

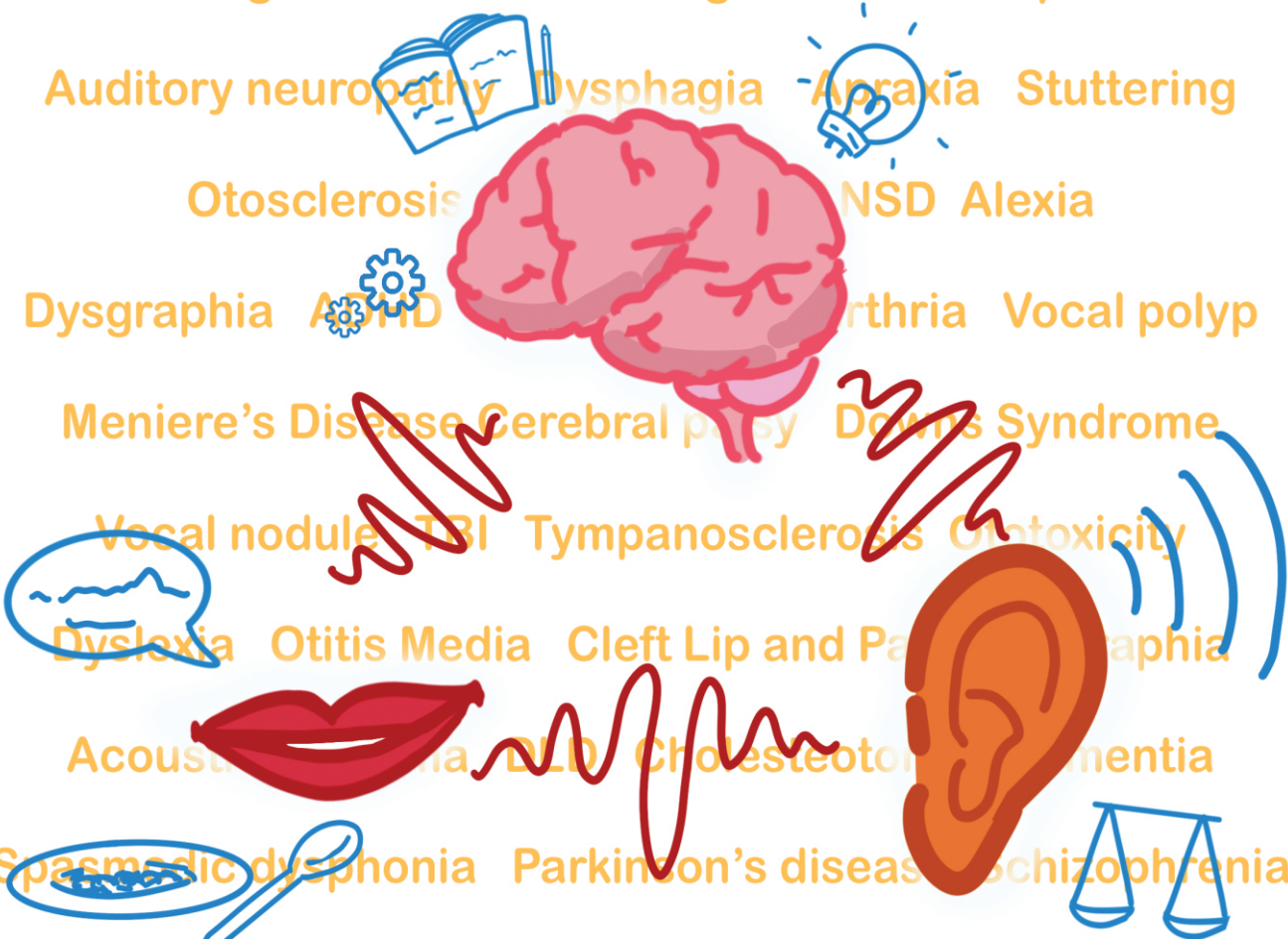
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Hearing loss Autism Vertigo Tinnitus Aphasia
Auditory neuropathy Dysphagia Apraxia Stuttering
Otosclerosis NSD Alexia
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Vocal nodule TBI Tympanosclerosis Otitis
Dyslexia Otitis Media Cleft Lip and Palate Dysphagia
Acoustic neuroma DLD Cholesteatoma Dementia
Spasmodic dysphonia Parkinson's disease Schizophrenia
Presbycusis Speech sound disorder NIHL Cochlear implant



Book Review:

Of Sound Mind: How Our Brain Constructs a Meaningful Sonic World.

Nina Kraus, Cambridge, Massachusetts: The MIT press 2021
ISBN 9780262045865, Available as hard copy (Rs1893), on Kindle (Rs.1023)
and a free trial as an Audio book, on Amazon

Reviewed by Madhuri Gore

The title is intriguing- explaining the effect of sound on the brain and what the brain does with it and how it affects the person. The book is a labour of love by an auditory neuroscientist Dr. Nina Kraus. Kraus writes with a mixture of personal as well as research observations mainly from the work in her lab, but also from other research. She gives a perspective of Tallal's, Merzenich's, Krishnan's, Peretz's, and Patel's research contribution among many. Draws liberally on metaphor, analogies illustrating her points with familiar real life musical experiences - Zakir Hussain, Lady Gaga, The Beatles, and Jazz musicians. The book gives a holistic picture on current knowledge of impact of sound on -to quote her- "our sonic selves". Kraus has placed the knowledge in a known construct with appropriate analogies. It begins with an introduction prior to the other chapters. There are footnotes to explain, provide details on concepts and there is a treasure trove of notes (67 pages) containing references for each chapter, a glossary, index and acknowledgements (10 pages). Illustrations though in black and white provide a composite picture. Kraus adopts a conversational tone and tells the story of our sound minds - chapters are arranged logically starting from a brief introduction about sound, to the processes of listening, bird song, bilinguals, noise and ageing. The meaning of Latin words (the bane for many) are explained and this adds to ease of reading.

