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CHILDHOOD APRAXIA OF SPEECH (CAS) - OVERVIEW AND TEACHING STRATEGIES

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Abstract:
Childhood apraxia of speech (CAS) also known as Developmental verbal Dyspraxia (DVD) is an unusual speech disorder in which a child struggles on realising accurate mouth, jaw and tongue movements in order to speak. Children with CAS have problems saying sounds, syllables, and words. It's important to know that CAS is just a label for a speech disorder. In other words, the child's brain has to learn how to make plans that tell his or her speech muscles how to move the lips, jaw and tongue in ways that result in accurate speaking. At the same time, these movements must ensure that the speech is occurring at normal speed and rhythm. In childhood apraxia of speech, the brain struggles to develop plans for speech movement. As a result, children with CAS don't learn accurate movements for speech with normal ease. In CAS, the speech muscles aren't weak, but they don't perform normally because the brain has difficulty leading or harmonizing the movements. A child with apraxia cannot move his or her lips or tongue to the right place to say sounds correctly because the message from the brain to the mouth is disrupted.

Keywords: apraxia of speech (CAS), speech and language disorder, teaching strategies

1. Apraxia

Apraxia is an acquired disorder of motor planning, but is not caused by incoordination, sensory loss, or failure to comprehend simple commands (which can be tested by asking the person to recognize the correct movement from a series). It is caused by damage to specific areas of the cerebrum. Apraxia should not be confused with ataxia, a

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lack of coordination of movements; aphasia, an inability to produce and/or comprehend language; abulia, the lack of desire to carry out an action; or allochiria, in which patients perceive stimuli to one side of the body as occurring on the other.

2. Types of apraxia

There are several types of apraxia including:

- Ideomotor apraxia is a deficit to organize or complete motor actions that depend on semantic memory. The patients are capable to describe how to perform an action, but unable to "imagine" or act out a movement such as "pretend to brush your teeth" or "pucker as though you bit into a sour lemon." The ability to perform an action automatically when cued, however, remains intact. This is known as automatic-voluntary dissociation.
- Ideational/conceptual apraxia: Patients have an incapability to theorize a task and impaired ability to complete multistep actions. Consists of an inability to select and carry out an appropriate motor program.
- Buccofacial or orofacial apraxia: Non-verbal oral or buccofacial ideomotor apraxia resulting in difficulty carrying out movements of the face on demand.
- Constructional apraxia: The inability to draw or construct simple configurations, such as intersecting shapes.
- Gait apraxia: The loss of ability to have normal function of the lower limbs such as walking. This is not due to loss of motor or sensory functions.
- Limb-kinetic apraxia: Difficulty making precise movements with an arm or leg.
- Oculomotor apraxia: Difficulty moving the eye, especially with saccade movements that direct the gaze to targets.
- Apraxia of speech (AOS): Difficulty planning and coordinating the movements necessary for speech. It can independently occur without issues in areas such as verbal comprehension, reading comprehension, writing, articulation or prosody.

Apraxia is most often due to a lesion located in the dominant (usually left) hemisphere of the brain, typically in the frontal and parietal lobes. Lesions may be due to stroke, acquired brain injuries, or neurodegenerative diseases.

3. Childhood apraxia of speech and other childhood speech disorders

"Childhood apraxia of speech (CAS) is a neurological childhood (paediatric) 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). CAS may occur as a result of known neurological impairment, in association with complex neurobehavioral disorders of known or unknown origin, or as an idiopathic neurogenic speech sound disorder. The core impairment in planning and/or programming spatiotemporal parameters of movement sequences results in errors in speech sound production and prosody."

American Speech-Language-Hearing Association
(ASHA) Ad Hoc Committee on Apraxia of Speech in Children, (2007)

There are three significant features that differentiate CAS from other childhood speech sound disorders. These features are:

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

Even though CAS is a developmental disorder, it will not simply vanish when children grow older. Children with this condition do not follow classic patterns of language acquirement and will need special treatment in order to make progress.

4. Symptoms

Children with childhood apraxia of speech (CAS) may have many speech symptoms or characteristics that vary depending on their age and the severity of their speech problems.

CAS can be associated with delayed onset of first words, a limited number of spoken words, or the ability to form only a few consonant or vowel sounds. These symptoms usually may be noticed between ages 18 months and 2 years, and may indicate suspected CAS.

As children produce more speech, usually between ages 2 and 4, characteristics that likely indicate CAS include vowel and consonant distortions; separation of syllables in or between words; and voicing errors, such as "pie" sounding like "bye."

Many children with CAS have difficulty getting their jaws, lips and tongues to the correct position to make a sound, and they may have difficulty moving smoothly to the next sound.

Children vary in how quickly their speech improves, but with speech therapy many children with CAS develop understandable speech.

Many children with CAS also have language problems, such as difficulty comprehending speech, reduced vocabulary or difficulty with word order.

Some symptoms may primarily be seen in children with CAS and can be helpful to diagnose the problem. However, some symptoms of CAS are also symptoms of other types of speech or language disorders. It's difficult to diagnose CAS if a child has only symptoms that are found in both CAS and in other types of speech or language disorders.

