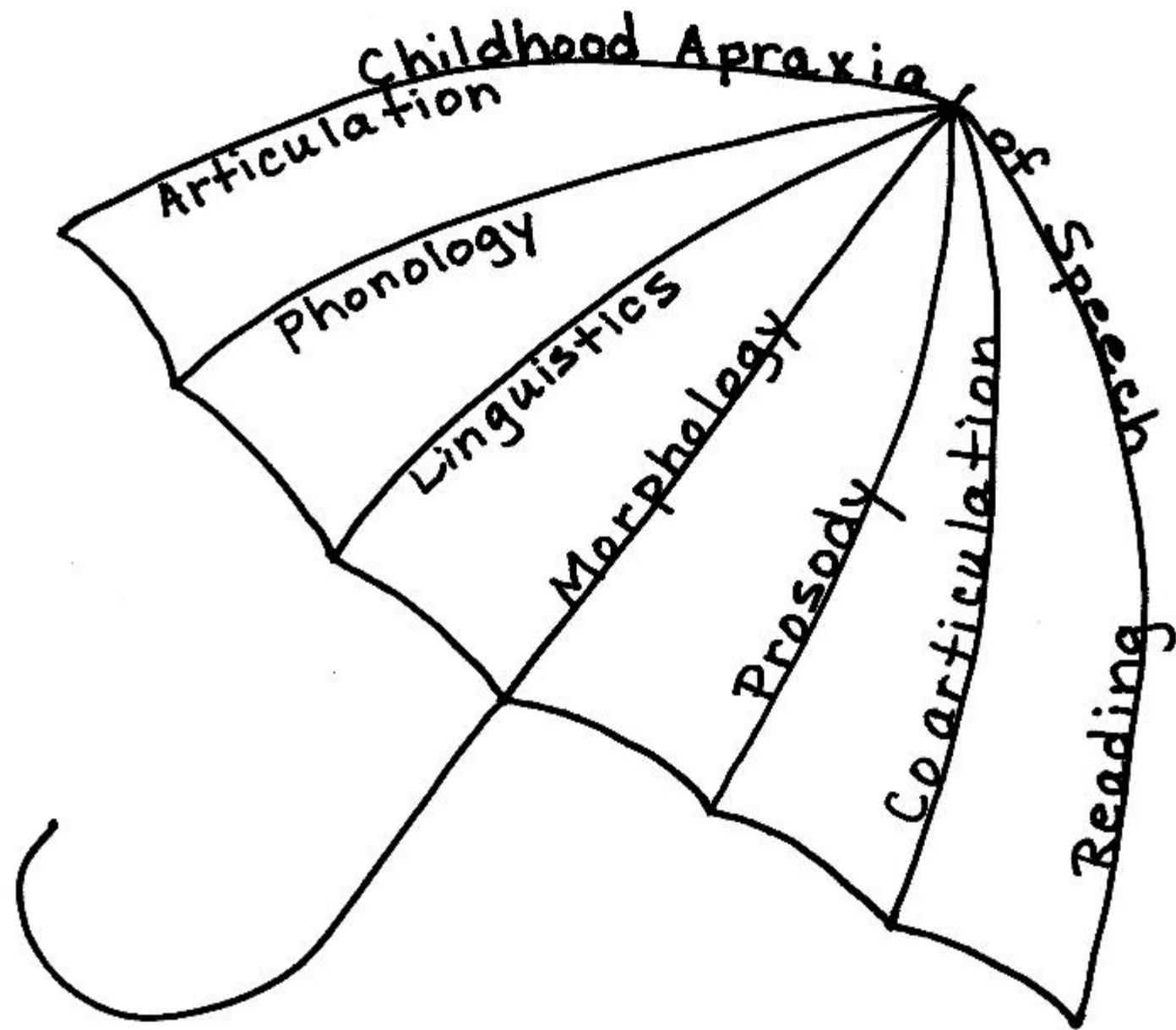
Motor Planning (CAS) Therapy Features

- Focused attention by child, reinforced by early success

- Intensive, frequent, individual practice

- Multiple repetitions of speech movements

- Memorization of speech movement sequences

- Multi-sensory Input (many types of cueing)

- Slower Rate

Hall et al., 2006, , Haynes, 1985, as cited in Caruso & Strand, 1999

Motor Planning (CAS) Therapy Features

- Multi-sensory Feedback

- Systematic progression through hierarchies

- Emphasis on Self-Monitoring

- Compensatory speech and language strategies

- Prosody remediation

- Addressing all aspects of disordered communication

Hall et al., 2006, Haynes, 1985, as cited in Caruso & Strand, 1999

Childhood Apraxia of Speech

- Articulation
- Phonology
- Linguistics
- Morphology
- Prosody
- Coarticulation
- Reading

