

# Sound Processing in the Brain: What Have We Learned from Concussion and from Healthy Athletes?

Nina Kraus, PhD, Hugh Knowles Chair, Professor of Neurobiology, Otolaryngology  
Communication Sciences and Disorders, Northwestern University

Tory Lindley, MA, ATC, Senior Associate Athletic Director for Health, Safety and Performance,  
Head Athletic Trainer Northwestern Athletics

Cynthia La Bella, MD, Medical Director, Institute for Sports Medicine, Lurie Children's Hospital of Chicago,  
Professor of Pediatrics, Northwestern University Feinberg School of Medicine



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The auditory system is a uniquely complex sensory system and sound processing relies on exquisite temporal precision to integrate signals across neural synapses. Given this complexity and precision, together and that axons of the auditory system are highly susceptible to damage caused by mechanical force, we are investigating the auditory processing consequences of concussion. In two cohorts, adolescents being treated for concussion in a sports medicine clinic and Division I college athletes, we have discovered that 1) listening to speech in noise is disrupted following a concussion, 2) the objectively-obtained neural response to speech sounds (frequency-following response, FFR) is disrupted following a concussion, 3) FFR disruption tracks with other non-auditory post-concussion symptoms, 4) there is physiological evidence of long-term auditory processing declines in student-athletes who had suffered a concussion one or more years in the past, and 5) Elite athletes (Division I) have healthier sound processing brain activity. Together these findings suggest that the auditory system should be included in the assessment and management of athlete health.



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Department of Physical Therapy and  
Human Movement Sciences

645 N. Michigan, Rm. 810