Narrative Review ISSN 2835-6276

American Journal of Medical and Clinical Research & Reviews

Internal Echo Chamber: Schizophrenia Source Monitoring Errors, Self-Speech, and Auditory Hallucinations

Ashok Kumar Dudi

*Correspondence: Ashok Kumar Dudi

Received: 04 Nov 2023; Accepted: 07 Nov 2023; Published: 10 Nov 2023

Citation: Ashok Kumar Dudi. Internal Echo Chamber: Schizophrenia Source Monitoring Errors, Self-Speech, and Auditory Hallucinations . AJMCRR 2023; 2(11): 1-11.

ABSTRACT

Research and results: *Self-speech perception, inner cognitive processes, and auditory hallucinations interact complexly in schizophrenia. Source monitoring errors, which identify internal from exterior stimuli, are linked to auditory hallucinations. Schizophrenia-related auditory hallucinations depend on the left temporal lobe, which forms self-speech and interprets cognitive processes. Cognitive theories propose that faulty corollary discharge processes cause inadequate inner speech monitoring and misinterpretation of internal cognitions as external stimuli. Audio hallucinations are linked to maladaptive language network dynamics, unstable speech encoding, and poor inner speech representations. Internal thoughts may be misinterpreted as external voices due to impaired predictive signaling, source attribution, and cognitive control. explain neurotransmitter interactions to explain auditory hallucinations. Neuroimaging studies have linked sensory cognitive impairment to auditory hallucinations, which escalate with left temporal lobe and left superior temporal gyrus brain activity. Cognitive remediation therapy, antipsychotic medication, and neurobiological therapies may aid schizophrenia patients with auditory hallucinations and improve treatment.*

Aims and objectives: *The objective of this study is to offer a distinctive perspective on the psychology of hallucinations.*

Methods: *Based on a psychologist's self-healing from schizophrenia, the study examines hallucinations. Introspection, professional skill, and substantial literature research are used to understand hallucinations and schizophrenia's impacts.*

Conclusion: *Antipsychotics, cognitive therapy, and multimodal treatment can minimize auditory hallucinations, improve cognition, and reduce impairments and hallucinations in schizophrenia patients with early identification and treatment.*

Keywords: Speech self-perception, Internal thought processes, Source monitoring mistakes, Left temporal lobe, Neurotransmitter interactions, Cognitive remediation.

Introduction

The goal of comfort and intelligibility has driven generations of humans. Humans have always sought comfort, safety, and meaning in an unpredictable environment. Our oldest ancestors sought refuge in caves, and ergonomic office chairs and virtual reality surroundings reflect this search today. Due to our insatiable curiosity about the outside world and our internal reasoning, human exploration has been amazing. However, this desire has sometimes led us down dangerous paths, particularly in mental health.

Humanity has created a society that is both comforting and unsettling in its pursuit of progress. The rapid and unprecedented advancement of technology in recent centuries has advanced science, industry, and interconnectedness. It has also led to psychopathological illnesses, a more mysterious part of our existence.

Schizophrenia, a complex mental illness, has fascinated scholars, doctors, and society. The line between reality and perception is blurred in this situation, causing sensory distortions and incorrect beliefs. In the following pages, we explore schizophrenia's perplexing elements, focusing on hallucinations.Despite its extensive history, schizophrenia continues to elude both experts and laypeople. This sickness affects millions worldwide and raises many questions. Although the cause of schizophrenia is unknown, a complex interaction of psychological, neurological, and environmental factors is believed to be responsible (Szoke et al., 2020). Understanding schizophrenia begins with acknowledging that it is a convergence of variables that represent the complexity of human experience.

Among the many scientific studies on schizophrenia, one aspect remains a mystery: What makes hallucinations so unique and intimately connected to human experience? Hallucinations are sensory experiences without an external stimulus (Toh et al., 2021). In schizophrenia, hallucinations are usually aural, visual, or tactile. Individuals can experience mild hallucinations to severe ones that impact their self- and environment-perception. Comprehending the causes and mechanics of schizophrenia hallucinations is essential to comprehending the subjective experiences of patients with this incapacitating condition.