Many Types of Cueing

Used w/ all speech sound disorders

- Auditory

- Visual

- Speech model to imitate

- Cognitive (tell what to do)

- Mirror work

- Written

- Graphic (pictures)

- Use of tools to assist eliciting sounds

- 3D objects or toys

Additional ones w/ CAS

- Touch cueing (on SLP, parent, or child)

- Gestural cueing

- Integral Stimulation (I say it, you watch, you say it – add cueing if needed, possibly even we say it together)

- Backward chaining

- Modeling slower rate

- Strong use of fading cues

- Claps/taps/counting for multi-syllabic words

Individualized?

Consider:

- intellectual, physical, social & academic level of the child w/ CAS

- severity & influence of overlapping disorders

- severity of CAS diagnosis - officially diagnosed?

- possibility of parental/classroom support & how to access

- Is student verbal or using AAC?

Categories of Treatment

- Language

- Intelligibility

- Natural Communication

- Academics

Language Ideas

- Vocabulary

- Beyond Generic/Functional Language

- Grammar

- Increasing mean length of utterance (MLU)

- Multisyllabic Words

Vocabulary

Vocabulary

- Mindset of inclusivity of vocab in all activities

- Reading books or conversing, define "new" words

- Have student practice using "new" words in different contexts

- Make notes of new vocab for reinforcement

- Video of Mindset of Inclusive Vocabulary: amplify and r's

Functional/Generic Language

Is student only using generic, nonspecific vocabulary when capable of more?

- Verbs like put, do, get, make, want instead of place, practice, receive, construct, would like

- Adjectives like big, pretty, smart, good instead of large or enormous, beautiful or gorgeous, intelligent or capable, gifted or obedient

- Non-specific nouns like man, lady, bread instead of the the principal, the cashier, blueberry muffins

Functional/Generic Language

- Target words with specificity in executing your tx goals.

- Use the teachable moment to suggest unplanned suitable words to use and practice.

- Work on C-C coarticulation in the new words.

Examples: "I slice the steaming bread" for "I cut the hot bread".

"There's an abundance of beautiful wildflowers" for "there are lots of pretty flowers".

Grammatical Errors

Lewis, et al., (2004) report one of most persistent deficit areas in older children w/CAS is recep/exp language.

Velleman's (2006) order of teaching presents these grammatical morphemes last to the school-aged child (note all end with V before adding the morpheme):

plural: tubas, shoes
possessive: Rosa's, Joe's
3rd person singular: goes, tries
past tense: skied, tried

Grammatical Errors

- If those that end in Vs before adding the endings are appropriate for the school aged child, then we should probably follow up with those same morphemes added to words ending with Cs with the older students.

- In my clinical judgment that is exactly what they are usually missing as well as the use of contractions.

- Adding the grammatical morphemes to words ending in Cs requires CC coarticulation.

- Use of these structures need to be practiced in many contexts using co-articulation in words, phrases, and sentences, not just written in workbooks.

- Video of past tense in sentences

Increasing MLU

- Practice different phrases that compose longer sentences (noun, verb, prepositional, etc.).

- Parse them segmented but in sequential order.

- Combine them using Integral Stimulation (I say it & you listen; now we say it with appropriate cue – perhaps repeated trials for reinforcement).

- Fade cueing and have student produce the sentence.

Examples of simple parsing

Parsed

Practice phrases separately

- I drink ---- a coke, the milk, the juice

- You have ---- a ticket, a jacket, a ball.

- We see ---- a game, a toy, a cap.

- She cut ---- her toe, the meat, a paper.

Combined

- Do with IS then fade cues

- Work on less/easier points of coarticulation

- Work on rate

- Work on accents

- Work on eliminating pauses

Examples of complex parsing

Parsed

- The man with the BIG hat -
  - ate lunch on the patio.

- I do NOT have the time – to practice piano today.

Combined

- Do with IS then fade cues

- Work on multiple points of coarticulation

- Work on rate

- Work on accents

- Work on adding gestures

- Work on eliminating pauses

Multisyllabic Words

Multisyllabic Words

- Target according to their difficulty of construction – not just # of syllables.

- Teach intentionally with lists, cards, activities.

- Teach as they come up in life and tx.

- Make lists from child's reading material and practice.

- Practice in different contexts and sentences repeatedly.

All 3 Syllable Words the Same?

