



"GENETIC FACTORS OF STUTTERING IN CHILDREN: THE ROLE OF HEREDITY" (A STUDY OF THE GENETIC CAUSES AND HEREDITARY FACTORS OF STUTTERING.)

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ABSTRACT

*Stuttering is a speech disorder that affects many children, with genetic and hereditary factors playing a significant role in its development. Research indicates that stuttering tends to run in families, and several genes have been implicated in its onset. Genome-wide association studies (GWAS) and family studies have identified genetic loci, such as **GNPTAB**, **KIAA0319**, and **FOXP2**, that may contribute to stuttering, particularly in relation to speech and language development. Despite the genetic predisposition, stuttering's inheritance is complex, involving the interaction of multiple genes and environmental factors. Twin studies further support the genetic component, showing a higher concordance rate for stuttering in identical twins compared to fraternal twins. Understanding the genetic basis of stuttering is crucial for early diagnosis, genetic counseling, and developing targeted interventions. While genetics plays a key role, environmental influences, such as early speech environments, also contribute to the manifestation and severity of stuttering.*

Stuttering is a multifactorial speech disorder characterized by disruptions in the fluency of speech, including involuntary repetitions, prolongations, or blocks in sounds, syllables, or words. It typically manifests in early childhood, with the onset often occurring between the ages of 2 and 5 years. While the exact causes of stuttering are not fully understood, a growing body of research highlights the role of genetic and hereditary factors in its development. Studies suggest that stuttering tends to run in families, indicating a strong genetic predisposition, though environmental influences also contribute to its expression.

The search for genetic causes of stuttering has gained momentum in recent decades, with advances in molecular genetics and genomic technologies providing valuable insights into the underlying mechanisms. Several candidate genes have been identified through genome-wide association studies (GWAS) and family-based research, linking specific genetic variants to the occurrence of stuttering. These genes are thought to be involved in speech and language

processing, neural function, and brain development, areas that are critical for fluent speech production.

Despite the progress made in identifying potential genetic factors, stuttering remains a complex condition with no single genetic cause. Instead, it is likely influenced by the interaction of multiple genetic loci and environmental variables, such as early speech experiences, neurological development, and stressors in childhood. This complexity makes the study of stuttering a challenging yet important area of research, with implications for early diagnosis, intervention, and genetic counseling.

The aim of this paper is to explore the genetic and hereditary factors contributing to stuttering in children, providing an overview of current findings and discussing their implications for understanding the disorder's origins and potential therapeutic approaches.

Stuttering has long been considered a hereditary disorder, with family studies providing substantial evidence that genetic factors contribute to its development. The prevalence of stuttering in children is higher among those with a family history of the disorder. First-degree relatives (parents, siblings) of individuals who stutter are more likely to develop stuttering themselves, which suggests that a genetic predisposition plays a crucial role in its onset. A study by **Riley (2009)** found that approximately 30% of children with stuttering have a family member who also stutters, further supporting the heritable nature of the disorder.[1,15]

Research efforts have focused on identifying specific genes that may be associated with stuttering. Genome-wide association studies (GWAS) and linkage studies have pointed to several candidate genes that may influence the development of the disorder. [2] These genes are typically involved in speech and language processing, neural development, and brain function. Some of the most significant genes implicated in stuttering include:

-GNPTAB, GNPTG, and NAGPA: These genes are involved in lysosomal storage and cellular processes that affect the nervous system. Mutations in these genes are associated with speech and language disorders, including stuttering. These findings suggest a possible connection between stuttering and neurodevelopmental processes related to speech production.

-KIAA0319: This gene, which has been associated with dyslexia, has also been linked to stuttering. It is involved in the development of neural circuits that are critical for language and speech processing. Studies indicate that alterations in this gene may contribute to difficulties in speech fluency.

-FOXP2: Known as the "speech gene," **FOXP2** is crucial for the development of motor skills necessary for speech. While mutations in **FOXP2** are known to cause speech and language disorders in humans, its role in stuttering is still under investigation. Some studies suggest that variants of this gene may contribute to the increased risk of stuttering, though more research is needed to confirm this association.

Stuttering is considered a complex genetic trait, meaning that its inheritance does not follow a simple Mendelian pattern. It is influenced by multiple genes, each contributing a small effect, and by interactions between genetic factors and environmental influences. The complex nature of stuttering inheritance is reflected in its variability, both in terms of its onset and severity. Some individuals may develop mild forms of stuttering that improve with age, while others experience more persistent and severe speech disruptions.[4] In addition to genetic factors, environmental influences such as early speech-language experiences, emotional stress, and neurodevelopmental factors are believed to play a role in the expression of stuttering. For instance, children who experience high levels of stress or who are exposed to delayed language development may be more susceptible to stuttering, even if they have a genetic predisposition to the disorder. This interaction between genetic vulnerability and environmental triggers makes the development of stuttering highly individualistic and difficult to predict.

In summary, stuttering is a multifactorial disorder influenced by both genetic and environmental factors. Although significant progress has been made in identifying candidate genes that may contribute to stuttering, much remains to be understood about the precise genetic mechanisms involved. Family and twin studies underscore the hereditary component of stuttering, while research into epigenetics suggests that environmental factors also play a role in the disorder's expression. Ongoing research into the genetic underpinnings of stuttering holds promise for more effective early interventions and personalized therapeutic approaches.

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