- Praxis: Ελληνική Λέξη που σημαίνει « κίνηση»

- Στοιχεία Πράξης περιλαμβάνουν: μίμηση, ξεκίνημα, μέτρηση δύναμης, διαδοχή, χρόνο, και οργάνωση κίνησης

- Οργάνωση

- Απραχία είναι η μείωση της ικανότητας οργάνωσης και πράξης στοχευμένων κινήσεων

- Απραξία μπορεί να γίνει/παρουσιαστεί σε οποιοδήποτε μέρος του σώματος

3 Τύποι Απραξίας

- **Απραξία στα άκρα:** Αναφέρεται στην ανικανότητα πράξεις καθορισμένων και στοχευμένων εκούσιων κινήσεων με τα δάκτυλα, χέρια, ποδιά (άλλος ονομάζεται Δυσπραξία)
- **Non-Verbal Oral Apraxia:** αναφέρεται στην ανικανότητα του ατόμου να πράξει προσωποκινητικές κινήσεις μετά από υπόδειξη ή διαταγή.
- **Απραξία της Ομιλίας :** Αναφέρεται στην ανικανότητα του ατόμου να οργανώση, να συγχρονίσει και να διαδοχοστοιχίσει τους απαραίτητους ήχους/φωνήματα για εκούσια ομιλία (CAS in children; AOS in adults)

ASHA's Definition of CAS

"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…the core impairment in planning results in errors in speech sound production and prosody."

ASHA Technical Report 2007

Apraxia or Dyspraxia?

Look at the prefixes in medical terminology:

“a” means absence or total loss

“dys” means partial loss

In the past some SLPs used the term Dyspraxia to refer to a milder form of verbal apraxia

But…Dyspraxia is a term used to refer to limb apraxia and it has its own ICD-10 code

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 verbal apraxia occurs in adults, it is acquired

In children, the verbal apraxia can occur congenitally or be acquired anytime during the developmental period of speech acquisition

Etiologies of Childhood Apraxia of Speech

Neurologic Impairment – CAS can occur as a result of infection, illness, injury, trauma or stroke (MRI will be remarkable)

Complex Neurodevelopmental Disorder – CAS can occur as a secondary diagnosis of other primary diagnoses including genetic, metabolic and/or mitochondrial disorders (e.g. Autism, Fragile X, Down Syndrome, Epilepsy)

Idiopathic Neurogenic Speech Sound Disorder – CAS can occur as a disorder of unknown origin which means no observable neurological abnormalities or neurodevelopmental conditions are present

Who Diagnoses CAS?

CAS is a speech sound disorder, therefore, it is

diagnosed by a speech-language pathologist

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)

The SLP should document the atypical speech development (motoric) and explain how this differs from a developmental language delay (linguistic)

ICD-10 Codes

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

Code for Childhood Apraxia of Speech (CAS): R48.2

Code for Phonological and Articulation Disorders: F80.0

Code for Expressive Language Disorder: F80.1

Code for Mixed Receptive-Expressive Language Disorder: F80.2

Code for Dysarthria (in children/non post CVA): R47.1

Code for Dyspraxia (limb apraxia, clumsy child syndrome, developmental coordination disorder): F82

Should We Diagnose CAS In Children Under Age 3?

SLPs should be cautious about giving a firm diagnosis of CAS prior to age 3 for two main reasons:

First, we cannot formally diagnose CAS until the child is verbal - CAS is a speech disorder (motoric), not a language disorder (linguistic)

Second, there is still a lot of brain development occurring prior to age 3

Early Brain Development

Because most of brain development occurs prior to age 3, the earlier we treat these kids, the better their prognosis becomes.

Early Brain Development

Babies are born with 100 billion neurons. Prior to age 3 the young brain must establish and reinforce connections between neurons. These connections are formed when impulses are sent and received between neurons. Axons send the messages and dendrites receive them. These connections form synapses. During the first 3 years of life the number of neurons stay the same but the number of synapses increases. (www.classbrain.com article 30)

The Brain is Not Complete at Birth!

Synapses = wiring

Synaptic connections are created at a rapid rate through age three

By age three, 85% of the core structures of the brain are formed

While synapses are developing, the brain builds the

potential to learn

Repetition of appropriate interactions will help the brain reinforce existing synaptic connections & make new ones

(www.wccf.org , www.zerotothree.org, www.classbrain.com article 30)

CAS is a Dynamic Speech Sound Disorder: Δυναμική Δυσλειτουργία Ομιλίας/ήχων

CAS PHONOLOGY ARTICULATION

Dynamic = Symptoms change over time

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

The Challenge of Diagnosing Very Young Children

"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

We do not yet have a blood test or brain scan that can lead to a clinical diagnosis of CAS. Therefore, SLPs must rely on signs and symptoms in very young, minimally verbal children.

In order to administer a standardized apraxia test, we need 2 things:

A willing participant

A child with imitation skills

Making a Diagnosis

Once the child is verbal enough to participate in a formal evaluation using a standardized testing tool, it becomes easier to give an accurate diagnosis of CAS.