- **<u>NO!</u>** Syllables and words that have CC together are harder that those that have CV constructs alternating. From easiest to hardest….

banana CVCVCV is easiest

bandana CVCCVCV - CC in same place

balcony CVCCVCV - CC in different places

baptism CVCCVCC – 1st CC has 1 unreleased C

battlefield CVCCCVCC - 1 CCC & 1 CC

- Video of unreleased plosive

Intelligibility

- Coarticulation - one of the primary characteristics of CAS (ASHA, 2007)

- Lingering consonantal articulation errors

- Lingering vowel errors – on list of additional characteristics of CAS (ASHA, 2007)

- Many children with speech sound disorders, (which includes childhood apraxia of speech), present with much reduced intelligibility. (Flipsen, 2010)

Definition of Coarticulation

➢ The influence that sounds exert on one another is called <u>coarticulation</u>, which means that the articulation of any one sound is influenced by a preceding or following sound.

Bernthal, J. & Bankson, N, 1993

Definition Cont.

➢ Coarticulation is the way the brain organizes sequences of vowels and consonants, interweaving the individual movements necessary for each into one smooth whole.

swphonetic.com

What do we coarticulate?

- Sounds within syllables

- Syllables within words

- Words within phrases and sentences

Coarticulation: Important for CAS

- Since a primary characteristic of CAS is disrupted coarticulatory transitions between sounds and syllables (ASHA, 2007), correct coarticulation frequently needs to be targeted to prevent disjointed, robotic, or unintelligible speech.

- Rehearsing coarticulation also can help remediate prosody problems, another primary characteristic of CAS, especially if we practice with correct accents & pitch.

Coarticulation

- There was an abundance of beautiful wildflowers.

Becomes

- There wa-za-nabundan-sov-beautiful wildflowers. (with unreleased d in wildflowers).

Teach students to talk like real people both with your pronunciations and your coarticulation.

When to Target Coarticulation?

- As soon as the child with CAS starts putting two sounds together.

- To produce "me" we must do CV coarticulation with the m and e.

- Continue as needed to target coarticulation until the end of therapy when the child can produce all types in sentences as long & complex as is age appropriate for the child.

How to avoid obtrusive schwa (uh)

When learning consonant sounds & consonantal endings…..

- Never add voicing to a voiceless consonant, releasing the consonant with "uh" (sss becomes suh)

- Don't add the "uh" to consonants that are continuents (mmm becomes muh)

- Release voiced plosives with minimalistic voicing

- Don't release final consonants at the end of a phrase or sentences. Ex. Put it on top.

Different Types of Coarticulation

Text Book Types

- Anticipatory

- Retentive

- Anticipatory/Retentive Combos

Sound Context Types

- Vowel to Vowel – VV

- Vowel to Consonant - VC

- Consonant to Vowel – CV

- Consonant to Consonant – CC, CCC, or CCCC

Each can occur within syllables, words, or between words in sentences

Coarticulation Context Types

- Vowel to Vowel (VV): "I"

- Vowel to consonant (VC): "I need"

- Consonant to Vowel (CV): "take a"

- Consonant to Consonant (CC): "bathroom"

- CCC: "contests"

Find other instances and tell what type: "I need to take a friend to the bathroom before the contests."

Details - Coarticulation Contexts

Vowel to Vowel (V-V)

- back to front – addition of slight /y/ as in lion or playing

- rounded to unrounded – addition of slight /w/ as in snowing or know it

- diphthongs – often one of the easiest places to start teaching children with CAS to sequence sounds

Teaching a Diphthong

First the child must have the 2 vowels in it.

- Unblended sequencing of the two vowels

- Blending of the 2 vowels for the diphthong

- Use of the target diphthong in production of CVs: cow, bow, now

- Use of the diphthong in a CVC production: town, down, or CCVC - clown, or CVCC – sound.

- Use of diphthong in words in phrases & age appropriate phrases or sentences

Details – VC Coarticulation Contexts

Vowel to Consonant (VC)

- Within 1 syllable word – up, on, in

- Between two syllables or words – mama, baby, a man, the cup, I go

- At end of syllable or sentence when a final single C is a plosive (quickly released sound) – the plosive is unreleased.

Examples: "Put it on the top." The final p is unreleased; just posture the lips for p.

When 2 Cs as in "best", final C is released.

Details – CV Coartic. Contexts

Consonant to Vowel (CV)

- Within a 1 syllable word – go, my, to.

If you are segmenting and saying g-o or c-at with a pause in between the C & V, you are not producing a CV or CVC but a separate C & V or separate C and VC. If used for training, keep the segmentation practice very, very brief.

CV Coarticulation Cont.