The mind is a complex network of cognitive, emotional, and sensory activities. Schizophrenia hallucinations complicate awareness and understanding in this complex framework. These intriguing and unsettling encounters lead us to study the human mind to determine what is real and what is not. By studying schizophrenia's pathology, we learn more about the human psyche's fragility and plasticity.

Our society is at a critical point due to technological and cultural advances. Modern comforts and conveniences seem to coincide with a variety of psychopathological diseases due to human ingenuity. Mental illness paradoxically results from seeking comfort, understanding, and growth. The complex relationship between human accomplishments and problems is best illustrated by schizophrenia, which causes hallucinations.

This study examines the mind's mysteries, notably schizophrenia's hallucinations. This investigation will examine the complicated interaction between

psychophysiological variables, neurotransmitter activity, and brain circuitry that causes hallucinations. Our study will also examine the psychological, social, and existential effects of hallucinations on schizophrenia patients. Our goal is to improve our understanding of schizophrenia and help improve diagnosis, treatment, and support for those with this serious condition.

Join us as we examine schizophrenia's diverse hallucinations. We will explore the mysterious human mind to discover its secrets. Our goal is to grasp human complexity.

Methodology

The personal and professional journey of a Psychologist with over two decades of expertise is used to study schizophrenic hallucinations. Since the author self-healed from schizophrenia, their experience is crucial to the research. The research combines introspection, professional competence, and thorough literature research on Google Scholar, and PubMed. The author's schizophrenia experience illuminates hallucinations' subjective character and schizophrenia's wider effects. This self-healing shows the human spirit's resiliency and aids scientific research.

The research also reviews schizophrenia and hallucination literature utilizing Google Scholar, and PubMed. A thorough understanding of schizophrenia's neurobiological, psychological, and physiological elements, with a focus on hallucinations, is the goal. The literature search data is carefully analyzed, synthesized, and categorized to extract key findings, theories, and empirical data on schizophrenia's neurobiological mechanisms, symptomatology, and treatment approaches, with a focus on hallucinations.

The author's schizophrenia experience gave the research a unique viewpoint on hallucinations, emotional and cognitive elements, and self-healing. This research follows strict ethical guidelines, protecting the privacy and dignity of those who have endured comparable challenges. The author bases their personal insights on scientific material. This research paper uses a thoughtful blend of introspection, extensive literature research, and professional expertise to explore schizophrenia hallucinations scientifically and compassionately, rooted in the author's personal and professional journey.

Hearing Hallucinations in Schizophrenia: Causes, Mechanisms, and Treatments

Auditory hallucinations, which entail hearing voices without external cues, are common in schizophrenia, which affects 1% of the population (Romeo & Spironelli, 2022). Hallucinations impact 60%–80% of schizophrenia patients, with auditory hallucinations having uncertain etiology (Brébion et al., 2020). Despite rich historical data, scholars struggle to understand the mechanisms that cause these hallucinations, shrouding them in mystery. The symptoms' cryptic traits continue to puzzle researchers, despite extensive historical evidence. The cause of auditory hallucinations in schizophrenia patients has long puzzled experts. Disruption in self-generated speech and internal mentation triggers auditory hallucinations in this complex cognitive interaction.

Comprehensive and varied research is needed to understand the complicated neural processes that cause sensory-cognitive impairment and auditory hallucinations in schizophrenia. Cognitive studies, enhanced neuroimaging, and genetic studies are our main tools for investigating this strange phe-

nomenon. Schizophrenia often causes sensory-cognitive impairment, which affects self-speech and cognition processes. The cognitive paradox discussed here is crucial to schizophrenia patients' auditory hallucinations and other psychotic symptoms. According to research, auditory hallucinations may be caused by neurocognitive impairments and dopamine dysregulation in speech and language processing brain areas (Sato, 2022). Feedback loops that don't work right between the frontal speech production and temporal auditory regions may make it harder to keep an eye on oneself, which can mess up processes that involve voice perception.

