

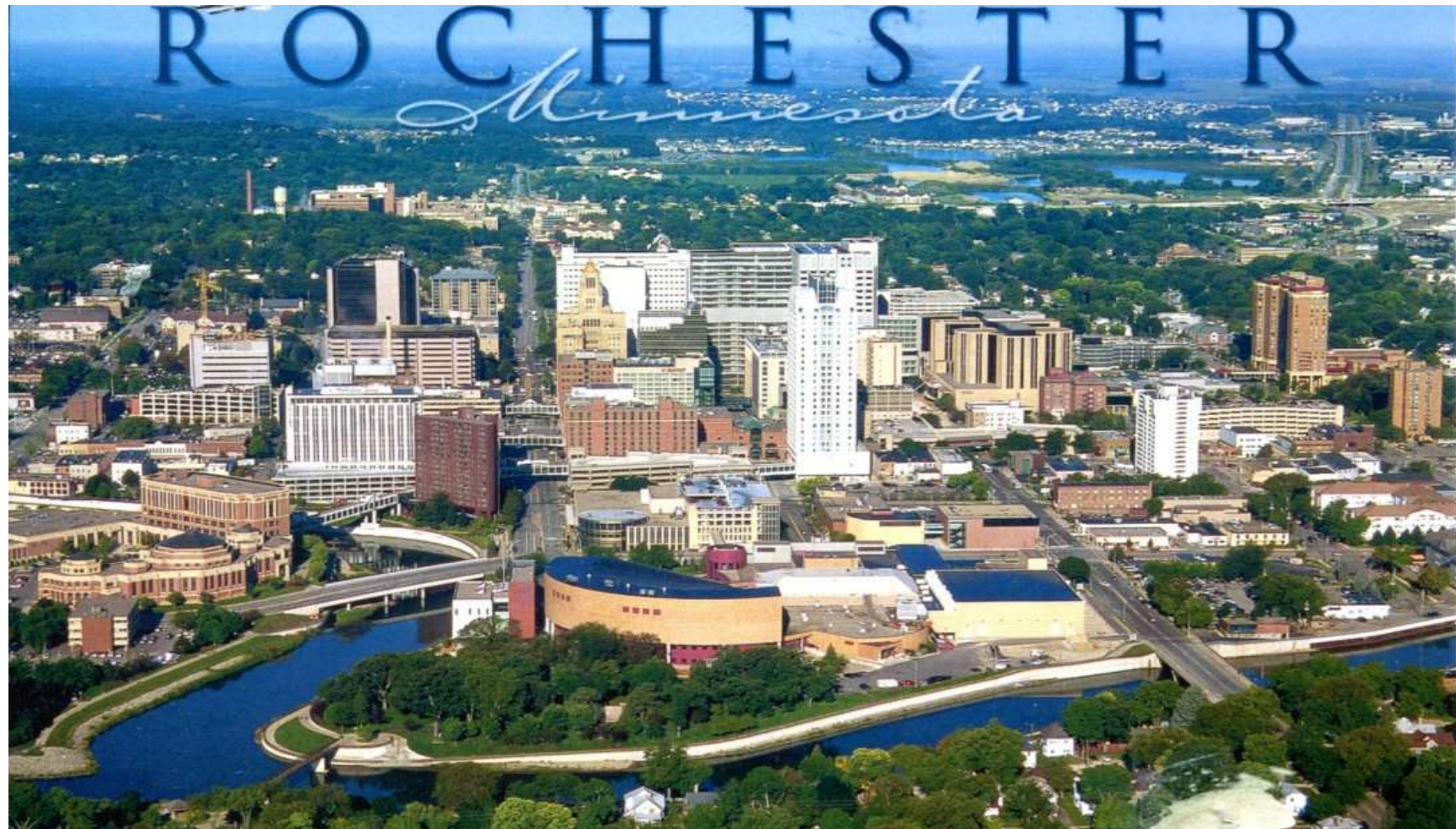
# Current Developments in Evidence Based Practice for Treatment of Childhood Apraxia of Speech

Ruth Stoeckel, Ph.D., CCC-SLP

Mayo Clinic

Mayo Clinic Children's Center





Mayo Clinic Children's Center





## Mayo Clinic in Rochester, Minnesota

- tertiary care center
- Speech Pathology department with a reputation for expertise in adult and pediatric motor speech disorders.
- Many children are seen for second opinion as well as initial diagnosis; some children are seen for treatment.

Mayo Clinic Children's Center





# Childhood Apraxia of Speech: Evidenced-based Practice for Treatment

- What is Childhood Apraxia of Speech (CAS)?
- What are comorbidities co-occurring with CAS?
- What is the current research for treatment of CAS?