Consonant to Vowel CV coarticulation cont.

- Within each syllable of multisyllabic words (CVCV - mama, CV_1CV_2 -mommy, $C_1V_1C_2V_2$ – bunny. The syllables must also connect, not ma---ma, unless segmented for a brief practice period for training order.

- Between a word that ends in a C and one that begins with a V – take a man (ta ku man), pop a bubble (po pu bubble).

Teaching Articles

English speakers say "uh" for a, "thuh" for the, and "un" for an unless they are used for emphasis. Do ***NOT*** teach them as they are spelled but how we actually say them. So…
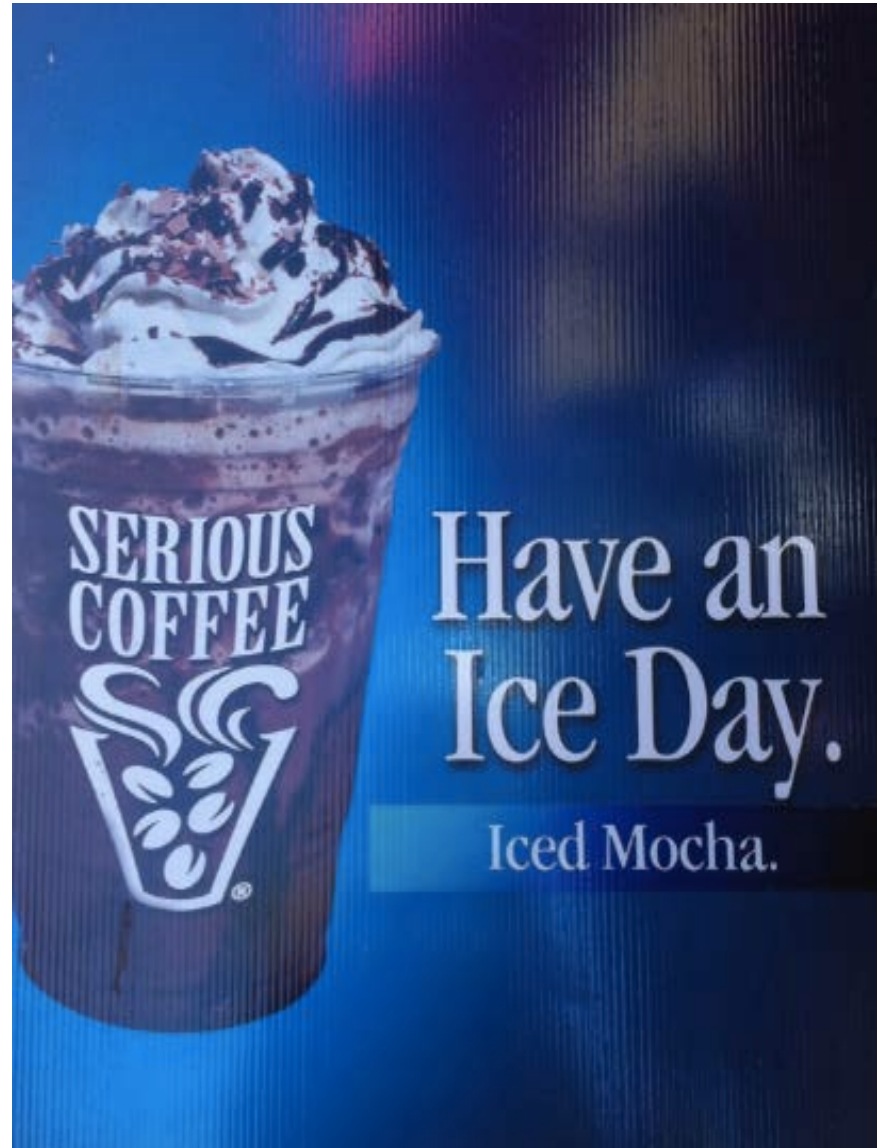
uh boy,

thuh cat,

and un eagle are correct flowing speech.

Great Example

Corporate use of a coarticulated pun to advertise iced coffee.

Have an ice day = Have a nice day.

This is a good example of how CV coarticulation actually works between words. Notice that is doesn't work unless both articles are produced with "uh" (schwa).

CC Coarticulation

__Rethink__ about clusters/blends (2 or more Cs).

Not just at the beginning of words; found in the middle & end of words. Especially found in between words and are still blended together through coarticulation.

Since found in all of these places, usually need to practice them in therapy for CAS in all these places.

- Initial clusters within words like st in stop, br in bread, gl in glad.