A large collection of empirical research illuminates schizophrenia's sensory and cognitive challenges. This extensive study shows sensory-cognitive dysfunction and the intricacies of auditory hallucinations in this demographic. The extensive network of empirical data linking sensory cognitive impairment and auditory hallucinations in schizophrenia is convincing. The cognitive symphony in this study explains the complexity of this phenomenon and its links to schizophrenia patients' sensory and cognitive environments. The concept suggests that elevated subcortical dopamine levels may enhance thoughts and perceptions, causing auditory hallucinations (Samutsakorn & Carius, 2023).

Neuroimaging studies have shown that schizophrenia patients who have hallucinations have different connections between the frontal and temporal regions and speech perception circuitry than those without hallucinations. Numerous studies are being conducted to determine the link between sensory cognitive impairment and auditory hallucinations in schizophrenia. These efforts highlight the complicated interaction in this relationship (Cuevas-Yust, 2014).

We examine the complicated relationship between sensory cognitive impairment and auditory hallucinations in schizophrenia patients, showing many interrelated findings that enhance our understanding of this phenomenon. Numerous discoveries into the intricate link between sensory cognitive impairment and auditory hallucinations in schizophrenia offer new therapeutic methods.

Perception distortion from sensory cognitive dysfunction

Schizophrenia causes sensory control problems due to cognitive abnormalities in sensory processing and perception. The above cognitive deficits may cause auditory hallucinations because people may have trouble distinguishing their own ideas from external sensory stimuli. Cognitive deficits like working memory, attention, and executive function may make auditory hallucinations more confusing. Schizophrenia causes auditory sensory dysfunction, including poor sensory gating, pitch discrimination, and noise detection (Shepard & Joy, 2003). Visual and olfactory deficits include diminished contrast sensitivity, increased light sensitivity, and difficulty seeing and distinguishing scents.

Cross-modal binding—integrating auditory and visual sensory information—is difficult for schizophrenia patients. Reality distortion and abnormal symptoms are typical of the disease due to dissociation. According to neurochemical theories, GABA and glutamatergic neurotransmitter abnormalities may cause sensory and perceptual problems. Sensory dysregulation in schizophrenia may be caused by faulty prediction signaling in higher-order cortices to fundamental sensory regions, disrupting neural networks. Multiple sensory deficiencies suggest

brain circuit abnormalities that contribute to the condition's cognitive fragmentation and reality distortion (Schenkman, 2021).

Schizophrenia-related cognitive and sensory difficulties

Sensory and cognitive impairments in schizophrenia patients are important. In neurophysiological tests, sensory gating decreased across modalities, causing sensory overload and impaired early sensory processing. Sensorimotor gating abnormalities, which impair prepulse inhibition of the startle response, are more common in schizophrenia ("Corrigendum to: Impaired Sensorimotor Gating Using the Acoustic Prepulse Inhibition Paradigm in Individuals at a Clinical High Risk for Psychosis," 2020). Multiple cognitive domain deficits characterize broad cognitive disorders. Neurocognitive exams evaluate schizophrenia patients' attention, working memory, processing speed, and social cognition.

Infrared imaging can detect anomalies in sensory and association areas, which are essential to higher-level cognitive activities. Grey matter decreases in the medial temporal, prefrontal, and parietal regions, according to research. Task-based functional magnetic resonance imaging (fMRI) has been used to identify frontal, temporal, parietal, and occipital activation patterns during perception and cognition. This story involves dopamine, glutamate, and GABA neurotransmitters. Pharmacological models of schizophrenia have shown that dopamine hyperactivity, or NMDA receptor hypofunction, replicates cognitive disintegration and perceptual impairments. This lends credence to these neurotransmitter systems' significance in schizophrenia pathogenesis (Stahl, 2007).