Some characteristics, sometimes called markers, help distinguish CAS from other types of speech disorders. Those particularly associated with CAS include:

- Difficulty moving smoothly from one sound, syllable or word to another
- Groping movements with the jaw, lips or tongue to make the correct movement for speech sounds
- Vowel distortions, such as attempting to use the correct vowel, but saying it incorrectly
- Using the wrong stress in a word, such as pronouncing "banana" as "BUH-nan-uh" instead of "buh-NAN-uh"
- Using equal emphasis on all syllables, such as saying "BUH-NAN-UH"
- Separation of syllables, such as putting a pause or gap between syllables
- Inconsistency, such as making different errors when trying to say the same word a second time
- Difficulty imitating simple words
- Inconsistent voicing errors, such as saying "down" instead of "town," or "zoo" instead of "Sue"

Other characteristics are seen in most children with speech or language problems and aren't helpful in distinguishing CAS. Characteristics seen in both children with CAS and in children with other types of speech or language disorders include:

- Reduced amount of babbling or vocal sounds from ages 7 to 12 months old
- Speaking first words late (after ages 12 to 18 months old)
- Using a limited number of consonants and vowels
- Frequently leaving out (omitting) sounds
- Difficult to understand speech
- Other speech disorders sometimes confused with CAS

Some speech sound disorders often get confused with CAS because some of the characteristics may overlap. These speech sound disorders include articulation disorders, phonologic disorders and dysarthria.

A child who has trouble learning how to make specific sounds, but doesn't have trouble planning or coordinating the movements to speak, may have an articulation or phonologic disorder. In an articulation disorder, a child has difficulty with specific sounds. He or she may leave out the sound or use another sound in its place. In

phonologic disorders, a child has certain sound error patterns, such as difficulty producing sounds in the back of his or her mouth.

Many children with childhood apraxia of speech (CAS) have other problems that affect their ability to communicate. These problems aren't due to CAS, but they may be seen along with CAS. Symptoms or problems that are often present along with CAS include:

- Delayed language, such as difficulty understanding speech, reduced vocabulary, or difficulty using correct grammar when putting words together in a phrase or sentence
- Delays in intellectual and motor development and problems with reading, spelling and writing
- Difficulties with gross and fine motor movement skills or coordination

Hypersensitivity, in which the child may not like some textures in clothing or the texture of certain foods, or the child, may not like tooth brushing.

5. Diagnosis

The current knowledge that we have about Childhood Apraxia of Speech (CAS) is that CAS occurs in the following 3 conditions:

1. Neurological impairment caused by infection, illness, or injury, before or after birth or a random abnormality or glitch in fetal development. This category includes children with positive findings on MRI's of the brain.
2. Complex Neurodevelopmental Disorders – We know that CAS can occur as a secondary characteristic of other conditions such as genetic, metabolic, and/or mitochondrial disorders. In this category would be Childhood Apraxia of
3. Speech that occurs with Autism, Fragile X, Galactosemia, some forms of Epilepsy, and Chromosome translocations involving duplications and deletions.

The following five speech characteristics that an individual with apraxia of speech may exhibit:

- Effortful trial and error with groping
- Self-correction of errors
- Abnormal rhythm, stress and intonation
- Inconsistent articulation errors on repeated speech productions of the same utterance
- Difficulty initiating utterances

Childhood Apraxia of Speech (CAS) can be diagnosed by a speech language pathologist (SLP) through specific tests that measure oral mechanisms of speech. The oral

mechanisms exam comprises tasks such as pursing lips, blowing, licking lips, elevating the tongue, and also involves an examination of the mouth. A complete exam also includes surveillance of the patient eating and talking. Tests such as the Kaufman Speech Praxis test, a more formal examination, are also used in diagnosis.

A differential diagnosis of CAS is frequently not possible for children under the age of 2 years old. Even when children are between 2–3 years, a clear diagnosis cannot always occur, because at this age, they may still be not capable to focus on, or collaborate with testing procedures

6. Management and Therapies

There is no cure for CAS, but with suitable, intensive involvement, children with the disorder can improve considerably.

CAS requires various forms of therapy which varies with the individual needs of the patient. Typically, treatment involves one-on-one therapy with a speech language pathologist (SLP). In children with CAS, consistency is a key element in treatment. Consistency in the form of communication, as well as the development and use of oral communication are extremely important in aiding a child's speech learning process.

Many therapy approaches are not supported by thorough evidence; however, the aspects of treatment that do seem to be agreed upon are the following:

- Treatment needs to be intense and highly individualized, with about 3-5 therapy sessions each week
- A maximum of 30 minutes per session is best for young children
- Principles of motor learning theory and intense speech-motor practice seem to be the most effective
- Non-speech oral motor therapy is not necessary or sufficient
- A multi-sensory approach to therapy may be beneficial: using sign language, pictures, tactile cues, visual prompts, and Augmentative and Alternative Communication (AAC) can be helpful.

