

The Role of Genetics in Speech, Language, and Reading Disorders among Children

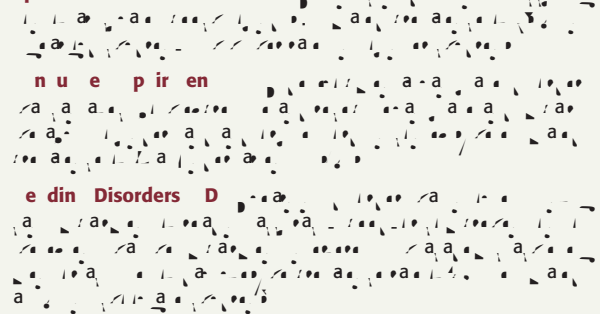
Speech, language and reading disorders are among the most common disorders in the United States, affecting one of every ten people in the United States, more than one million students in special education programs in public schools in the United States are identified as having a speech or language impairment.

In children, speech, language and reading disorders may have significant short and long term effects on learning. Students with communication disorders often encounter academic difficulties with language, reading and spelling, but research also suggests that these disorders can lead to general academic difficulties that may be long lasting. Earlier identification of communication disorders and appropriate intervention can greatly improve a child's future outcomes.

There are many types of speech, language and reading disorders among children, speech sound disorders are the most prevalent. They occur when there is a significant delay in the acquisition of articulate speech sounds and may be associated with a limitation in the motor skills needed to produce speech sounds or with phonological errors. Speech sounds are represented in the brain. Speech sound disorders occur most often in young children, with a prevalence of about 10% in children at age three. By age six, this number has declined to about 5% of these children, about half will have later academic difficulties.

Childhood speech sound disorders may have life long effects. As adults, individuals who report a history of childhood speech sound disorders continue to do worse on measures of communication and language skills than do adults without this history. Moreover, adults with a history of these disorders

Speech Sound Disorders (SSD)



complete fewer years of schooling and require more remedial services. Speech sound disorders can also affect employment because they often require communication skills and reduce the use of information and communication technologies. Research has shown that adults with a history of speech sound disorders often hold jobs that require fewer of these types of skills.

It is critically important to gain a better understanding of these disorders so that early identification and intervention can take place. While communication disorders may be related to other disabilities or syndromes, in most cases the causes are unknown. Their long term social, educational and economic consequences, combined with unknown etiology, are strong justifications for the pursuit of research including family and genetic studies. Such studies aim to understand more about the underlying risk factors that may influence these complex disorders. Researchers at Case Western Reserve University are exploring the role of genetics and heredity in communication disorders such as speech sound disorders.

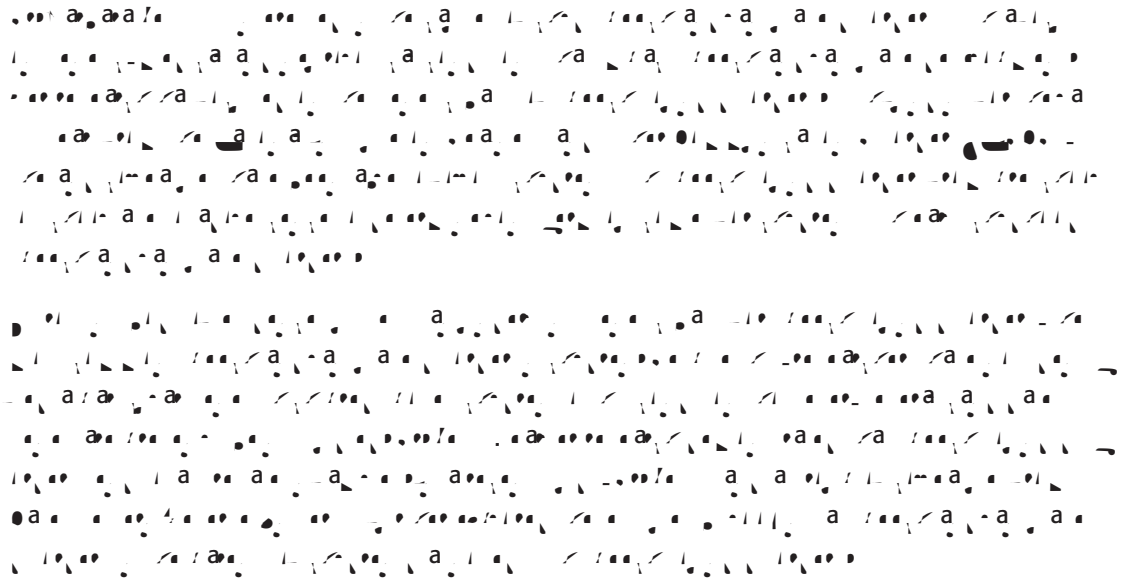
The Schubert Center for Child Studies in the College of Arts and Sciences at Case Western Reserve University promotes multidisciplinary research on children and childhood. Our goal is to build and enhance connections among research, policy, and educational initiatives at the university and with the community. The Schubert Center's focus is on children and childhood from infancy through adolescence in local, national, and international contexts.

