Development, pathology and remediation of speech. Ray D. Kent, Waisman Center, University of Wisconsin-Madison, Madison, WI, USA.

This paper considers progress in the understanding of speech development and speech disorders, with a correlated discussion of substrate knowledge in evolutionary biology, genetics, and neurobiology. Studies in evolution point to a number of craniofacial adaptations that may have contributed to the emergence of efficient vocal communication in hominids. Research in genetics has shown that certain communication disorders have a genetic component and that at least seven chromosomes are implicated in speech and language functions. Investigations in neurobiology have established that the human craniofacial system is specialized in its muscle fibers and sensory receptors. The muscle fibers in particular are highly complex compared with the fibers in the limbs and trunk and are heterogeneous both across and within craniofacial muscles. With this background, speech development in children can be portrayed as a motor learning process that is continually amended and refined during the growth and development of a complex biological system in which production-perception linkages insure basic fidelity to communication requirements. The integrity and efficiency of this system can be compromised by a number of conditions, including neurologic disease or damage, congenital anomalies, acquired structural defects, and a range of developmental disabilities. Treatment of these disorders deploys a variety of methods that are increasingly based on knowledge of neuroscience, biomechanics, and behavior science. A unifying thread among these topics is the potential for a systems biology of speech that spells out a research agenda for speech development and disorders.