The child with CAS should begin speech therapy as soon as the disorder is identified. A speech-language pathologist will know how much therapy a child will require. Speech therapy helps the brain form new connections to help make the movements for speech. The speech-language pathologist may use several different techniques to help the child learn to produce and sequence speech sounds. There is not one program used to treat CAS. Treatment will depend on the child's speech characteristics, age and ability level. In some cases, sign language or a talking device are used to help the child communicate until the child's speech is clear to others.

The goal of speech therapy is to teach the child a new motor skill. For this skill to become easy, the child must practice often between speech therapy sessions. The parent should work with the child a few minutes several times each day. Short, frequent sessions are better than occasional long sessions. The more the child practices, the faster the progress will be noticed and the sooner the child will be able to develop clear speech. Speech therapy will also focus on improving the language system in children with both speech and language deficits; pre-literacy and literacy skills may also be addressed in older children with CAS.

8. Teaching Strategies

Speech services for a child with apraxia of speech are typically provided by a speech language pathologist. However, elementary children would benefit more from their speech services if the same expectations and support are provided in the classroom.

General elementary teachers can use some of the strategies in the classroom to provide support as they are needed:

> *"In the school setting, classroom teachers are a readily available resource for carryover practice collaboration"*
>
> *(Hammer, 2009, p. 34)*

Teachers are needed for providing support in the classroom related to what an individual is doing with the speech-language pathologist. Collaboration between the speech-language pathologist, classroom teacher, and family is needed in order to develop and support meaningful and effective interventions. The communication within this team should be seamless. The speech-language pathologist is in charge of what therapies are used and should communicate practice activities or strategies for teachers and parents to utilize during their time with the child.

A child with apraxia needs continuity throughout the avenues of his daily interactions with others in order to make use of the strategies and techniques he learns in therapy; if he never uses them in authentic situations, then the purpose of therapy is defeated. Using the literature on young children and adults, teachers can use aspects of the treatments described regularly in the classroom as deemed appropriate to improve outcomes for elementary students.

Music and rhythmic speech can be utilized when students read passages chorally as a class or when students sing songs, even if those songs are not academic. Choral reading and singing are ways to incorporate all students and still aid those with

childhood apraxia of speech (CAS) in developing appropriate rate and rhythm.

Researchers of young children mentioned above encourage the use of music and melody in treatment. Cueing systems and self-awareness can play a part in the general education classroom for elementary students with CAS if they are part of the treatment implemented by the speech language pathologist. For instance, teachers could act as encouragers of various cues during class and could provide feedback related to errors when appropriate during class. Seating the student closer to the teacher may also be preferable to provide for quick connection. Researchers of young children mentioned above suggest the use of cueing systems and encourage self-awareness to aid the individual in realizing the current and desired actions.

Communication skills are an aspect that general elementary teachers can also incorporate based on the research provided. Communication can be achieved in different ways in the classroom, and, depending on the students, may be implemented in various ways.

Alternate forms of communication suggested for use with adults include communication books, drawing systems, and gestural systems. Each of these could be practiced and utilized as a regular part of the classroom in order to help a student with CAS to be unlimited by speech challenges; conversely, a teacher would not want to discourage a student's speech. Role play and practicing conversational language, like less-formalized script training, could be implemented in the classroom as well. Students could practice together and work as partners, perhaps as a station or center activity.

Elementary students tend to enjoy interacting with one another, even if they are given specific role play guidelines. Conversation partners may be an option depending on the grade level of students and speech skills of the student with CAS in the classroom.

Modelling, repetition, and word familiarization can be addressed by elementary teachers in a way that aids students with CAS in the general education setting. Modelling via the "I do, we do, you do" strategy, suggested by ASHA (2007), is beneficial for many students, regardless of CAS classification; however, in reference to students with CAS, this modelling strategy allows for the teacher to determine the pace and support given at each stage. If more repetition is necessary, then the teacher can incorporate more practice according to need. For students who need additional experiences with words, teachers can modify multi-sensory approaches, recommended for children and adults, like the integrated phonological approach and the semantic feature analysis approach. Both approaches utilize visuals, repetition, and a playful atmosphere. The more students believe that practice is fun or a game, the more they will likely enjoy and engage in it.

All of the suggestions provided based on the literature available on young children and adults are best accompanied by more classroom management related tips provided by Bahr, Velleman, and Ziegler (1999). Examining the relationships between the teacher, speech language pathologist, and students provides insight as to how to make it all work. For instance, all students need to feel valued and comfortable in their classroom environment. Creating a classroom community that promotes learning for all students regardless of ability by teaching them to respect one another will encourage students to feel valued and comfortable.

Establishing trusting relationships is also another task pertinent to aiding an elementary student with CAS because when a student trusts those who can help them, they are generally more open to receive the help.

9. Conclusion

The strategies and suggestions for teachers provided above are intended to help teachers be part of the treatment process in the classroom by adjusting and incorporating aspects of classroom practices that can make a big difference. Research regarding elementary aged students with childhood apraxia of speech and formalized strategies for general elementary teachers to use in the classroom are still in need. The need for information regarding elementary students with CAS is pertinent.

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