Analyzing Schizophrenia's Auditory Hallucinations

Schizophrenia patients have sensory cognitive impairment, which includes self-verbalization, internal cognition, sensory information processing, working memory, attention, and executive functioning. These factors affect auditory hallucinations. The evolution of auditory hallucinations depends on identifying source monitoring problems. Schizophrenia sufferers sometimes have trouble distinguishing and ignoring auditory cues that are unrelated to their surroundings, resulting in an overwhelming sensory stream. Auditory hallucinations activate the left temporal lobe, which controls self-speech and internal cognition. Brain scans show more activity in certain parts of the striatum, thalamus, paralimbic regions, and hypothalamus that are connected to the mesolimbic dopamine system (Hugdahl, 2008).

This study examines auditory hallucinations and cognition. Poor corollary discharge—the inability to self-monitor inner speech—is a major cause of auditory-verbal hallucinations. Reduced P50 suppression in source monitoring can predict the severity of auditory hallucinations in schizophrenia patients (Daskalakis, 2008). Poor speech processing along frontotemporal circuits might cause verbal hallucinations by misinterpreting maladaptive beliefs as external inputs. The problem worsens when top-down cognitive control systems cannot inhibit erroneous bottom-up signals. Schizophrenia patients' aberrant salience and dysregulation of dopamine in subcortical areas exacerbate the hallucinatory symphony and reality distortion.

Schizophrenia Auditory Hallucinations: Inner Dialogue Impairment

The complex relationship between self-speech per-

ception, interior cognitive processes, and auditory hallucinations is clear. Deviations in source monitoring, a cognitive function that distinguishes internal ideas from external stimuli, have been associated with auditory hallucinations. Since it generates self-speech and interprets internal cognitive processes, the left temporal lobe is crucial to schizophrenia-related auditory hallucinations. Cognitive theories suggest that improper corollary discharge processes lead to poor monitoring of inner speech, which misinterprets internal cognitions as external stimuli. According to the Defective Self-Monitoring Hypothesis, adolescents' lack of self-awareness is what causes auditory verbal hallucinations (McGuire et al., 2000). Internal cognitive processes and external sensory cues merge due to this impairment.

Multifaceted auditory hallucinations in schizophrenia patients are characterized by poor self-speech and inner-thought awareness. Corollary discharge mechanisms, which help people hear and understand their thoughts and speech, malfunction in schizophrenia. This misattribution of cognitive processes to external sources causes auditory-verbal hallucinations. Aberrant salience and precision signaling are crucial to understanding auditory hallucinations. Lack of clarity about inner speech and thoughts intensifies attention and anomalous significance, resulting in auditory hallucinations without external voices. The phenomenon is associated with maladaptive language network dynamics, including unstable speech encoding and inadequate inner speech representations. Reduced cognitive control allows corollary discharge impulses to reach auditory regions, allowing interior speech to be experienced as auditory verbal hallucinations. It adds to the phenomenon's complexity (Stephane et al., 2022).

According to empirical evidence, auditory hallucinations are the result of a complex interaction between deficiencies in monitoring, modulating, and identifying internal speech and cognitive processes. Impaired predictive signaling, source attribution, and cognitive control may cause mistaken internal ideas for external voices. Understanding this process may help treat schizophrenia by disrupting internal discourse and revealing auditory hallucinations. According to the Inner Speech Imagery Model, impaired self-regulation can distort auditory images, resulting in human speech-like qualities (Terband & van Brenk, 2023). According to source monitoring reports, cognitive process origins are unclear since they are hard to attribute to internal or external sources.

Schizophrenia Auditory Hallucinations: Dopaminergic Modulation Mechanisms

Multiple factors contribute to auditory hallucinations in schizophrenia, including mesolimbic dopamine dysregulation. Dopamine is involved in many physiological and psychological processes during the dopaminergic stage. The mesolimbic dopamine system links the ventral tegmental area to multiple limbic regions, regulating salience attribution, motivation, and reward. Understanding auditory hallucinations requires understanding neurotransmitter interactions (Waters, 2003).

