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Speech, language, and *SETBP1*-HD

What is *SETBP1*-HD?

SETBP1 is a gene located at chromosome 18q12.3. *SETBP1* haploinsufficiency disorder (*SETBP1*-HD) occurs when there is a change or small loss (microdeletion) within the *SETBP1* gene. The diagnosis of *SETBP1*-HD is established in an individual by genetic testing.

What are the associated health and medical conditions seen in *SETBP1*-HD?

SETBP1-HD is associated with motor developmental delay, speech and language disorder, attention-deficit/hyperactivity disorder (ADHD), and mild to moderate intellectual disability or learning difficulties.[1-4]

Speech vs Language

The terms 'speech' and 'language' are often used as the same terms; however, they actually mean different things to a speech pathologist:

Speech is focused on speech sounds. This includes accuracy, articulation, breath support, voicing, resonance (e.g., nasality), and prosody (e.g., stress and rhythm).

Language involves the understanding and use of words (vocabulary) and sentences (grammar).

What are the common speech and language features in children with *SETBP1*-HD?

In terms of speech, children with *SETBP1*-HD take some time to develop their verbal speech. The most common speech disorder diagnoses in children with *SETBP1*-HD are typically childhood apraxia of speech (CAS) and phonological disorder.[2]

CAS is a difficulty with how the brain plans speech sounds. Children with CAS know what they want to say, but their brain struggles to correctly move their lips, jaw, and tongue to speak clearly and be understood.

Phonological disorder refers to difficulty understanding and using sounds correctly to covey meaning. Children with phonological disorder also often use sound error patterns that are typically seen in the speech of younger children (e.g., fronting of sounds such as 'tar' for car, reducing sound clusters such as 'bed' for bread etc.).

In terms of language, children with *SETBP1*-HD also have difficulties expressing themselves with regards to organising and producing words and sentences (expressive language impairment) or understanding sentences and words (receptive language impairment). Individuals with this *SETBP1*-HD are sociable and have a strong desire to communicate.

Minimally verbal children with *SETBP1*-HD often communicate using sign language, gestures, or digital devices, which can help them to develop their language before their speech production ability develops.[2]

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Murdoch Children's Research Institute
50 Flemington Road, Parkville VIC 3052
geneticsofspeech@mcri.edu.au

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How can speech pathologists (SPs) support children with *SETBP1*-HD?

As speech and language disorders are a core feature of *SETBP1*-HD, SP input should start early in life and include **assessment** and **therapies** tailored to each individual. Many countries/states provide early intervention programs where speech therapy may be provided by government programs, educational programs, private practices, or a combination of these depending on your location. Families can seek advice from local practitioners about the services available to them in their region.

Assessment/evaluation

Important domains for an SP assessment include:

- Speech production skills: to evaluate for specific speech diagnoses (e.g., CAS, phonological disorder)
- Expressive and receptive language skills
- Social/pragmatic language skills
- Feeding and swallowing abilities

The types of assessment tools used will vary depending on the child's individual profile and developmental age. Assessment may be required at an initial diagnosis and throughout childhood and adolescence. The goal of assessment will be to understand the nature and severity of speech and language challenges, then make recommendations for appropriate therapies when needed.

Therapy/intervention

There is no research on speech and language interventions that are *specifically* designed for children with *SETBP1*-HD. Speech and language interventions for children with *SETBP1*-HD are currently guided by the child's individual profile and the best evidence for speech and language disorders more generally, and include:

• Augmentative and alternative communication (AAC)

AAC refers to ways of communicating other than talking (speech), such as the use of sign language or communication devices. AAC options can support language development prior to speech developing (using AAC does not prevent or slow down language development) and can also be of benefit when speech is unclear. Given children with *SETBP1*-HD have delayed communication development, introducing AAC in the early years should be considered to foster language development and provide a means for children to engage, learn, and reduce communication frustrations. The need for AAC or the AAC options used by individuals may change over time. SPs work with children and families to find the most appropriate AAC options tailored to needs and abilities.

- **Evidence-based treatments for CAS**

Existing treatments have varying levels of efficacy. Some examples include:

  - Nuffield Dyspraxia Program [5]
  - Rapid Syllable Transition Treatment (ReST) [5]
  - Dynamic Temporal and Tactile Cueing (DTTC) [6]
  - Prompts for Restructuring Oral Muscular Phonetic Targets (PROMPT) [7]

Families should ask their SP about how effective these programs (or the ones they are recommending) will be for their child given their age and symptoms. The type of therapy will depend on: (1) the child's symptoms, (2) their age, (3) the severity of their condition, and (4) any other health or development challenges they have.

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Like with any skilled movement, practice or therapy is usually most successful when it happens several times a week. When CAS symptoms have resolved with therapy, there may still be a need for continued SP input to address challenges in other areas of communication such as expressive language skills (e.g., vocabulary, sentence formation), social/pragmatic language skills (e.g., conversation skills, topic maintenance), and literacy.

It is also important to note that CAS is a difficulty with planning and programming movements for speech. There is no strong evidence to support the use of non-speech oral motor exercises alone (e.g., pursing, blowing, lip massage etc.) as an effective treatment for speech sound disorders.[8]

How does speech develop over time in *SETBP1*-HD?

We do not yet fully understand how speech develops over time for children with *SETBP1*-HD, however studies are currently underway to learn more about the ongoing communication trajectory. To learn more about this study and get involved contact: angela.morgan@mcri.edu.au or speechtracker@mcri.edu.au.

Further information and support:

- For information and support on *SETBP1*:https://www.setbp1.org
- More information on CAS: CAS Fact Sheet
- More information on phonological disorder: Phonological Disorder Fact Sheet
- More information on AAC: AAC Fact Sheet

References:

1. Marseglia G., et al., (2012). 372 kb microdeletion in 18q12.3 causing SETBP1 haploinsufficiency associated with mild mental retardation and expressive speech impairment. *Eur J Med Genet.,* 55, 216–21.
2. Morgan, A., et al. (2021). Speech and language deficits are central to SETBP1 haploinsufficiency disorder. *European Journal of Human Genetics*, 29(8), 1216–1225.
3. Jansen, N. A., et al., (2021). Clinical delineation of SETBP1 haploinsufficiency disorder. *European Journal of Human Genetics*, 29(8), 1198–1205.
4. Morgan A, Srivastava S, Duis J, et al. SETBP1 Haploinsufficiency Disorder. 2021 Nov 18. In: Adam MP, Everman DB, Mirzaa GM, et al., editors. GeneReviews® [Internet]. Seattle (WA): University of Washington, Seattle; 1993-2022. Available from: https://www.ncbi.nlm.nih.gov/books/NBK575336/
5. Murray, E., McCabe, P., & Ballard, K.J. (2015). A Randomized Controlled Trial for Children With Childhood Apraxia of Speech Comparing Rapid Syllable Transition Treatment and the Nuffield Dyspraxia Programme-Third Edition. *Journal of Speech Language and Hearing Research*, 58(3), 669-686.
6. Murray, E., McCabe, P., & Ballard, K. J. (2014). A systematic review of treatment outcomes for children with childhood apraxia of speech. *American journal of speech-language pathology*, 23(3), 486–504.
7. Morgan, A. T., et al. (2018). Interventions for childhood apraxia of speech. *The Cochrane database of systematic reviews*, 5(5), CD006278.
8. Lee, A. S., & Gibbon, F. E. (2015). Non-speech oral motor treatment for children with developmental speech sound disorders. *The Cochrane database of systematic reviews*, 2015(3), CD009383.

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