- Medial clusters like mp and nz in co<u>mp</u>uter and chi<u>mp</u>a<u>nz</u>ee

- Final clusters within words like mp in ju<u>mp</u> & nd in fou<u>nd</u>.

- Final/initial cluster connections created between words like zm in his man, bsh in grab shoes, shl in push ladders, nd in can do

Coartic. Contexts – CC Details

- There are many, many variations of production with CC coarticulation. Following is a list of 12 of them explaining what happens in those on the list. Each represents a type of CC coarticulation, not just one combo or only the examples.

- For example, the addition of s for plurals makes an s sound in 1000s of nouns ending in voiceless sounds and makes a z sound in 1000s of nouns ending in voiced sounds.

Details – CC Coartic. Contexts

1. Same sound or its cognate (identical movement - but on 1 sound is made with voice and on 1 is voiceless like s and z) are back to back between words, then only say the initial sound in the second word and we "hear" it in both words - He knows Sam, I pet Tabby, I had ten.

2. Two sounds similar in place and manner are back to back between words & 1 is omitted – s before sh as in horseshoe & kiss Shauna.

Details – CC cont.

3. 1 sound influences the place of production of another sound to a new place of production. When th sounds are adjacent to t, d, n, or l – bir<u>thd</u>ay, wi<u>th L</u>illy, cu<u>tthr</u>oat, then the alveolar sounds become dentalized between the teeth.

4. A sound influences the preceding sound to change voicing; the features of the 1ˢᵗ sound in a word always takes precedence – "I have to" becomes "I haf to" & "hiz turn" becomes "his turn".

Details – CC cont.

5.   Most American speakers substitute a flap (light touch) /d/ for /t/ when /t/ is between two vowels and not at the beginning of a stressed syllable (as in hotel) - either between words (get it, minute or) or within a word (water, better).

   Rhodes, Clear English Corner, 2017

6.   Two Cs back to back are produced in the same place but vary in manner, voicing or nasality – within a word (jump, land) or between words (thumb popped, can do). This is the 1st CC coarticulation type I teach.

Details – CC cont.

7. When using the conjunction "and", the production varies, depending on dialect & whether the "and" is followed by a V or C.

- Tom and Mary – since Mary starts with a C, the d in "and" is usually omitted.

- Owls and eagles – since eagles starts with a V, the d in "and" is usually produced and connected to the 1st letter in eagles when pronounced: Owls an deagles.

Details – CC cont.

8. Two C's are produced back to back but are produced in different locations in the mouth – Example: an alveolar (tongue tip sound produced in front) beside a velar (tongue humped up in back) – within a word (skate, blocks) or between words (kiss Ken, block Sam).

I usually teach this type after the CC coarticulation that is produced in the same place in the mouth has been taught and practiced.

CC Coarticulation Cont.

9. 1st of two Cs back to back is an unreleased plosive either within a word (popped, kicked) or between words (pop two, kick two)

In the above examples, the C at the end of the root word or 1st word of 2 is unreleased. Articulators are placed for that C and momentarily held until the next C is said.

Details – CC cont.

10. Morphological endings "s" or "ed" are   added to create plurals, 3rd person singular verbs, etc. or past tense. Voice follows voice; air follows air.

11. Three or more Cs are back to back and are a mixture of voiced and unvoiced sounds between words; like chameleons they change in different environments. (swans feed, swans do; dogs flip, dogs blend in).

CC cont. – A complex example

12. In anticipation of adding the past tense ending to words ending in ch or j (also the second sound of g), the production of the ch or j is unreleased. Examples: watched, judged

- Instead the sh or zh is released; retaining the voiceless or voiced feature of the ch or j but transforming the ending into a continuant; thus allowing the addition of the t for the voiceless ch and d for voiced j.

- If these changes did not occur, the words would need to be two syllables: wa/tched

Video

Video of multiple contexts of coarticulation

Lingering Consonant Errors

- Determine level

- Do articulation tx that includes motor learning features like….
  - Multiple repetitions to memorize movements
  - Slower rate of speech initially and slower of progression through therapy
  - Multi-sensory Input (many types of cueing)
  - Systematic progression through hierarchies