# Brief Definitions of Speech Sound Disorders (SSDs)

- All speech involves movement, however we differentiate disorders by primary aspects of impairment:
- Phonologic disorder
  - Impairment of *linguistic* knowledge
- Dysarthria
  - Impairment of *motor execution*
- CAS
  - Impairment of *motor planning/programming*

# What is Childhood Apraxia of Speech (CAS)?

It is a

- neurologic
- pediatric
- **speech** sound disorder

In which the precision and consistency of movements are impaired in the absence of neuromuscular deficits

# CAS

“The core impairment in planning and/or programming spatiotemporal parameters of movement sequences results in errors in speech sound production and prosody.”

ASHA Technical Report, 2007

Mayo Clinic Children's Center



# ASHA Technical Report, 2007

- identified CAS as a unique speech sound disorder requiring its own research and treatment methodologies
- provided clinicians and researchers with information to increase consistency in diagnosis and treatment methods



# Diagnostic Symptoms of CAS (Technical Report 2007)

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.

- Video example of CAS.

# Co-occurring Issues

- There is a robust finding in the literature of an association between early speech-language problems and later academic problems.
- Research suggests that this association appears to be true for children with CAS (e.g., Lewis & Ekelman, 2007)

# 2016 Retrospective Study At Mayo Clinic

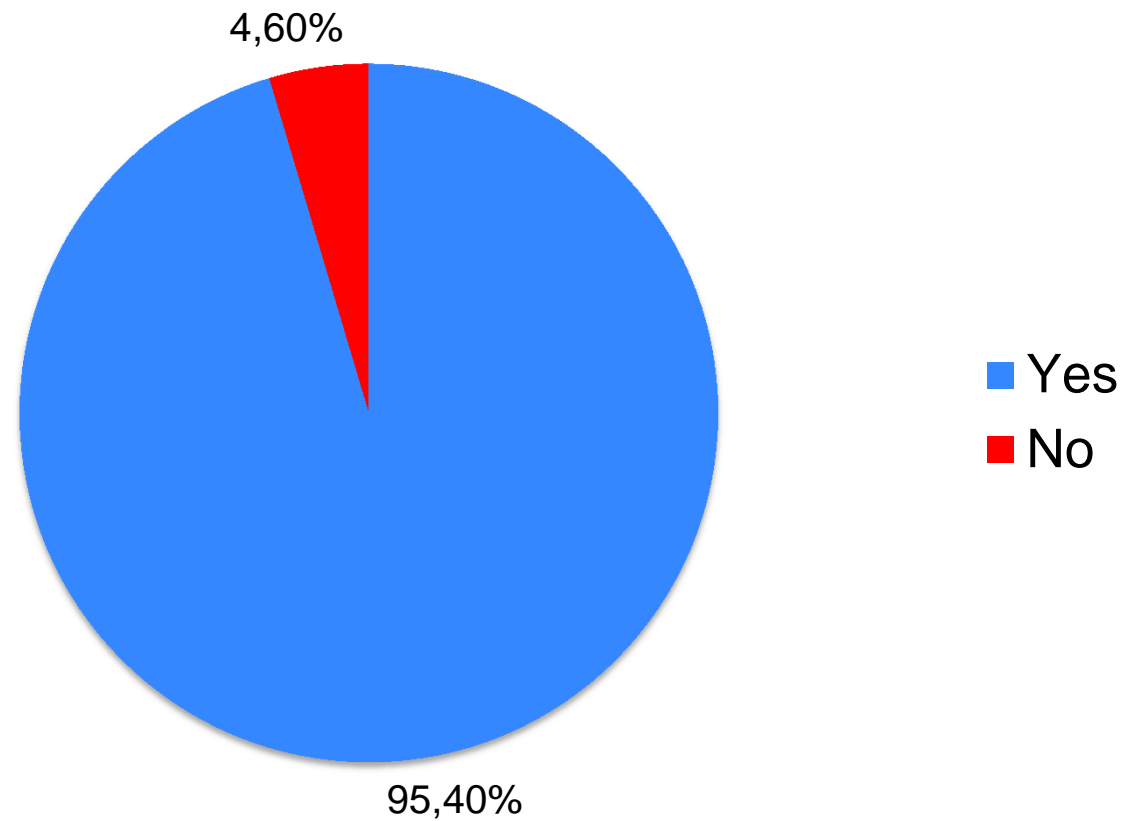
- A cohort of **391** children was identified
- Medical records of children were reviewed who were
  - Seen by a Mayo Clinic SLP between 2007 and 2015
  - Given a diagnosis of CAS by one or more Mayo SLPs

# Initial Analysis: Comorbidities Categorized

- Cardiac issues
- Craniofacial issues
- Developmental/Cognitive Delay
- Dysarthria
- Genetic anomalies
- GI/Feeding problems
- Hearing problems
- Idiopathic CAS
- Neurologic problems (including abnormal MRI)
- Psychiatric/Behavioral Disorders
- Visual problems
- Other speech issues
- Other health issues



# Results: Expressive Language Delay



Mayo Clinic Children's Center

# Treatment: Research to Practice

- *Communication* is the priority
  - ✓ For minimally verbal children, you may need to start with imitation, AAC, etc. (DeThorne, et al., 2009)
  - ✓ The child needs to understand the task; intent to improve movement (Maas, et al., 2008)
  - ✓ Promote early success – the child should be stimulable for targets (Maas, et. al, 2008)
  - ✓ Use of functional targets can increase motivation (Strand & Debertine, 2000)