Until that time, we report the characteristics, signs and symptoms of the motor planning difficulties and state that we are suspecting CAS as the cause for the lag in speech development.

sCAS = Working Diagnosis (Υποψιαζόμενη Απραξία της Ομιλίας)

That's why we use the term **suspected Childhood Apraxia of Speech** (sCAS) when working with very young, minimally verbal children

Misdiagnosing CAS

Research has shown that many children with a diagnosis of CAS have been incorrectly diagnosed. (Davis, Jakielski, & Marquardt; ASHA 2007)

Why is this occurring?

Diagnosing too young

Diagnosing speech disorder in children w/o speech

Professional other than SLP making the diagnosis

Lack of specific guidelines regarding when it's "ok" to make the diagnosis

Why is it so Difficult to Diagnose Childhood Apraxia of Speech?

Question:

Why is it so difficult to correctly diagnose CAS and so easy to misdiagnose it?

Answer:

Because many of the characteristics overlap with other disorders; there is no blood test or genetic screening tool by which to make the diagnosis; CAS may be a secondary diagnosis instead of the primary diagnosis; and symptoms may change over time (Lewis et al. 2004)

The Complexity of Speech

(It's a miracle we speak at all!)

CAS is a MOTOR disorder – and speech is the most finely tuned motor act we perform

Speech = coordination of respiration, phonation,

articulation and resonation

Speech requires the coordination of more than 70 muscles and body parts

"Given this complexity, even mild motor difficulties

are enough to disrupt speech development."

Jennejahn & Turner

Key Diagnostic Features of CAS

Atypical development (carefully scrutinize the birth to 15 month period of development)

Strong desire to talk

Effort associated with talking

Difficulty sequencing sounds & syllables

Inconsistent speech sound errors

Vowel errors

Prosodic abnormalities

History of “pop-out” words

Use of “go-to” sound/word

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

We must be skilled at diagnostic therapy in order to make a differential diagnosis by identifying specific characteristics to confirm or rule in or rule out our working diagnosis of suspected CAS

Suspected CAS or Autism?

Some young children with Childhood Apraxia of Speech (CAS) may be mis-diagnosed as having Autism Spectrum Disorder (ASD) because there are 4 primary overlapping symptoms that commonly occur in both disorders including:

Child is minimally verbal

Child has social deficits

Child has poor eye contact

Child has sensory issues

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 NOT a communication risk-taker
- May have sensory issues

Autism Spectrum Disorder

- Lacks social referencing/ overall poor eye contact
- Limited speech production because child lacks symbolism/doesn't understand that words have power or inappropriate speech production due to echolalia and scripting
- Likely has sensory issues

Suspected CAS

- Motorically based
- Vowel errors
- Inconsistent errors
- Effortful speech
- Errors increase as length/complexity of utterance increases
- Impaired prosody
- Success with speech is situationally dependent - "on demand" vs. "automatic"

Dysarthria

- Linguistically based
- Vowels typically intact
- Consistent error patterns
- Speech is not effortful
- Errors consistent regardless of utterance length
- Prosody is intact
- No difference in how easily speech is produced based on the situation

It is important to remember that while kids with autism have sensory dysfunction, not all kids with sensory dysfunction have autism!

Beware!

CAS + SPD can mask as ASD

Differential diagnosis is critical!

Suspected CAS

- Difficulty planning the movements necessary for speech – lack of consonants and vowels
- Difficulty with motor PLANNING
- Not associated with weakness
- Receptive language better than expressive

Dysarthria

- Difficulty in the actual production of speech – distortion of consonants and vowels
- Difficulty with motor EXECUTION
- Characterized by weakness
- No significant difference between receptive & expressive language skills

Suspected CAS

- No difficulty with involuntary motor control for eating (unless there is also oral apraxia)
- Inconsistent speech errors
- Prosody is disrupted – rate, rhythm , inflection patterns & stress impaired – better control of pitch and loudness
- Voice quality is intact

Dysarthria

- Difficulty with involuntary motor control for eating due to muscle weakness and incoordination
- Articulation is imprecise, but errors are consistent
- Monotone voice common; difficulty controlling pitch and loudness levels
- Voice quality may be impaired depending on type of dysarthria

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

Weakness problems (Dysarthria) vs. Praxis problems (CAS)

Differential Diagnosis

Suspected CAS vs. Phonological Disorder

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 (Pam Marshalla said that backing and initial consonant deletion are indicative of a more severe and a more persistent speech sound disorder)

Differential Diagnosis

Suspected CAS vs. Language Delay

While children develop skills at different rates, 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. If the developmental sequence is out of order/atypical then the child is more likely exhibiting a disorder.

Delay: child follows a typical path of development, it just takes longer

Disorder: child acquires milestones out of sequence/ scattered skills/lacks the foundation skills on which to build

- Slow, inconsistent progress
- Noticeable difficulty with vowel sounds
- Limited babbling history
- Restricted sound inventory
- Disruption in the normal sequence of development- "atypical development"
- Impaired prosody
- Plays silently (even during high energy play)

- More rapid, consistent progress
- Vowels intact
- Typical babbling history
- Wider variety of speech sounds in repertoire
- Speaks like a child who is chronologically younger - "delayed or late talker"
- Prosody is intact
- Is noisy during play

Differential Diagnosis

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

Language Delay (late talker)

Suspected CAS (motor planning/praxis problems)

Dysarthria (motor execution/weakness)

Phonological Disorder (patterns of sound errors)

Autism Spectrum Disorder (communicative intent)

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

Appropriateness of the therapy

Family involvement

Etiology

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