Hierarchy Ladders©

Classic Artic	Phonology	Cueing	Speed	Coarticulation	Linguistics	Morphology
Spontaneous Speech	3-Syllable Words	No Cues	Regular Rate	C to C w/ one unreleased plosive -walked	Noun Phrase + "be" verb + Adjective	Contractible Auxiliary
Structured Conversation	CVCVC	Intermittent Model	Natural Coarticulation	C to C diff. place of prod. in word - lift	Sentence + Prep Phrase	Contractible Copula
Story Retell	C1VC2	Imitation	Accented Coarticulation	C to C same place of prod. in word - find	Prepositional Phrases	Uncontractible Auxiliary
Sentences	CVC	1st Posture Only	Blended Words		NP + Action verb + N P	Irregular 3rd person
	VC	Posturing	Unblended Words	C to V between words - put it	Additional Pronouns	Regular 3rd Person "s"
Carrier Phrases	CV1CV2	Phonemic Cue	Blended Syllables	V to V between words - do it	Simple Sentence	Past Tense–ed
Simple Phrase	CVCV	Mouthing		V to C in syll. - up	Verb + "a" + Noun	Uncontractible Copula
Word	CV	Whispering	Unblended Syllables	C to V in syll. - he	Pronoun "I"	Possessive "s"
Syllable	C	Simultaneous Speaking	Prolonged Phonation	V to V in syll. - I	Verb	Irregular Past Tense Verbs
Sound	V				Article "a"	Plural "s"
					Noun	-ing

C=Consonant   V=Vowel   Syll=Syllable   Prod=Production

Kay Giesecke & Heather MacFadyen, 2005, ed. 2009

Lingering Consonant Errors

- Practice correct production in the articulation hierarchy, eventually long sentences that include work on
  - Coarticulation
  - Prosody
  - Inclusion in multisyllabic words, morphology such as past tense & plurals, & multiple targets per sentence.
  - Normal rate

- Though Diedrich and Bangert (1976) found that students with articulation problems who achieved 75% correct production on word lists and conversation retained skills as well as clients kept longer, I have not found that to be true clinically with students with CAS.

- I continue working on generalization until 100% for a couple of weeks to prevent regression.

Lingering Vowel Errors

- Determine which vowels/diphthongs errors and consistency of errors.

- If needed, use hierarchy of difficulty to practice

- Correct all vowel errors, not just during specific practice of vowels.

- Correct all vowels in longer & longer sentences.

- Continue correcting all vowel errors until child dismissed/discontinued

Natural Communication

- Prosody
  - Rate
  - Unnatural pauses
  - Accents
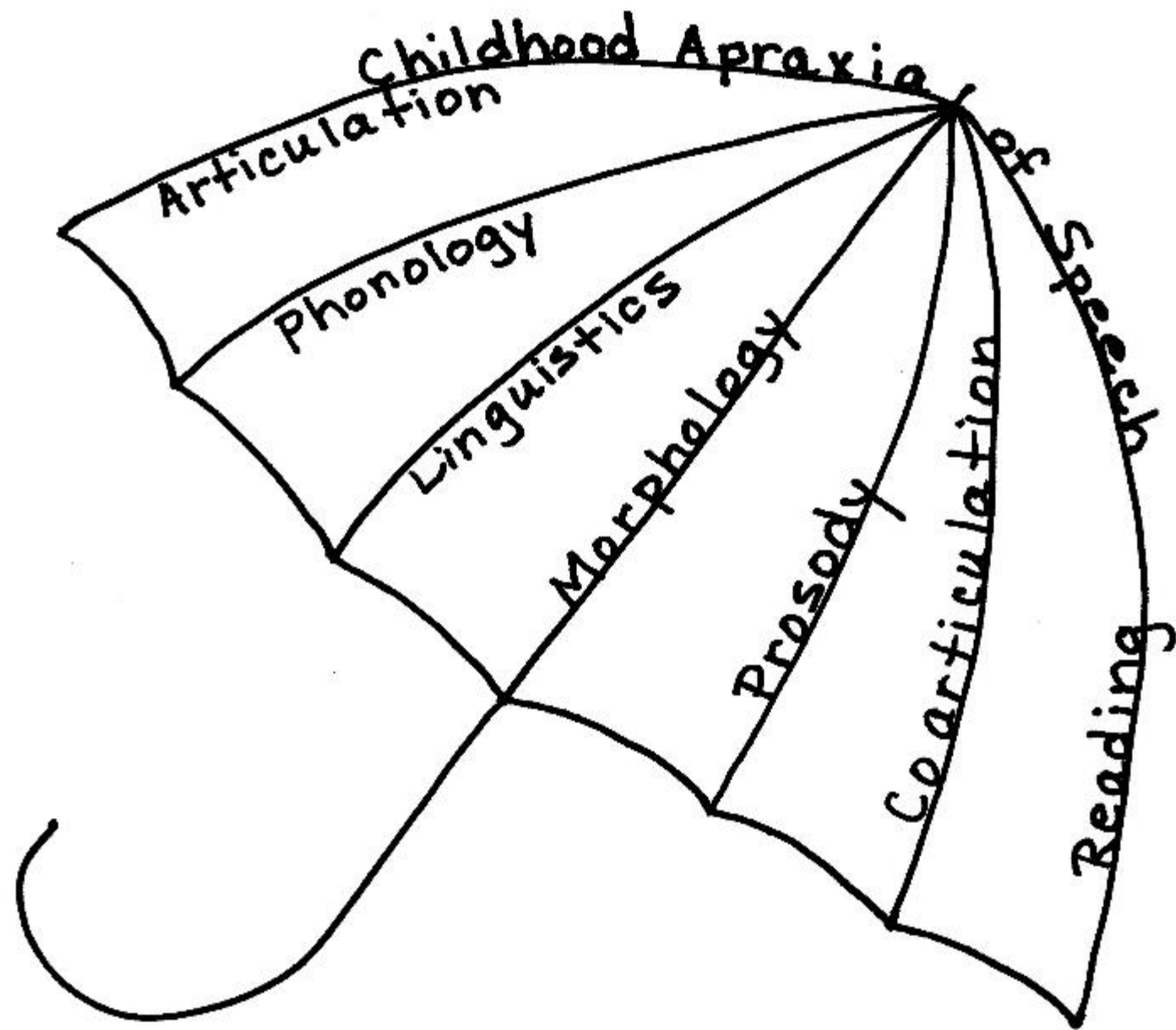 - Volume

