



Fact Sheet - Speech disorders

Childhood Apraxia of Speech (CAS)

Childhood Apraxia of Speech (CAS) is detectable in early childhood but can continue into adulthood.

Children with CAS have problems saying sounds, syllables, and words accurately and with the correct rhythm.

Although a child with CAS knows what they want to say, their brain struggles to correctly move their lips, jaw, and tongue to speak clearly and be understood.



Learning to speak is like learning to perform any skilled movement like playing the piano or knitting: at first you must concentrate on all the steps involved but with practice this process becomes automatic. While most children memorise the steps involved in speaking, children with CAS must continually re-learn how to produce a word or phrase by asking themselves:

- Which sounds do I need?
- What order do the sounds come in?
- How do I move my lips, tongue etc. to make those sounds?
- Which sounds or words do I stress?

Children with CAS can become frustrated that they cannot communicate clearly or be understood. Families can also find it hard to understand why speech is so difficult for their child when for others it is often automatic or easy.

We don't know exactly how many children have CAS, but we know it is rare. Only one or two children per 1000 enrolled in speech therapy are estimated to have it. CAS is the term most used today in Australia, the United States, Canada, and Europe but it is also known as Developmental Verbal Dyspraxia (typically in the United Kingdom), Apraxia of Speech or Verbal Dyspraxia.

What are the signs of CAS?

There are many different signs and not all children will have the same ones. The signs also change as a child gets older and as the severity of the condition changes.

Young children with CAS may:

- have difficulty feeding
- coo, babble or play with sounds less than other children
- use a limited range of sounds when they do begin to talk
- find it easier to understand others than talk themselves
- visibly struggle to talk; groping or searching for sounds
- be very hard to understand even to people close to them (i.e., family members).

Older children with CAS may:

- struggle with longer words or phrases
- drop or add sounds to words or replace sounds with unexpected sounds (e.g., 'copa' for 'helicopter'; 'umbaneda' for 'umbrella')



- say the same word in a number of different ways (e.g., ‘caterpila’, ‘catiperla’, ‘cratapila’ for ‘caterpillar’)
- stress the wrong part of a word or sentence making their speech sound ‘robotic’ or ‘accented’.

Children with CAS are more likely to have language, reading, and spelling difficulties. Sometimes children with CAS will also have problems with small muscle movements (called fine motor skills, e.g., problems handwriting or cutting) or large muscle movements (called gross motor skills, e.g., running). In some instances, children may also have a diagnosis of motor dyspraxia or developmental co-ordination disorder. Some children also have more generalised learning difficulties such as intellectual disability, or other neurodevelopmental conditions such as autism spectrum disorder, attention deficit hyperactivity disorder, and epilepsy.

What causes CAS?

Unfortunately, we don’t often know. We know that something interferes with messages accurately getting from the brain to the mouth muscles, but we don’t always know why that is. CAS may be caused by genetic changes - some of which we can identify and others which we don’t yet know. There have been over 30 single genes or ‘monogenic’ conditions shown to cause CAS (e.g., *FOXP2*-related speech and language disorder; *CDK13*-related disorder; *SETBP1*-haploinsufficiency disorder, (see <https://www.geneticsofspeech.org.au>).

There are also chromosomal level disruptions that typically involve more than one gene which are also associated with CAS (e.g., 16p11.2 deletion; Koolen-de Vries syndrome).

Children with these conditions most commonly have other health, development, or cognitive difficulties. In a small number of cases, CAS may be caused by a problem breaking down the simple sugar galactose (but this condition is typically detected in the first months of life), or by damage to the brain from a neurological lesion or stroke.

How is CAS diagnosed?

It is important to see a speech specialist (known as a speech pathologist, speech and language pathologist, or speech therapist depending on your country) to confirm a diagnosis of CAS. This is because CAS is a complex condition with a number of signs and associated conditions and speech pathologists are specially trained to be able to recognise CAS. In Australia, your doctor may refer you to a speech

pathologist, but your teacher and other health professionals can too. To diagnose CAS, your speech pathologist will get your child to do a number of ‘talking tests’. The language and speech skills of toddlers naturally vary a lot. This means that before two to three years of age, children with other types of speech and language conditions may share some of the early signs of CAS (e.g., slow to talk, few first words) without having CAS. Because CAS is rare, if you or your speech pathologist are unsure about your child’s diagnosis, it might be best to see a speech pathologist with experience diagnosing CAS.

How is CAS treated?

Early therapy with a speech pathologist can improve your child’s ability to communicate with others and reduce their frustration. Like with any skilled movement, practice or therapy is usually most successful when it happens several times a week. While some children largely overcome CAS with therapy, others find therapy improves their ability to communicate but does not change the concentration CAS demands or the tiredness it can cause.

The type of therapy will depend on:

- the child’s symptoms
- their age
- the severity of their condition, and
- any other health or development problems they have.

Existing treatments have varying levels of efficacy for treating CAS, including:

- Nuffield Dyspraxia Program
- Rapid Syllable Transition Treatment (ReST)
- Dynamic Temporal and Tactile Cueing (DTTC)
- Prompts for Restructuring Oral Muscular Phonetic Targets (PROMPT)

You should ask your speech pathologist about how effective these programs (or the ones they are recommending) will be for your child given their age and symptoms. Therapy may also include activities designed to strengthen literacy and language skills, given children with CAS have a greater risk of problems with these skills.

Children who are experiencing great difficulty with the production of verbal speech may also benefit from multi-modal forms of communication, such as sign language, gesture, or communication devices. These are also known as augmentative or alternative communication (AAC) options. Many parents are concerned that use of AAC may reduce their child’s



verbal speech and language development. However, evidence suggests that providing children with more successful and easier communication options can reduce frustration and will encourage language and speech learning. For example, being able to produce short sentences with a digital device is a very powerful achievement for a child who finds it difficult to produce one syllable words and helps to support their learning of sentence structure or grammar.

Further to speech and language focused therapies, your child may also benefit from seeing:

- Psychologists or counsellors if they are struggling at school with learning or social relationships
- Occupational therapists or physiotherapists if they have fine and/or gross movement challenges
- Neuropsychologists, if they have trouble with attention, memory, or other cognitive issues

Things to remember

- Children with CAS have trouble correctly moving their mouth muscles so they can speak clearly and be understood.
- CAS begins in childhood but often remains throughout adulthood.
- Genetic causes are frequently being identified for CAS (see: <https://www.geneticsofspeech.org.au>)
- It could be helpful to ask your GP whether they feel genetic testing could be relevant for your child. In Australia, we have a genetics of speech clinic where you will see a speech pathologist and a clinical geneticist to see whether there may be a genetic cause for your child's CAS. (<https://www.geneticsofspeech.org.au/research/speech-apraxia-and-genetics-clinic/>)
- It is beneficial to seek help early and get the right treatment and support for your child's symptoms and age.

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