The book is organized into two sections-The first section "How Sound Works" with 4 chapters and the second is a much larger section titled "Our Sonic Selves" consisting of 8 chapters. The first section deals with the basis of sound -or to put it as sound ingredients, our auditory system- sound within,

sound merged, learning and the quest for the listening brain. The second section is about the different sounds of music, speech, noise and their impacts and the response to sound in mammals, birds, amphibians, insects and even plants (yes truly). The opening chapter gives a catchy introduction to sound and its ingredients. All questions that a beginner experiences are addressed -pressure changes with changes in the atmospheric pressure, pure tones, modulated tones, intensity, timing, pitch, timbre *and* speech. This is followed by an introduction to the essence of the auditory system explaining the anatomy from the ear to the brain, and functions of conduction, transduction, transformation. A dry topic is made interesting when she gives a perspective of the auditory system to the body as a whole. For example, she says the organ of Corti "just missed the title of smallest organ in the body (curse you pineal gland!)".

What is the world of sound? How does hearing engage other senses, our movement, emotions, and mirror neurons. The direction of information flow-Upstream and Downstream is a great analogy. The concept of sound outside and inside the head and merging those signals gives another perspective which will engage the thought processes innovatively. I loved the chapter on learning. It is interspersed with "stories" on animal experiments- owls, rabbits- how they learn- (and unlearn), attention and more. The quest for the listening brain -the "biological portal into sound processing" is one of the best. It addresses the question: How the brain deals with different time scales from microseconds to seconds, how are

auditory objects created? Section 1 paves the way for understanding the rest.

Section 2 begins with music and its perception. The chapter is aptly titled '*music is the jackpot*' since it engages the "cognitive, motor, reward and sensory networks" starting from musicians to music healers as a future. Is rhythm a part of us? Does it help to learn to speak, hear in noise and even to spell? Although music perception has gained so much interest, Kraus gives importance to *rhythm*. To me it suggests that it is the next area to explore. I am probably biased, but I think she was right to devote a whole chapter to it, from rhythm intelligences linked to brain rhythm, listening (with a mention of Martin Luther King's compelling rhythm in speech) and language learning. We also learn about "vocal learners", birds that imitate sounds and probably a capacity to predict future beats in rhythm. The reference to rhythm and socializing suggests mirror neurons. There is a third chapter dealing mainly with music. In this chapter, Kraus has addressed the questions of how does music help? What is its link to speech? How can sound processing be strengthened? Does strengthening processing through music alleviate effects of deprivation? Are the changes reflected in mis-match negativity (MMN)? In the chapter on the root of language is sound, Kraus explores the link between perceiving sound consistency to learn language and the information obtained from using the sound (the mighty) /da/ in evoked potentials. She has written elegantly about reading, language, and sound. There is a bit of history of language and spelling change (good to understand), FFR- explained the easy way. How timing was important to consistency in perception. A mention is made about language related giftedness. While bilinguals have many advantages, they appear to have a downside too. A bonus is one exclusively on bird song.

Aging is another aspect: how does auditory training help the older population? How long do they last? How is sound coded in the aging brain? The

concept of neural noise and the lack thereof in musicians and athletes is explored in the chapter on Sound and Brain Health. The effect of concussion on sound processing is discussed. Although the chapter on noise seems a bit jarring, it fits well in the sound mind concept. The book ends with 'Our Sonic Minds' -past present and future- she explores how our perception may be rich or dulled by noise, how languages we speak help us understand each other, how ignoring sound and music might affect us. What choices must we make to use the power of the sound mind. The end is on a philosophical note.

As a book, it sparks the interest in our perception of sound and the "sound mind". One can of course read it in one go, but there is so much to read and think that one goes back again and again to find new ideas. Although easy to read, the treatment of each chapter is not superficial. In the chapter about sound and the brain you can read about neurotransmitters. She also introduces the binding principle. Every part of the research mentioned is linked to real life, related research in speech and language. Everything related to sound. What is unique to humans- and what is not. For example., how many of us know bird song has dialects? And that plants respond to buzzes and water flow sound (not I am Groot). Horses may not really "dance" to music, but birds can; Snowball the cockatoo on YouTube does. In the text, Kraus draws attention to important aspects "if you have not seen Snowball the cockatoo, look now", and I did.

The book is stimulating whether one is a layperson or a professional working with hearing. If the aim was to make "Of Sound Mind" accessible to a cross section of readers, I think it has definitely reached its goal. Has it given a new dimension to the phrase 'of sound mind'? yes it certainly has. This is a wonderful gift to the field. We needed a book on sound. A must read for every audiologist and speech language pathologist either in the making or a professional, a must for libraries and a great gift for friends.

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