- Inclusion of gestural language if needed

Practice longer and more sentences

- Intentionally practice long sentences (compound or embedded phrases) with good intelligibility and prosody .

- Practice producing sentences in sequences
  - Repetitive sequences
  - Diverse sequences
  - Life stories
  - Procedural discourse
  - Conversation: talking, listening, & asking questions

- Video on conversation

Academics

- Special Ed advocate for students with CAS

- Reading

- Spelling

- If student has limb dyspraxia, possible hand writing

- Possible need for social skills training

Childhood Apraxia of Speech

Articulation
Phonology
Linguistics
Morphology
Prosody
Coarticulation
Reading

Reading Disorders and CAS in the Research

Depends on the definition of a reading disorder as well as the population studied

- 50-70% of children with a language disorder

- 50-75% of children with speech sound disorders

- Children with CAS:
  - Have difficulty with rhyming and segmentation (Marion, Sussman, & Marquardt, 1993; Marquardt, Sussman, Snow, & Jacks, 2002)
  - Were poorer spellers than children with normal articulation who were matched for reading (Snowling and Stackhouse, 1983)
  - Had difficulties with reading, especially compared to a group of children with speech sound disorders, but were more similar to a group of children with a speech sound disorder and a language disorder (Lewis, Freebairn, Hansen, Iyengar, & Taylor, 2004)

Scope of Practice of SLP?

- "SLPs have a variety of roles and responsibilities with regard to literacy intervention, but in general they must ensure that students with special needs receive intervention that builds on and encourages the reciprocal relationships between spoken and written language." (ASHA Practice Portal)

- Should be collaborative in nature, working closely with teachers and resource personnel

How to teach reading to children with CAS?

- Similar fashion to how to teach them to speak: based on principles of motor learning

- Children *typically* learn to read out loud first

- Reading out loud requires sequencing speech sounds, the core deficit in CAS

Adapt to CAS characteristics

- Disjointed co-articulation – don't recommend asking the students with CAS to do traditional blending for reading without helping them

- Need for:
  - Lots of repetition in order to memorize
  - More cueing – including integral stimulation for motor learning (simultaneous production)
  - Reduction and withdrawal cueing as progress
  - Slow rate to allow for more time for motor planning

- Tendency to "lose" words and regress without following hierarchies and progressively building more complex syllable shapes

Apps as efficient as a SLP?

- Can't make judgments about changing goals midstream

- Can't slow down rate of delivery

- Can't deal with lack of attention of child

- Can't give tactile, gestural, cognitive cueing, etc.

- Most done only in repetition instead of other types of cues such as touch, gestures, mouthing the words or simultaneous speech

- Basically syllable and word lists with matching illustrations and audio models on an electronic tablet

- SLPs ethically bound to use evidence based therapy techniques

Advantages of current apps

- Can be done at home by a parent

- Provide an alternative to traditional therapy materials

- Can be used as a reward to motivate a child

- Less expensive than real therapy

- Cut down on planning time for SLP

Disadvantages of current apps

- A cop out in providing quality therapy

- Most only provide auditory input

- No multisensory feedback on responses

- No adjustments to programs as child completes levels

- Poor design in some - complex words mixed with simple

- Verbal communication is interaction between human beings. Apps take the human connection out.

