

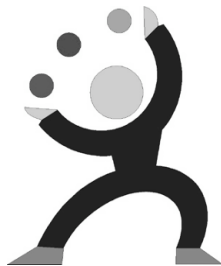
Understanding and treating Childhood Apraxia of Speech

Ohio Speech-Language-Hearing Association
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1

The Four Concerns in Planning Treatment for CAS

Speech Production
Motor learning
Speech Production
Prosody, vowels,
inconsistencies
Language – especially
written
Communication!!!!



2

Structure of Today's Talk

- I. Background
 - Nature of the deficit - Justification for a motor learning framework for treatment
 - Defining characteristics – Areas of difficulty requiring special attention (vowels, inconsistency, prosody)
 - Accompanying characteristics with high impact – Areas of difficulty to anticipate (written language skills, multisyllabic word production)
- II. Motor Learning Framework
 - Motor Learning Principles
 - Dynamic Temporal and Tactile Cueing (Strand), a motor learning approach
 - Adaptations to Enhance Motor Learning (e.g., Cycles)

3

III. Special Speech Production Challenges

- Consistency
- Prosody
- Vowels

IV. Language Issues

- Phonological awareness
- Other issues similar to those found in children with other types of language problems

V. Communication/the Whole Ball of Wax

4

I. Background

Nature of the Deficit

Definition of CAS according to the CAS Position Statement (ASHA, 2007)

- "a neurological childhood (pediatric) 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). . . .

5

Three contexts in which it occurs

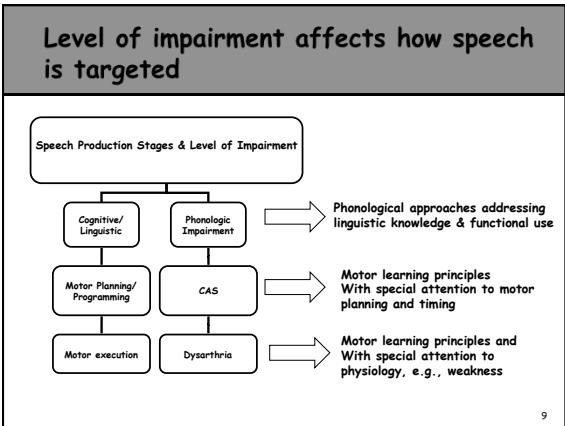
- Idiopathic – Unknown origin
- Syndromic - In association with complex neurobiological disorders of a genetic or metabolic nature – e.g., Fragile X, Galactosemia, Autism
- Acquired – e.g., intrauterine stroke, infection, trauma

(ASHA, 2007)

6

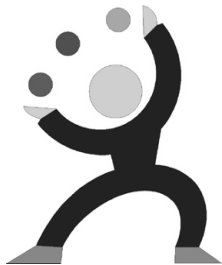
■ *The core impairment in*
 ■ *planning and/or programming spatio-temporal parameters*
 ■ *of movement sequences results*
 ■ *in errors in speech sound production and prosody."*

(ASHA, 2007, p. 2)



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10

2. Defining/discriminative characteristics

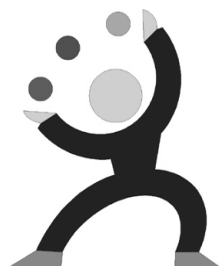
- “inconsistent errors on consonants and vowels in repeated productions of syllables or words,”
- “lengthened and disrupted coarticulatory transition between sounds and syllables,”
- “inappropriate prosody, especially in the realization of lexical or phrasal stress.”

(ASHA, 2007, p. 2)

11

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12

Co-Occurring Deficits & Special Considerations

- Expressive oral language deficits
- Receptive oral language deficits
- Written language deficits
 - Reading
 - Spelling
- Writing
- Phonemic Awareness
- Behavioral Issues (e.g., withdrawal, frustration, anger, etc.)

