

Neuroscience and Psychiatry

Aligning Computational Psychiatry With the Hearing Voices Movement

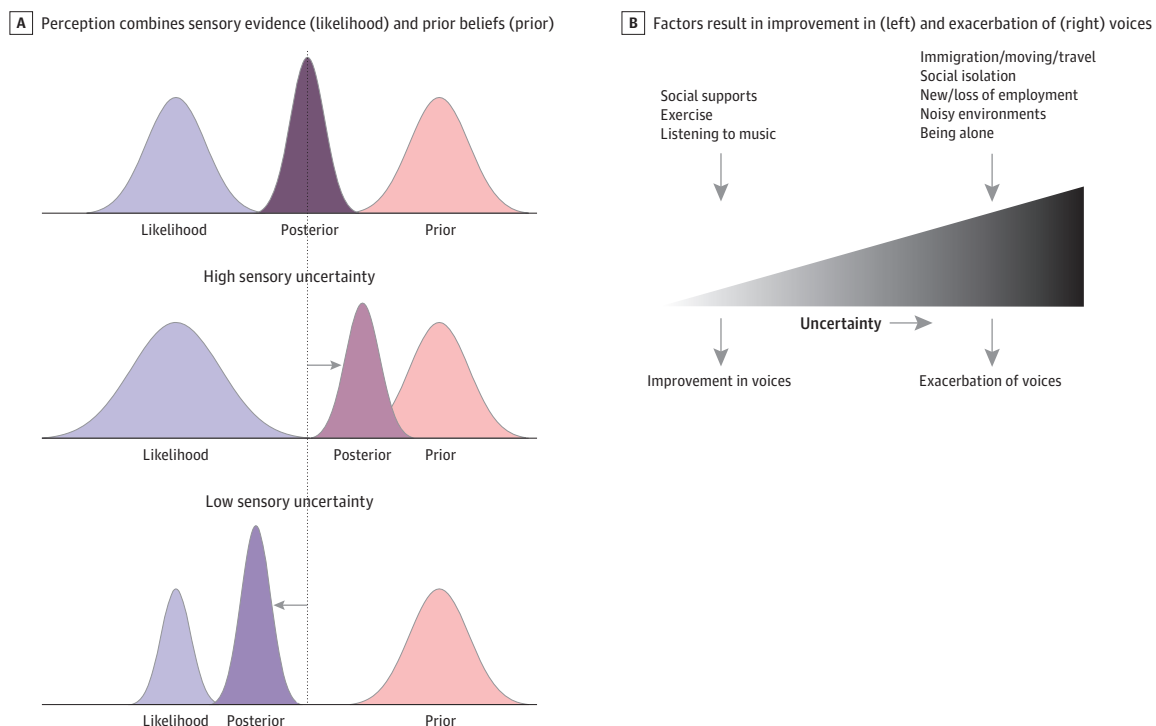
Hearing Their Voices

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Established approaches to the diagnosis and treatment of psychosis face a growing challenge. Critical psychiatry demands that we put patient rights, autonomy, and recovery at the forefront of treatment. It downplays the role of the brain in etiology and thus the efficacy of pharmacological treatments, which critical psychiatrists argue do more harm than good.¹ This may be dismissed out of hand by the contemporary psychiatrist: while there are adverse effects of antipsychotic use, these drugs outperform placebos in controlled clinical trials—a bar that is not met by cognitive therapies.¹ However, some critical psychiatry views find empirical support: psychotic symptoms worsen in the context of social isolation,² they are sensitive to the emotionality expressed by family members,³ and they are statistically associated with trauma.⁴

We suggest that the burgeoning field of computational psychiatry (CP) may reconcile biological psychiatry with critical psychiatry, while honoring the values and goals of those with lived experience of psychosis. We will focus herein on auditory verbal hallucinations, or voices. This Neuroscience and Psychiatry article highlights how the Hearing Voices Network (HVN), a growing recovery-oriented organization that emphasizes accepting voice-hearing experiences,⁵ and a new predictive processing (PP) account of hallucinations⁶ might offer similar insights. Given the HVN's tendency to downplay biomedical explanations of voices, it may seem that the HVN and brain-based CP make strange bedfellows. However, CP emerged from a desire for concision across multiple levels of explanation, whether neurobiological, cognitive, or social. Com-

Figure. Uncertainty in Voice Hearing



A, Perception combines sensory evidence (likelihood) and prior beliefs (prior), weighted by their relative precision (or inverse variance) to infer a posterior probability of any given event. When uncertainties of likelihood and prior are approximately equal (top), the posterior takes both into account approximately equally. In the context of increased sensory uncertainty (middle), posteriors are pulled toward priors, increasing hallucinations.⁷ By contrast, in the context of decreased environmental uncertainty (bottom), posteriors are pulled toward

the likelihood, decreasing probability of hallucinations. B, Factors result in improvement in (left) and exacerbation of (right) voices, per members of the Hearing Voices Network. The factors on the left decrease sensory uncertainty, whereas those on the right increase it. We highlight sensory processes that influence voice hearing; however, higher-level factors (eg, faith and spiritual belief) may influence hallucinations through hyperpriors and prediction errors over the lower-level priors that could possibly pertain.

putational psychiatry is about modeling the world and the brain within it. By spanning and uniting levels of explanation, CP embraces the pluralism that is central to the HVN and brings the power of this pluralism to the service of clinical care.