Disadvantages of Apps

- Most recipients of speech therapy are young children who learn best through hands on activities.

- Unable to find research yet to prove efficacy

- All require a parent, teacher, or SLP to administer to be efficacious

- Parent should be trained to efficaciously administer

- Not individualized to child

- No instruction on prosody or coarticulation

- Most not designed to elicit multiple correct repetitions

Just a thought……

Study published in the American Speech and Hearing Leader magazine found that the more children 6 months to 2 years of age use handheld electronics the more likely they are to have expressive speech delays – each 30 minute increase daily in screen time = 49% increased risk of delays

ASHA Leader, Aug. 2017

Is using electronic games and apps, even if artificial intelligence is built in, really good for learning and preparing children for life and human relationships?

Thanks!

- Thanks for participating in this webinar. If you should have any questions, you may contact me at kaygiesecke3d@gmail.com or on my cell, 214-505-5041. If you email please write "apraxia question" on the subject line.

References

- American Speech-Language-Hearing Association. (2007). Childhood Apraxia of Speech (Ad hoc Position Statement). Available from www.asha.org/policy.

- American Speech-Language-Hearing Association. Written Language Disorders. Practice Portal. http://www.asha.org/Practice-Portal/Clinical-Topics/Written-Language-Disorders

- Bernthal, J.E. & Bankson, N.W. (1993). Normal Aspects of Articulation, a chapter in *Articulation and Phonology Disorders,* .(pp 38-44). New Jersey: Prentic Hall

- Rhodes, K, SLP & American Accent Coach on Clear English Corner/American Accent Training on Flap /t/.

- Diedrich & Bangert, (1976) as cited in Chapter 2 Research Studies of Generalization and Carryover by Pam Marshalla in *Carryover Techniques in Articulation and Phonological Therapy,* 2010, (pp.9-20). Millcreek, WA, Marshalla Speech and Language.

- Flipsen, P, 2010. Measuring Intelligibility in Children and Why, Idaho State University, article handout on www.asha.org

- Handheld Screen Time Linked to Delayed Speech Development, The ASHA Leader Research in Brief, Volume 22, Issue 8, Aug, 2017, (pp.16-16).

References, cont.

- Hall, P.K. & Jordan, L.S. (2006). Features of Motor-programming Treatment with Children Exhibiting DAS. Chapter in *Developmental Apraxia of Speech, Theory and Clinical Practice,* (pp.191-218).Austin: Pro-Ed.

- Haynes, S, Developmental Apraxia of Speech: Symptoms and Treatment, In Clinical Management of Neurogenic Communication Disorders. (pp-259-266). Boston: Little, Brown & Co. as cited in Clinical Management of Motor Speech Disorders in Children by Caruso, A.J. & Strand, E.A.. (1999), (PP- 117-117). New York: Thieme

- Lewis, A.L. & Ekelman, Bl.L. (2007). Literacy Problems Associated with Childhood Apraxia of Speech. *Language Learning and Education, 10-17.*

- Lewis, B.A., Freebairn, L.A., Hansen, A.J., Iyengar, S.K. & Taylor, H.G. (2004). School- age follow-up of children with Childhood Apraxia of Speech. *Language, Speech, and Hearing Services in Schools 35*(2): 122 –140.

- Marion, M. J., Sussman, H. M., & Marquardt, T. P. (1993). The perception and production of rhyme in normal and developmentally apraxic children. *Journal of Communication Disorders, 26, 129-160.*

- Marquardt, T. P., Sussman, H. M., Snow, T., & Jacks, A. (2002). The integrity of the syllable in developmental apraxia of speech. *Journal of Communication Disorders, 35, 31-*49.

References cont.

- Marshalla, P in *Carryover Techniques in Articulation and Phonological Therapy,* 2010, (pp.9-20). Millcreek, WA, Marshalla Speech and Language.

- Snowling, M., & Stackhouse, J. (1983). Spelling performance of children with developmental apraxia of speech. *Developmental Medicine and Child Neurology, 25, 430-437.*

- Strand, E. & Skinder, A. (1999.) Treatment for Developmental Apraxia of Speech: Inte)gral Stimulation Methods. Chapter in *Clinical Management of Motor Speech Disorders in Children,*. (pp.109-148).. New York: Thieme.

- Velleman, S.L., Childhood Apraxia of Speech: Assessment/Treatment for the School-Aged Child, Presentation handout from presentation at ASHA Convention Miami, 11/16/06