William D. O'Leary, PhD, Director; Elizabeth Short, PhD, Associate Director; Jessica Ritchie, PhD, Assistant Director; Gaetano Tenenbaum, PhD, Assistant Director; Donald Reedheim, PhD, Assistant Director; Michelle C. Tague, PhD, Assistant Director.

The Role of Genetics in Speech, Language, and Reading Disorders among Children



Dr. Leis is an Associate Professor of Communication Sciences



Dr. Leis and colleagues were interested in comparing parents with and without a history of speech sound disorders in order to further understand the familial nature of speech sound disorders and their long-term effects.

Both speech sound disorders and language impairment have been shown to aggregate in families, a finding which provides justification for the consideration of the influence of genetic factors in both disorders. Because of this, Dr. Leis and colleagues looked at the two disorders together.

To that extent do speech sound disorders, with or without language impairment, aggregate within the families of children who have speech sound disorders, and to that extent do these disorders aggregate within an individual?

To that extent does language impairment, with or without speech sound disorders, aggregate in families of children with speech sound disorders, with or without language impairment?

The study population included parents of children with speech sound disorders and parents of children with speech sound disorders report also having experienced these types of disorders themselves. Therefore, studies of parents can shed light both on the familial aspects and adult outcomes of these conditions.

One hundred and forty-seven parents from the greater Cleveland, Ohio area participated in this study. Fathers and mothers (parents) were assessed for speech, language and reading disorders. Of the parents who participated, 10 had a history of speech sound disorders, while 37 did not.

Participants were tested on their ability to produce speech sounds, phonological processing skills, spelling, reading decoding, oral motor skills and language. These tests included the repetition of multisyllabic words, tongue twisters, dig Latin, written spelling, and other tests of communication. A history of speech sound disorders was tested directly when possible, and through interviews when direct testing was unfeasible. Data collected from the tests were recorded, reviewed and analyzed by licensed speech language pathologists. Data were also collected about

the presence of language impairments, reading disorders and spelling disorders in the nuclear family.

The authors divided the parents into three groups for comparison: parents with a history of speech sound disorders, parents with a history of speech sound disorders and language impairment, and parents without a history of either condition. Results of assessments of language, spelling and reading were compared for these three groups.

Overall, parents without a history of speech sound disorders performed better on measures of language, spelling and reading than did parents with a history of these disorders. In particular, parents with a history of speech sound disorders performed less well on all measures except on Big Latin and measures of oral motor skills. Parents with a history of speech sound disorders and language impairment did worse than those parents with a history of speech sound disorders alone. There were no significant differences in education or occupational level between parents with a history of both speech sound disorders and language impairment and parents with a history of speech sound disorders alone. Additionally, there were no differences between mothers and fathers across any of the groups.

Dr. Lewis and colleagues found that there is significant co-occurrence of speech sound disorders and language impairment within individuals. Within families, there was significant aggregation of both speech sound disorders and language impairment, although the aggregation was stronger for language impairment. Specifically, the likelihood of experiencing language impairment increased a factor of more than four for each additional family member with language impairment, while the odds of speech sound disorders increased more than twofold for each additional family member with speech sound disorders. This suggests that the risk for these disorders increases as more relatives are affected and illustrates that speech sound disorders and language impairment aggregate in families and often occur together.