Positive symptoms, including hallucinations and delusions, have been connected to mesolimbic hyperdopaminergia. Interrupting anticipatory communication and stimulus significance may misallocate priority to internal mental representations, causing auditory and verbal hallucinations. Dopamine dysfunction can affect corollary discharge systems, preventing internal actions from having sensory

effects. When dopamine modulation lowers the accuracy of predictive signals and raises the importance of mapping, internal cognitive processes may be mistaken for external auditory inputs (Wenzel & Cheer, 2014).

Dopamine in the striatum disrupts thalamic sensory filtering, causing cortical hyper-excitability and intrusive sensations. Dopamine regulates sensory inputs' relevance and extraneity. Increased mesolimbic system activity may affect thalamic gating. Dopamine dysregulation in the mesolimbic pathways, which are involved in motivation and important processing, greatly affects cognitive processes like event prediction, stimulus value evaluation, and sensory information filtering. Modulating hyperdopaminergic effects and their effects to reduce happy feelings is promising (Devilbiss et al., 2012).

Cracking Schizophrenia's Auditory Hallucinations

Auditory hallucinations are examined cognitively in The Cognitive Chronicles, including source monitoring, working memory, attention, and executive function (Anthony, 2004). Neuroimaging studies use advanced techniques like fMRI and PET to study auditory hallucinations and brain pathways. The mesolimbic dopamine system is linked to the subcortical nuclei of the striatum, thalamus, paralimbic areas, and hypothalamus, which show increased neuronal activity. In auditory hallucinations, the left temporal lobe, which controls self-speech and internal thought, is mysterious.

The Genetic Epilogue investigates a topic's genetics and its effects. Genome-wide association studies (GWAS) and candidate gene studies are used to identify genetic variables in schizophrenia and auditory hallucinations. Continuous research on this topic gives hope of understanding the complicated mechanics behind these phenomena and improving treatments and assistance for those affected. This thorough method guides the investigation of sensory-cognitive deficits and auditory hallucinations in schizophrenia patients.

Schizophrenia's Complex Interplay: Sensory Cognitive Impairment and Auditory Hallucinations

Cognitive studies examine the relationship between sensory cognitive deficiencies and auditory hallucinations in schizophrenia. Source monitoring, working memory, and executive function deficiencies were positively associated with auditory hallucination severity (El Haj & Allain, 2012). There is found a strong connection between auditory hallucinations and left superior temporal gyrus activation. The Neuroimaging Odyssey highlights a link between sensory cognitive impairment and auditory hallucinations. The study clarifies how source monitoring, working memory, attention, and executive function deficiencies affect auditory hallucinations. Auditory hallucinations intensify with increased brain activity in the left temporal lobe and left superior temporal gyrus, according to neuroimaging. This study shows that sensory cognitive impairment and auditory hallucinations interact in a complex way, which can help us understand and manage the issue (Carter et al., 1994).

The Interplay of Sensory Cognitive Impairment and Auditory Hallucinations in Schizophrenia

This study examines how sensory-cognitive deficiencies affect auditory hallucinations in schizophrenia patients. Auditory hallucinations are positively correlated with source monitoring, working memory, attention, and executive function deficits.

Like puzzle pieces, this relationship is interconnected. Cognitive deficiencies, like coordinated performance, impair the ability to discriminate between internal and external inputs, causing auditory hallucinations.

Neural notes, are also investigated. Increased left temporal lobe activity, which processes self-speech and internal thought, is linked to auditory hallucinations. The left superior temporal gyrus, known for auditory processing, is engaged during the increased activity (Copolov et al., 2000).

