

Are There Negative Effects from White Noise Sound Therapy?

Summary by John A. Coverstone, AuD

Sound therapy is one of the most commonly prescribed treatments for tinnitus as well as a common self-prescribed method for dealing with tinnitus. The majority of sound therapy treatments – either professionally prescribed or self-incepted – use white noise to mitigate the relative loudness of tinnitus. A recent article published in *JAMA Otolaryngology – Head & Neck Surgery* calls into question the long-term effects of using white noise for tinnitus therapy.¹

The authors of this study, two of whom are on staff (one is a founder) of Posit Science, a private company offering a brain training system, performed a literature review of white noise research and effects on cognitive function, cognitive decline, and cognitive development. Based on their review, the authors assert that white noise may have negative consequences on central auditory function and brain functioning in general. They recommend that white noise should be avoided as a treatment for tinnitus.

The authors cite a handful of studies showing various effects on brain function. In one study, researchers found that young rats exposed to eight weeks of continuous noise had brain processing function that was indistinguishable from brain function of normally aging rats.² They

also found that the effects reversed when the rats were restored to a normal environment.

In another study, researchers demonstrated that continuous noise exposure over an eight-week period induced plastic changes in brain function of rats of various ages.³ A third study cited as evidence for the negative effects of low-level noise exposure studied the effects on the brains of rats of both constant noise exposure and intermittent noise exposure for 10 hours per day, which yielded similar results.⁴

What all the studies cited in the article have in common is research involving rats with constant and exclusive noise exposure. This is a significant drawback to the conclusions of the paper because none of the supportive evidence was gathered in human studies. Furthermore, the rat subjects referenced in each supporting article were generally exposed to noise 24/7 (with one exception) and exposed to only noise. This is difficult to compare to the daily experiences of humans, who are typically engaged in social interaction, including listening to conversation, music, and a wide variety of sounds. These structured sounds potentially have significant positive consequences on brain function, as shown by research linking hearing loss and cognitive decline.⁵ The exception to this might be individuals who are socially isolated,

which has been shown to have its own negative effects, including in rodents.

At this point, there is no direct evidence of deleterious cognitive effects from noise therapy used with humans. Noise exposure has been shown to have negative effects on humans in the form of annoyance, sleep disturbance, educational performance, and cardiovascular health. However, no conclusive evidence could be found for any negative cognitive effects when noise exposure is below minimum harmful levels (80–85 dB sound pressure level). Readers are encouraged to maintain current regimens prescribed by their audiologist, psychologist, or physician until discussing further any possible side effects. 🌈



- 1 Attarha, M., Bigelow, J., & Merzenich, M. M. (2018, August 30). Unintended consequences of white noise therapy for tinnitus – Otolaryngology's Cobra Effect: A review. *JAMA Otolaryngology – Head & Neck Surgery*. Advance online publication. doi:10.1001/jamaoto.2018.1856.
- 2 Kamal, B., Holman, C., & de Villiers-Sidani, E. (2013). Shaping the aging brain: Role of auditory input patterns in the emergence of auditory cortical impairments. *Frontiers in Systems Neuroscience*, 7, 52. doi:10.3389/fnsys.2013.00052
- 3 Zhou, X., Panizutti, R., de Villes-Sidani, E., Madeira, C., & Merzenich, M. (2011, April 13). Natural restoration of critical period plasticity in the juvenile and adult primary auditory cortex. *Journal of Neuroscience*, 31(15), 5625–5634. doi:10.1523/JNEUROSCI.6470-10.2011
- 4 Zhou, X., & Merzenich, M. (2012, May 15). Environmental noise exposure degrades normal listening processes. *Nature Communications*, 3, 843. doi:10.1038/ncomms1849
- 5 Lin, F. R., Yaffe, K., Xia, J., Xue, Q.-L., Harris, T. B., Purchase-Helzner, E., ... Simonsick, E. M. (2013). Hearing loss and cognitive decline in older adults. *JAMA Internal Medicine*, 173(4), 293–299