Dr. Lewis and colleagues compared adults with a history of speech sound disorders to those without a history of these disorders. They found that adults with and without a history of speech sound disorders had similar occupational levels and academic attainment. However, adults with a history of speech sound disorders continue to perform worse on measures that test speech sound production than do adults without this history.

Dr. Lewis and her colleagues

Dr. Lewis and her colleagues conducted a study to investigate the co-occurrence of speech sound disorders and language impairment within individuals and families. They found that there is significant aggregation of both speech sound disorders and language impairment, although the aggregation was stronger for language impairment. Specifically, the likelihood of experiencing language impairment increased a factor of more than four for each additional family member with language impairment, while the odds of speech sound disorders increased more than twofold for each additional family member with speech sound disorders. This suggests that the risk for these disorders increases as more relatives are affected and illustrates that speech sound disorders and language impairment aggregate in families and often occur together.

Dr. Lewis and her colleagues also compared adults with a history of speech sound disorders to those without a history of these disorders. They found that adults with and without a history of speech sound disorders had similar occupational levels and academic attainment. However, adults with a history of speech sound disorders continue to perform worse on measures that test speech sound production than do adults without this history.



The identification of underlying genetic factors for speech sound disorders has implications for researchers, clinicians and families perhaps most importantly, knowledge of genetic factors may improve diagnosis and early identification of children at risk of speech sound disorders. This early identification will allow for timely environmental intervention. Early intervention is crucial because of the potential of communication disorders to lead to social and educational isolation. In addition, communication and language skills are most easily learned before the age of five. While initial speech or language difficulties can be characterized as atypical, if children do not outgrow these speech patterns as expected, they may become disorders that can impede learning.

Children who exhibit such disorders may benefit from the assistance of a speech language pathologist. Speech language pathologists work with children, families and schools to facilitate a child's communication. This is done through individual therapy with the child and the development of goals and techniques to be used at home and in the classroom. Therapy can be useful to children throughout their educational trajectory as the understanding of phonological, language and reading become more complex. Further, speech language pathologists can provide long term assistance to children in the transitions from school to employment.

Research has demonstrated the efficacy of early intervention with speech language pathologists on the communication of children with speech sound disorders. The amount of treatment that a child receives is also associated with better outcomes. This progress is even more significant given that, untreated, communication disorders have the potential to become worse and to lead to deficits in reading, writing and spelling. Despite this, in Ohio and across the US, shortages of speech language pathologists exist. More efforts like those highlighted in the text are needed to ensure that children receive timely and appropriate intervention.

The research being conducted by Dr. Lewis and the team at Case Western Reserve University is vital. Increased understanding of the role of families and the genetic pathways of communication disorders is important for researchers and clinicians. For clinicians, this information may validate existing diagnostic categories or stimulate the development of new diagnoses. Genetic studies may also provide additional possibilities for the treatment of communication disorders. The co-occurrence of language, reading, and spelling disorders may be illuminated. Increased knowledge of the role of genetics in these disorders for researchers and clinicians, understanding genetic factors helps to bridge gaps between different disciplines and may lead to a more comprehensive understanding of communication disorders.

Research in Ohio ensure her identification and proper intervention for children

Ohio Department of Education
Division of Statewide Assessment

Ohio Department of Education
Division of Statewide Assessment

Ohio Department of Education
Division of Statewide Assessment

Ohio Department of Education
Division of Statewide Assessment

Ohio Department of Education
Division of Statewide Assessment

Journal of Speech, Language and Hearing Research
 Pediatric Annals
 Child Development
 Journal of Speech, Language and Hearing Research
 Journal of Speech and Hearing Research
 Journal of Speech, Language, and Hearing Research
 The Lancet Neurology
 Nature Reviews Neuroscience



Schubert Center for Child Studies
 614A Crawford Hall
 10900 Euclid Avenue
 Cleveland, OH 44106-7179
 216.368.0540
 www.case.edu/artsci/schubert/
 schubertcenter@case.edu