Your two-year-old has several sounds and does not have any true words, although she understands everything you say. Your five-year-old speaks in a very slow and halting manner and there does not appear to be a pattern to his errors: sometimes he says the word correctly and other times he does not. Your six-year- old has very low muscle tone, distorts her /s/ sounds and substitutes her vowel sounds; her mouth is often open and, on occasion, she still drools. Your four-year-old says, "I do" for "I go" and "tup" for "cup." And your five-year-old says, "wabbit" for "rabbit."

Kammie Green: what you may see

Kammie Green: same as above

Following an evaluation with a speech-language pathologist, the first child may be diagnosed with a suspected Childhood Apraxia of Speech (sCAS), the second child with CAS, and the third child with pediatric dysarthria. The four-year-old may be diagnosed with a phonological disorder and the last child likely presents with an articulation disorder.

All five of these children are demonstrating a speech sound disorder that impacts their ability to communicate clearly. Yet, these children are presenting with very different speech disorders, each one requiring a specific treatment.

It's important that we know the difference!

CHILDHOOD APRAXIA OF SPEECH

Childhood Apraxia of Speech (CAS) is a motor speech disorder due to a deficit in motor planning and programming speech movements. Simply, the child knows what they want to say, but cannot plan the motor movements or move their articulators with the right speed at the right time with the right force.

Kammie Green: in brain

According to ASHA (2007), "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 (e.g. abnormal reflexes, abnormal tone). CAS may occur as a result of known neurological impairment, in association with complex neurobehavioral disorders of known and 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" (ASHA, 2007).

Kammie Green: causes

Three consensus features have been identified as discriminatory from other PSSD's in diagnosing a deficit in the planning and programming of movements for speech, consistent with a Childhood Apraxia of Speech.

These features include

1. Inconsistent errors on consonants and vowels in repeated productions of syllables or words. Speech inconsistency is a core

Kammie Green: a sign of apraxia

feature of CAS, according to Iuzzini-Siegel, Hogan, Green, JSHR, 2017 and Grigos, Moss, Lu, JSHLR, 2015.

2. Lengthened and disrupted coarticulatory transitions between sounds and syllables. Syllable segregation, defined as "noticeable gaps between syllables," was observed with significantly greater frequency in children with CAS than in children with speech disorders that do not have CAS (Murray, McCabe, Heard, Ballard, JSLHR, 2015) .
3. Inappropriate prosody, especially in the realization of lexical or phrasal stress. Shriberg, et.al., 2017 found that Lexical stress errors are a result of a deficit at the motor planning and / or programming stage.

Kammie Green: stopping

It can be difficult to diagnose CAS, especially when a child speaks very little. The correct diagnosis will allow for the appropriate treatment approach. Evidence supports an intervention based on the Principles of Motor Learning as the treatment of choice to help practice the skilled movements needed acquire, retain, and generalize motor movements (Maas 2014). Therapy would focus on practicing syllables, words, and phrases using varying prosodic contours. Treatment based on non-speech oral motor exercises has not by proven effective in working with children with CAS (McCauley, Strand, Lof, Schooling, Frymark, AJSLP, 2009).

Kammie Green: how it is treated by therapists

PEDIATRIC DYSARTHRIA

Pediatric Dysarthria is a motor speech sound disorder resulting from neuromuscular weakness, paralysis or incoordination of the muscles needed to produce speech. The child's speech may be slurred or distorted and the speech may range in intelligibility, based on the extent of neurological weakness. There are several types of pediatric dysarthria with varying

Kammie Green: what dysarthria is

characteristics. A child can have too much tone (spasticity) or too little low tone (hypotonicity). The fine motor movements that control respiration (breathing), phonation (movement of the vocal cords during speech), resonance (nasality) and articulation (lips, cheeks, throat, velum, and larynx) are affected. In addition to articulation errors of varying severity, children with dysarthria may experience prosodic (melody of speech) errors due to difficulty changing their pitch and loudness and slow rate of speech. Hypernasality (inappropriate air leakage into the nose during speech) is often noted in children with a dysarthric speech pattern.

Kammie Green: variations based on the way sounds are performed

Kammie Green: common in dysarthric children

Evidence supports that motor learning principles may be associated with increases in speech intelligibility, precision of articulatory movements and voice quality and clarity for children with moderate and severe dysarthria" (Pennington, L., Parker, N. K., et al. (2016).

Kammie Green: levels and severity

ARTICULATION DISORDER

A speech sound disorder that impacts the production of individual sounds (e.g., wabbit/rabbit, wip/lip) is referred to as an Articulation disorder.

Kammie Green: what is an articulation disorder

Treatment of articulation errors may follow a "traditional" articulation therapy approach. This may begin with auditory training to hear the correct sounds, techniques to achieve the correct sounds, production of the new sounds in isolation, then syllables, words, and phrases, and finally to generalization when the child can use their newly acquired sound mastery into situations outside of the therapy room.

PHONOLOGICAL DISORDER

Phonology is the study of the sound system of a language and it tells us the rules that govern how sounds fit together to form words. A child who has a phonological disorder has not learned how these sounds fit together to produce words. There errors follow a pattern and the more error patterns, the more unintelligible a child's speech can appear. A phonological disorder is a language-based and not a motor-based speech sound disorder.

Phonological treatment approaches (e.g., Distinctive Features, Cycles, Minimal Contrasting Pairs) target a group of sounds with similar error patterns (e.g., fronting: d/g: do/go, t/k "tup"/cup), although the actual treatment may target individual sounds. The goal of these phonological approaches is to help the child internalize the phonological rules.

Kammie Green: varying approaches