Innovative Schizophrenia Auditory Hallucination Remedies

This study examines sensory-cognitive impairment and auditory hallucinations in schizophrenia patients. Cognitive remediation therapy improves cognition and reduces hallucinations. A conductor in a symphonic group suggests a calm listening experience. Additionally, mesolimbic dopamine pathway medications are important, according to the findings. Antipsychotics that antagonize dopamine receptors effectively diminish auditory hallucinations by modifying their perception. Dopamine release and interaction during dancing can promote calm and harmony in the auditory system (Rimmer, 2020).

Cognitive remediation therapy, antipsychotic medication, and neurobiological therapies for auditory hallucinations are essential to the multidisciplinary framework. This mechanism is coordinated by the left temporal lobe and the left superior temporal gyrus. This study illuminates the development of unique therapeutic interventions. It highlights cognitive remediation, the complex mesolimbic dopamine system, and multidisciplinary integration. The tactics in this symphony may help schizophrenia patients with auditory hallucinations, establishing the groundwork for a harmonious and positive future (Morrison, 2001).

Targeted Therapies' Effectiveness in Enhancing Positive Results and Optimism

Brain imaging studies of auditory hallucinators show separate fronto-temporal and speech and language networks. Targeted therapies, such as temporoparietal transcranial magnetic stimulation (TMS), may reduce auditory hallucinations (Hallmayer, 2005). The results show that sensory cognitive impairment is associated with auditory hallucinations in schizophrenia patients. The above findings remind us of the complicated relationship between cognition and perception, which may improve therapeutic interventions.

Substantial clinical implications of finding

Schizophrenia Patients with auditory hallucinations, a major source of misery, have a higher suicide risk. This emphasizes the urgency of treating hallucinations. Investigating the complex relationships between inadequate self-monitoring, speech perception anomalies, and dopamine dysfunction that cause auditory hallucinations can lead to customized therapies. This allows for more targeted and personalized therapies. Emerging therapies like transcranial magnetic stimulation (TMS) targeting frontal speech regions may help reduce these auditory hallucinations.

The complicated sensory processing and cognitive abnormalities of schizophrenia make it challenging for people. Understanding the linked sensory processing and perception dysfunctions may help create effective interventions and therapies for this complex condition. Sensing Agency Accounts suggests that cognitive effort in assimilating ideas af-

fects agency perception. Due to limited agency over ideas, auditory hallucinations can disrupt prediction processes. Finally, convergence is the combination of different elements (Wiech, 2023).

Schizophrenia hallucinations reveal the complexity of human thought and the junction of science and compassion. This publication advances our understanding of schizophrenia-related hallucinations, stressing the larger issues of mental health and the need for understanding and assistance. The journey continues as we expand on this foundation, developing interdisciplinary cooperation and using innovative therapies to help those struggling with mental difficulties. As authors, we aim to spark curiosity and compassion in the scientific community and the general public to help society understand and accept the profound complexities of human mental health. This collaborative journey aims to master hallucinations and lead the way toward holistic mental well-being, ushering in a brighter and more compassionate future for all those whose lives intersect with the intricate narratives of the human psyche.

Conclusion

Antipsychotics, cognitive remediation, and multimodal treatment may diminish auditory hallucinations in schizophrenia. Cognitive remediation addresses source monitoring, working memory, attention, and executive function. This increases cognition and minimizes auditory hallucinations from self-generated thoughts. Antipsychotics that block dopamine receptors treat schizophrenia most often. Auditory hallucinations may involve the mesolimbic dopamine pathway.

Early schizophrenia diagnosis and treatment can reduce auditory hallucinations. Early treatment may lessen these deficits and auditory hallucinations. Complex psychotic symptoms like auditory hallucinations are easier to comprehend and treat. Auditory hallucinations in schizophrenia are often linked to auditory and speech processing issues, which have multiple cognitive and physiological origins. Understanding these pathways could lead to methods to improve schizophrenia patients' well-being by targeting inadequacies.

Fundings: No fundings from anywhere for writing this manuscript has been received.

Conflict of interest: Ther is none conflict of interest to be reported in connection to this manuscript.