13

Case study of long-term effects of CAS "Keith" from 2:8 to 17:0 (Stackhouse, 1992)

At age 4,

- Diagnosed with DAS & oral apraxia,
- General clumsiness and severe unintelligibility,
- Very restricted phonetic repertoire (/b/, /d/, /r/ & glottal stop in words and some V errors)

At age 17, high average IQ

- Resolved motor problems in other domains, but speech errors on multisyllabic words
- Persistent reading and spelling problems

14

Longitudinal comparison study (Lewis et al., 2004)

- 3 Groups
 - Children with CAS (n=10)
 - Children with Speech Disorders only (SD) (n=15)
 - Children with Speech and Language problems (S&L)
(both of the nonCAS groups had moderate to severe sp problems)
- 2 Ages (preschool and school age)
- Dependent measures
 - language tests,
 - speech tests,
 - syllable sequencing,
 - nonsense word repetition,
 - phonological awareness

15

Results at Time 1 (ages 4 to 6)

CAS Group than the Speech-Only group on all measures,
but looked similar to Speech and Language Group (group on most measures
CAS compared to both other groups

- made more uncommon errors and
- had difficulties in sequencing

16

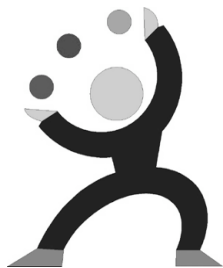
Results at Time 2 (age 8 to 10) Children with CAS (n=10)

8 showed some improvement in speech skills, BUT continued difficulty with
ddk,
multisyllabic real and
nonsense words,
Single word production skills improved more than speech production in connected speech
S&L group made greater gains in language than CAS group
CAS group continued to show receptive as well as expressive difficulties
6 diagnosed with reading problems; 8 with spelling problems; 4 with ADHD

17

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18

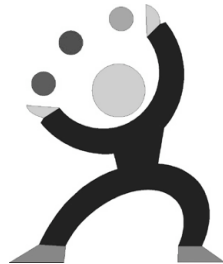
The ICDH Model of Chronic Disease & CAS (and other SSD)

- Pathophysiology – Effects on tissues, cells → unknown
- Impairment – Loss of anatomical function → Movement difficulty for speech
- Functional Limitation – Breakdown in speech production → Reduced intelligibility
- Disability – Reduced communicative competence
- Limitation on Social Roles – Lack of peer acceptance; reduced access to teachers/information in classroom

19

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20

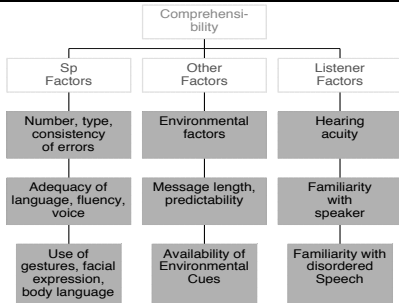
Group Exercise



- What treatment targets, methods come to mind when you consider communication and its effects on social roles as an appropriate focus of concern?
- Spend a couple of minutes thinking about this.....then talk to those around you.

21

Comprehensibility



22

My thoughts on how this affects *treatment*

Functional Limitation – Breakdown in speech

production → Reduced intelligibility

→ What can you change that affects intelligibility in addition to child's speech? Room acoustics? Listener hearing (e.g., grandparents?)

Disability – Reduced communicative competence

→ Consider AAC strategies; increase use of gestures; topic boards, etc.

23

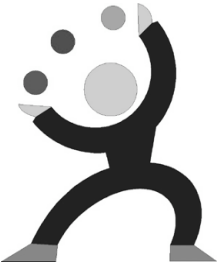
Limitation on Social Roles - Lack of peer acceptance; reduced access to teachers/ information in classroom

→ Consider peer & teacher education by you/ by the child with CAS; Consider attention to issues related to bullying

24

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25

II. Speech Motor Learning

1. Principles of motor learning
2. An example of an intervention focusing on motor learning –Dynamic temporal and tactile cueing (Strand)
3. Modification of an existing intervention to increase motor learning

26

1. Principles of motor learning. Recommendations from the motor learning & motor speech disorders literature

Provide many practice opportunities (i.e., trials or carefully organized repetitions)
 // other skilled motor practice
 “Practica hace al maestro”
 “Practice makes perfect.”

