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Lesions causing hallucinations localize to one common brain network

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Abstract

The brain regions responsible for hallucinations remain unclear. We studied 89 brain lesions causing hallucinations using a recently validated technique termed lesion network mapping. We found that hallucinations occurred following lesions to a variety of different brain regions, but these lesion locations fell within a single functionally connected brain network. This network was defined by connectivity to the cerebellar vermis, inferior cerebellum (bilateral lobule X), and the right superior temporal sulcus. Within this single hallucination network, additional connections with the lesion location dictated the sensory modality of the hallucination: lesions causing visual hallucinations were connected to the lateral geniculate nucleus in the thalamus while lesions causing auditory hallucinations were connected to the dentate nucleus in the cerebellum. Our results suggest that lesions causing hallucinations localize to a single common brain network, but additional

connections within this network dictate the sensory modality, lending insight into the causal neuroanatomical substrate of hallucinations.

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Contributions

NYK, JH, and MDF conceived and designed the work; NYK, JJ, OW, NR, EMR, and JMF acquired the data; NYK, JH, JJ, LS, APL, and MDF analyzed and interpreted data; NYK, DT, and MDF drafted the work; PRC, APL, and MDF revised the manuscript critically for important intellectual content; all authors approved the final version to be published and agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. NYK and MDF had full access to all the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.

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