The HVN is composed of peer support groups for voice hearers, known as Hearing Voices Groups, wherein voice hearers and their advocates work together to provide mutual support, share insights, and suggest ways to understand voices,⁵ assisting voice hearers to live peaceably with their experiences.⁵ Such groups provide an attractive alternative for voice hearers who perceive that they have not been fully helped and may have been sometimes harmed by traditional approaches or who believe that their stories have not been acknowledged.⁵ There are many frames of reference through which voice hearing may be seen (biological, social, and spiritual), and the voice hearer is encouraged to choose his or her interpretation and develop a personal relationship with the voices.⁵

Although CP encompasses many different theoretical approaches, we adopt a bayesian PP framework. Within this framework, perception (eg, cognition and belief) is an active, synthetic process: we perceive what would need to be present around us in order for our sensations to make sense.⁶ The brain contains a hierarchical model of its environment, built from prior experiences, to infer the causes of its sensations by combining feed-forward bottom-up information from the sensory organs with feedback or top-down predictions from higher-level regions, with weighting of these sources based on their precision.⁶

It was recently demonstrated that hallucinations are associated with high-precision priors,⁷ such that new percepts are created out of whole cloth. Hallucinations may be experienced as voices because our auditory apparatus is tuned to (ie, has strong priors for) the natural statistics of speech. Furthermore, they may be experienced as agents communicating because we believe that voices are typically attached to an agent. Hallucinations are distressing be-

cause they are nonconsensual and they engage the highest levels of our inferential hierarchy—those levels that contain our narratives about ourselves.⁸ Therefore, PP can honor, incorporate, and draw valuable information from the personal narratives of voice hearers like those in the HVN.

We are not born with our models of the world; we infer their parameter values through experience. However, those values may be innately constrained. For example, the expectation that a caregiver would protect us may be hardwired. If that expectation is violated, we may develop a world model—and a set of social expectations—that colors our perceptual inferences in a maladaptive manner. Therefore, the HVN's focus on trauma as a potential cause of voice hearing can be brought within the explanatory fold.

If the PP account is correct, we should expect voices to be exacerbated in contexts where uncertainty is increased, when one would rely more strongly on one's priors. Furthermore, voices should be mollified by more predictable circumstances. These are common themes discussed at Hearing Voices Groups (Figure).

Because PP strives to understand voices in terms of the usual functioning of perceptual and cognitive apparatuses, it is able to embrace the HVN's mission of normalizing voices. Even non-voice hearers can be impelled to hallucinate in the laboratory⁷; indeed, most perception may be considered a controlled hallucination.

The experts by experience who comprise the HVN have much to teach computational psychiatrists, who should be interested in the richness of their experiences. We should be aligning ourselves to explain and mitigate the features of voice hearing that are most salient and distressing to voice hearers. One challenge to alignment is finding an acceptable common language. Because the CP approach unites levels of explanation, it might be a means through which experts by education (academics, clinicians, and advocates) and experts by experience can realize their shared aim of a deeper understanding of voices.

ARTICLE INFORMATION

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REFERENCES

1. Jauhar S, McKenna PJ, Radua J, Fung E, Salvador R, Laws KR. Cognitive-behavioural therapy for the symptoms of schizophrenia: systematic review and

meta-analysis with examination of potential bias. *Br J Psychiatry*. 2014;204(1):20-29.

2. Hoffman RE. A social deafferentation hypothesis for induction of active schizophrenia. *Schizophr Bull*. 2007;33(5):1066-1070.

3. Hogarty GE, Anderson CM, Reiss DJ, et al. Family psychoeducation, social skills training, and maintenance chemotherapy in the aftercare treatment of schizophrenia. I. One-year effects of a controlled study on relapse and expressed emotion. *Arch Gen Psychiatry*. 1986;43(7):633-642.

4. McCarthy-Jones S, Longden E. Auditory verbal hallucinations in schizophrenia and post-traumatic stress disorder: common phenomenology, common cause, common interventions? *Front Psychol*. 2015; 6:1071.

5. Corstens D, Longden E, McCarthy-Jones S, Waddingham R, Thomas N. Emerging perspectives from the Hearing Voices Movement: implications for research and practice. *Schizophr Bull*. 2014;40 (suppl 4):S285-S294.

6. Powers AR III, Kelley M, Corlett PR. Hallucinations as top-down effects on perception. *Biol Psychiatry Cogn Neurosci Neuroimaging*. 2016;1 (5):393-400.

7. Powers AR, Mathys C, Corlett PR. Pavlovian conditioning-induced hallucinations result from overweighting of perceptual priors. *Science*. 2017; 357(6351):596-600.

8. Hirsh JB, Mar RA, Peterson JB. Personal narratives as the highest level of cognitive integration. *Behav Brain Sci*. 2013;36(3):216-217.