27

Use distributed versus massed practice (schedule lots of sessions), especially initially

- Probably the single most common recommendation re: CAS
- // Development of difficult motor skills of any kind (e.g., playing musical instrument; engaging in sports; becoming a skilled typist or potter or painter or video gamer or text messenger)
- and difficult cognitive tasks of any kind –
- “thou shalt not cram for tests”

28

Initially, block trials of like stimuli; later, randomize trials

Let's do a thought experiment, comparing the following mathematical tasks:

21/3 21/3 21/3 12/2 12/2 12/2 32/4 32/4
Versus
 21/3 12/2 32/4 12/2 21/3 32/4 12/2 32/4

29

More recommendations

Initially begin with a small stimulus set
 Use facilitators
 Choral/simultaneous production
 Tactile cues
 Slowed rate, that is then normalized and finally varied

30

2. Dynamic Temporal and Tactile Cueing

(DTTC) Formerly Integral Stimulation (Rosenbek et al, 1973; Strand & Skinder, 1999; Strand, Stoeckel, & Baas, 2006)

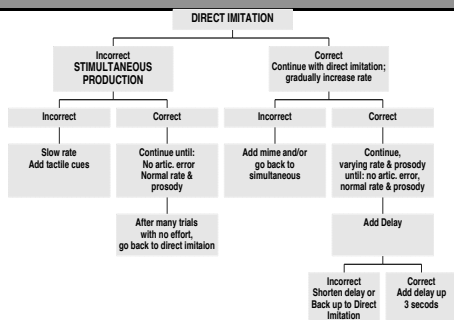
An articulatory approach designed to facilitate lots of movement practice
Uses imitation of productions that increase in length and complexity beginning at level where success is expected
Cueing strategies include slowing rate, simultaneous production, and tactile/ gestural cues

31

Using an increasing time delay between model and the child's production is an important feature
Better supported in terms of research than others

32

Structure of DTTC (Strand & Skinder, 1999)



33

3. Modifications to an existing approach – the Cycles approach (Hodson & Paden)

- Components
 - Auditory stimulation (formerly “bombardment”)
 - Production practice opportunities for a given phonological pattern (e.g., final consonants) for a small number of words
 - Cueing allowed, but generalization is expected; in part because words are chosen that are emerging in production

34

Cycles approach – Adaptations to increase motor learning

- Increase number of trials
- Use a smaller set of words (a relatively small set is already recommended)
- Carefully arrange timing between model and the child’s attempt and modify over time (lengthen if successful)
- Use other facilitators
 - Slowed rate
 - Tactile and gestural cues

35

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36

II. Special speech production problems

1. Prosody
2. Vowels
3. Inconsistency in error patterns

37

1. Prosody

- Suprasegmental characteristics of speech, including phrasing, rate, and stress
- Frequently assessment is quite subjective; however, better methods are emerging (e.g., Shriberg, Kwiatkowski & Rasmussen, 1990; PEP-C – Peppe, forthcoming)
- What are you most likely to see? Equal-excessive stress (Shriberg, Aram, & Kwiatkowski, 1997)

38

Working on Prosody

- Shriberg, Aram & Kwiatkowski identified a subgroup of children with CAS for whom excessive/equal/misplaced stress was a chief characteristic
- Sometimes thought to be a response to treatment, rather than an intrinsic aspect of CAS
- Recommendations for avoiding the problem in treatment
 - Avoid prolonged use of abnormal stress patterns, e.g., TI GER for "tiger" instead of TI ger
 - Vary prosodic features, e.g., pitch and loudness as soon as articulation is okay

39

Recommendations for treating prosody in older children from Velleman (1998, 2002)

For lexical stress

- Represent syllables with blocks and stressed syllables with a different color than unstressed syllables

- Work on stress identification
rhiNOcerous

Use backward chaining of multisyllabic words

bik-->A-bic-->syLLAbic--> tisyLLAbic--
multisyLLAbic

40

For Sentential/Phrasal Stress

Work on identification of stressed word in a sentence (beginning with exaggerated emphasis)

Use blocks as for lexical stress and consider backward chaining for phrases & sentences

Practice contrasting stress in words/phrases with contrastive stress (e.g., blackBOARD vs BLACKboard)

41

Practice responding to different wh-questions that elicit different stress:
e.g., Who ate the bread? What did the rat eat? What did the rat do to the bread?

