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Advances in Hallucination Research

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Hallucinations are intriguing phenomena that may negatively impact several aspects of life in people with or without a psychiatric disorder. Being sensory experiences without corresponding external stimulation of the relevant senses, they may arise from a confusion between internally generated and externally presented stimuli. They can occur in different modalities and take on different forms and meanings. In recent years, advances have been made in hallucination research by studying the cultural context of hallucinations,¹ applying transdiagnostic symptom network analysis² and investigating brain connectivity patterns.³ This Special issue helps to take a next step by bringing together new studies from different perspectives, varying from anthropological and epidemiological to neuroscientific research.

The article by Luhrmann et al (titled “Learning to discern the voices of gods, spirits, tulpas and the dead”) addresses voice hearing in several communities of people that are typically not in need of care. An example of such a community are mediums and medium-like new age practitioners, interviewed at Yale University, Durham University, and King’s College London. Another example of a community studied by Luhrmann et al regards evangelical Christians (interviewed at Stanford and the University of Chicago), who experience a verbal dialogue with God. By assessing shared implicit and explicit beliefs and expectations about voices, the investigators were able to delineate cultural “models” or “schemas” characteristic for such communities. They also note that there is considerable individual variation in hallucinatory experiences and forward suggestions for future research.

Khaled et al compare samples from the Middle-East and Western Europe in their article “Cross-cultural Differences in Hallucinations: A Comparison between Middle-Eastern and European Community-based

Samples”. More specifically, they compared epidemiological and phenomenological characteristics of hallucinatory experiences between two large samples, one from The Netherlands and one from Qatar. Even though auditory and visual hallucinations were more frequently reported in the Dutch sample, the clinical relevance of hallucinations was higher in the Qatar sample. The findings are discussed in relation to methodological aspects of the data acquisition and with respect to the possible influence of cultural factors.

Another frequently observed phenomenon is hallucinations in relation to loneliness. In this issue, Brederoo et al use the term “social deafferentation” (coined by Ralph Hoffman⁴), to show that loneliness is associated with social hallucinations in particular, for example, with hallucinated voices, touch, and human figures. Thus, social deafferentation may be analogous to sensory deafferentation, which refers to visual and auditory impairment that can lead to hallucinations in their respective modalities. In a similar large community-based sample, Germann et al show that recreational drug use is associated with more distress from hallucinations. The influence of drugs is component specific, with specific drug categories promoting a specific type of hallucinations. Though a causal role cannot be established based on their design, this yields important clues for further investigation.

In addition to loneliness and drugs, perceptual deficit is another important factor to increase the risk for hallucinations. This is true for visual loss, as in Bonnet’s syndrome, but also for hearing loss, which precipitates auditory hallucinations. In this issue, Marschall et al show the need for better screening and information about deafferentation hallucinations in people with hearing loss. Their study can help raise awareness of the relevance of sensory loss amongst researchers and clinicians.

To conclude this special issue, we have three imaging studies that inform us about anatomical and functional alterations associated with hallucinations.

Curcic-Blake et al investigated paracingulate sulcus (PCS) length and cortical thickness in schizophrenia patients with and without a lifetime history of auditory hallucinations. Earlier studies have reported reduced PCS length in association with hallucinations. The PCS has been shown to be a key area involved in reality monitoring: the ability to discriminate between internally generated and externally presented information. This study expands on earlier studies by investigating patients without a lifetime history of hallucinations (ie, never hallucinated), which allows for conclusions regarding the trait-like nature of possible differences. Left PCS length was shortest in the patient group with hallucinations and longest in the healthy comparison group, with the patient group without hallucinations in between. Differences in cortical thickness were also measured. This study paves the way to further investigation of neuroanatomical differences and how they relate to cognitive processes such as reality monitoring and speech perception, which will help elucidate the neurocognitive basis of the propensity towards hallucination.

Hugdahl et al (2023) pooled rare data of patients with schizophrenia indicating the presence of auditory hallucinations in the scanner. After assembling an unprecedented large sample of these “symptom-capture” data, they reconstruct the timelines of hallucinations and show a clear mid-frontal area associated with both onset and offset of hallucinations, suggesting a hallucinations-switch. Unveiling such a switch may inspire studies using neuro-feedback for hallucinations, but also brain stimulation treatment to reduce hallucinations.

In the last article of this Special Issue, Van Ommen et al report the functional neuroimaging correlates of visual hallucinations in patients with schizophrenia. They used a symptom capture paradigm, in which the participant

indicates the presence of hallucinations by pressing a button. During the experience of visual hallucinations, higher-order visual areas were activated, part of vision-related networks sub-serving attention and memory. Remarkably, primary visual cortex (V1) was not activated during the occurrence of the visual hallucinations. The authors propose a model in which V1 is disconnected from higher-order visual processing areas. V1 provides feed-forward information to the vision-related networks and receives inhibitory feedback projections from higher visual areas. The postulated disconnection of V1 could lead to an impairment in both feed-forward and feedback signaling and thus bias conscious perception away from bottom-up sensory information emanating from the senses and towards internally generated percepts. This intriguing hypothesis deserves further investigation, for example, using visual perception tasks and analysis of effective connectivity between the relevant networks.

Together, these papers both deepen and broaden our understanding of hallucinations and inspire new work of researchers who want to fathom this intriguing phenomenon, as well as clinicians looking for new strategies to treat these sometimes very distressing symptoms.

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