# Treatment: Minimally Verbal Children (DeThorne, et al., 2009)

- Provide access to AAC
- Minimize pressure to speak
- Imitate the child
- Use exaggerated intonation and slowed tempo
- Augment auditory, visual, tactile and proprioceptive feedback
- Avoid emphasis on nonspeech-like articulator movements: focus on function

# Treatment options for Children with CAS

- Integral stimulation/Dynamic Temporal and Tactile Cueing (DTTC)→ Emphasizes auditory and visual models
- Prosodic→ Emphasizes melody and rhythm as facilitators
  - Rapid Syllable Transition (ReST)
- Linguistic → incorporates phonological awareness  
Gillon

# Treatment options for Children with CAS

- Biofeedback → use of real-time imaging
  - Ultrasound
  - Palatal prosthesis
- Tactile/gestural → Touch/gestures are emphasized
  - PROMPT



# Treatment: Research to Practice

- Non-proven approaches
  - Nonspeech “exercises”, oral stimulation
  - Listening therapy/auditory integration
  - Diet and dietary supplements
  - Auditory processing interventions (e.g., Interactive Metronome, Forebrain, FastForWord)
  - Cranial manipulation/craniosacral therapy
  - Many others

# Treatment Research to Practice: Evidence from Systematic Reviews for...

- Dynamic Temporal and Tactile Cuing (DTTC)/Integral Stimulation
- Rapid Syllable Transition (ReST)
- Biofeedback
- PROMPT
- Nuffield Dyspraxia Programme (NDP3)
- Integrated Phonological Awareness Intervention

(Koehler, 2015; Murray, McCabe & Ballard, 2014; Maas, Gildersleeve-Neumann, Jakielski & Stoeckel, 2014)

Mayo Clinic Children's Center



# Treatment Research to Practice

- Strongest evidence for DTTC/Integral Stimulation

- Small scale studies

(Edeal & Gildersleeve-Neumann, 2011; Maas, Butalla & Farinella, 2012; Maas & Farinella, 2011; Maas, et al., 2008; Strand, Stoeckel, & Baas, 2006; current study, Maas & colleagues)

.

# Treatment Research to Practice

- Randomized, Control Study of ReST and NDP3 (Murray, McCabe & Ballard, 2016)
- Biofeedback (Ultrasound) (Preston, Brick & Landi, 2013)
- PROMPT (Grigos, Hayden & Eigen, 2010; Dale & Hayden, 2013)
- Integrated Phonological Awareness (Gillon, 2013)

# Best Available Evidence

- DTTC
  - for children with more severe CAS
- Integrated Phonological Awareness Intervention
  - for children 4–7 years of age with mild to severe CAS
- ReST
  - for children 7–10 years of age with mild-to-moderate CAS"



# Key Aspects of Treatment

- Quality Practice
- Principles of Motor Learning
- Intensity

# Treatment: Quality Practice

- A child should be able to achieve acceptable accuracy with some degree of assistance
- Working for accuracy from the start allows the child to develop automaticity for movements

# Treatment

## Principles of Motor Learning

- Choices need to be made about:
  - Organization of sessions
  - How to teach targets depending on
    - severity and type of motor speech disorder
    - immediate goal (acquisition vs stabilization/transfer)

(Maas, et al., 2008)

# Treatment: Principles of Motor Learning

- Practice Distribution:
  - Mass (many repetitions in a short period of time) vs Distributed (fewer repetitions over longer period of time)
- Practice Variability:
  - Constant (always the same) vs Variable (changing rate, prosody, etc.)

# Treatment: Principles of Motor Learning

- Practice Schedule
  - Blocked (predictable order) vs Random (varied order)
- Rate
  - Slowed (for accuracy) vs Varied (for automaticity)

# Treatment: Principles of Motor Learning

- Feedback Type
  - Performance vs Outcome/Results
- Feedback Frequency
  - Immediate vs Delayed

# Treatment: Intensity

- More frequency (intensity) of sessions or more intensity of practice within sessions results in better outcomes than less frequent sessions or less intense practice
- Optimal treatment intensity is specific to the intervention(s) being used and to the speech disorder being treated.

(Kaipa & Peterson,2016)

# Treatment: Intensity

- The 3 treatments with demonstrated treatment effects are recommended to have sessions at least twice per week and with greater than 60 trials per session





# Summary

- There is relatively limited evidence to guide intervention for CAS, however, it is growing rapidly
- Based on best available evidence, we can identify specific approaches and key aspects of those approaches that will help clinicians to achieve positive outcomes for children with CAS

# For the Future

- More research is needed, particularly in the area of children who speak languages other than English
- It is important to continue to train clinicians to appropriately diagnose and treat CAS
  - With treatment research an important component of this effort

Thank you to the participants in Linz for continuing to work to develop international expertise regarding CAS!