Carry over to reading, then conversation

42

2. Vowels - Reasons to treat vowels...

- Spontaneous or consonant-tx-related improvement does not always occur
- Contribution to intelligibility due to high frequency of occurrence in English
- Developmentally early
- Child's problems may be perceived as a foreign accent
- Vowel errors may not be as uncommon as once thought



Gibbon & Beck, 2002; Gibbon, et al., 1992; Hall, Jordan & Robin, 1993; Pollock & Hall 1991; Stoel-Gammon, 1990

43

Difficulties in targeting vowels



- No easy phonetic placement
- Limited treatment literature
- Harder perceptual judgments than for Cs
- Poorer understanding of vowel development

44

Techniques for addressing vowel errors

(Gibbon & Beck, 2002; Hall et al., 1993)

Begin with stimuable vowels
Auditory bombardment
Treat one vowel at a time

Consider facilitators such as
Choral production
PROMPT
Cued Speech

45

- Follow a traditional hierarchy of activities, beginning with detection, discrimination through production in more difficult contexts
- Minimal pair therapy (after successful production)

46


Visual aids to illustrate vowel contrasts

Shapes
e.g., rounded vs. unrounded

Movement
Monophthongs vs. diphthongs
(truck standing still vs. moving)

Color
All vowels; back vowels; front vowels, etc

Computer programs



(Gibbon & Beck, 2002; Hall et al., 1993)

47

3. Consistency

- Similarity of word production across repetitions
- Related to older concept of stimulability yet now emphasis is on word, not single sound, integrity

48

Informal procedure to assess consistency
(Shriberg, Aram & Kwiatkowski, 1997)

- Obtain 2 spontaneous and 2 imitated tokens of selected words on a standard articulation test, particularly multisyllabic words
- Expectations:
 - Children without CAS will usually improve across trials and with model
 - Children with CAS are more likely to show degraded performance across trials

49

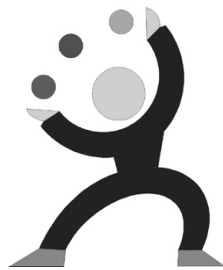
Examples of inconsistencies considered typical of CAS

- kangaroo [tæŋæwʊ], [tæŋæku], [tæŋæwʊk]
 - elephant [ɛnzɛnt], [ɛlɛðɪŋk], [ɛlesɪŋk]
 - dinosaur [daɪnəsɔ], [hɛlæ:əsɔ], [daɪnəsɔ]
 - teeth [tɪf], [tɪs], [tɪt], [tɛf], [tæf]
 - umbrella [ʌmbɛɪə], [ʌnbɛlɪ], [ʌmbæɪə]
- (Dodd, 1995)

50

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51

Addressing literacy issues

While not always present, they often will be, with special difficulties in sound symbol correspondence, sound blending and sound segmentation

Stackhouse & Snowling describe two such children as being different from other dyslexic children; as being deviant rather than delayed in acquiring the alphabetic principle

Stackhouse & Snowling, 1992

52

More on the nature of literacy problems

(Lewis & Eckelman, 2007)

- Studies suggest that spelling problems aren't simply a product of speech production difficulties
 - e.g., spelling errors don't "match" speech errors
- Perceptual weaknesses in
 - phonological awareness and
 - linguistic representations may be more important factors than speech production difficulties
- In addition, language problems seen in children, even without speech problems, are often associated with later literacy challenges

53

- Genetic studies suggest common processes or "component skills" (called endophenotypes in genetics) underlying
 - *reading*,
 - language, and
 - speech may be affected by
- genes that have effects on brain physiology (e.g., cell to cell communication) leading to these shared problems

54

A cascade of effects from brain cells to complex behaviors

- Genes, exposure to toxin, microbe →
- Specific structures in the brain, # and type of connections between different structures in the brain →
- Specific basic psychological processes, such as perception, memory, attention... →
- Complex behaviors, such as speaking, understanding, reading, spelling...

55

Working on Literacy Skills

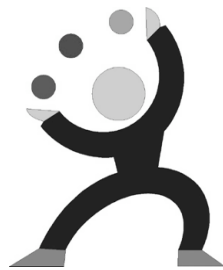
- Address phonological awareness, but consider other language weaknesses that can contribute to reading difficulties (Hoffman & Norris, 2006)
- Suggestions from a case study (Tempest & Parkinson, 1994)
 - Work on sight vocabulary, if child's visual memory skills are strong, using rebuses
 - Have the child learn words then create stories created using them
 - Make use of tactile, visual, and auditory cues in word learning
 - Address speech needs with Metaphon type treatment, which includes phonological awareness activities

Hoffman & Norris, 2006; Tempest & Parkinson, 1994

56

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57

Last Group Exercise



- Read over the case study in the handouts
- Discuss your initial ideas for planning treatment in a small group including the following topics:
 - How would you incorporate principles of motor learning
 - What special areas of speech production may you want to work on
 - What other areas seem to require attention?

58

References - Treatment

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