References

1. Szoke, A., Pignon, B., Boster, S., Jamain, S., & Schürhoff, F. (2020, August 31). Schizophrenia: Developmental Variability Interacts with Risk Factors to Cause the Disorder. BioEssays, 42(11). https://doi.org/10.1002/bies.202000038
2. Toh, W. L., Thomas, N., & Rossell, S. L. (2021). Comparing Primary Voice-Hearers with and without Hallucinations in Other Sensory Modalities. Psychopathology, 54(4), 214–220. https://doi.org/10.1159/000517455
3. Romeo, Z., & Spironelli, C. (2022). Hearing voices in the head: Two meta-analyses on structural correlates of auditory hallucinations in schizophrenia. NeuroImage: Clinical, 36, 103241. https://doi.org/10.1016/j.nicl.2022.103241
4. Brébion, G., Stephan-Otto, C., Cuevas-Esteban, J., Usall, J., & Ochoa, S. (2020, June). Impaired memory for temporal context in schizophrenia patients with hallucinations and thought disorganisation. Schizophrenia Research, 220, 225–231. https://doi.org/10.1016/

j.schres.2020.03.014

5. Sato, M. (2022, December). The timing of visual speech modulates auditory neural processing. Brain and Language, 235, 105196. https://doi.org/10.1016/j.bandl.2022.105196
6. Samutsakorn, D. K., & Carius, B. M. (2023, March). What is causing this patient's auditory hallucinations? JAAPA, 36(3), 48–49. https://doi.org/10.1097/01.jaa.0000918788.60351.2a
7. Cuevas-Yust, C. (2014). Do Thoughts Have Sound? Differences between Thoughts and Auditory Hallucinations in Schizophrenia. The Spanish Journal of Psychology, 17. https://doi.org/10.1017/sjp.2014.29
8. Shepard, P., & Joy, B. (2003, March). Clozapine fails to block psychostimulant-induced disruption of auditory sensory gating in the rat. Schizophrenia Research, 60(1), 259–260. https://doi.org/10.1016/s0920-9964(03)80394-8
9. Schenkman, L. (2021). Brain's sensory processor may prompt memory problems in autism. Spectrum. https://doi.org/10.53053/inwe5797
10. Corrigendum to: Impaired Sensorimotor Gating Using the Acoustic Prepulse Inhibition Paradigm in Individuals at a Clinical High Risk for Psychosis. (2020, October 3). Schizophrenia Bulletin, 47(1), 268–268. https://doi.org/10.1093/schbul/sbaa142
11. Stahl, S. M. (2007, April). Beyond the Dopamine Hypothesis to the NMDA Glutamate Receptor Hypofunction Hypothesis of Schizophrenia. CNS Spectrums, 12(4), 265–268. https://doi.org/10.1017/s1092852900021015
12. Hugdahl, K. (2008). Auditory hallucinations in schizophrenia: the role of cognitive, brain structural and genetic disturbances in the left temporal lobe. Frontiers in Human Neuroscience, 1. https://doi.org/10.3389/neuro.09.006.2007
13. Daskalakis, Z. (2008, February). rTMS, P50 and treatment refractory auditory hallucinations in SCZ. Schizophrenia Research, 98, 27. https://doi.org/10.1016/j.schres.2007.12.055
14. McGuire, P., Shergill, S., Bullmore, E., Simmons, A., & Murray, R. (2000, January). Attenuated engagement of areas implicated in verbal self-monitoring in patients prone to auditory hallucinations. Schizophrenia Research, 41(1), 12–13. https://doi.org/10.1016/s0920-9964(00)90334-7
15. Stephane, M., Dzemidzic, M., & Yoon, G. (2022, May). Altered corollary discharge in the auditory cortex could reflect louder inner voice experience in patients with verbal hallucinations, a pilot fMRI study. Schizophrenia Research, 243, 475–480. https://doi.org/10.1016/j.schres.2022.02.007
16. Terband, H., & van Brenk, F. (2023, May 9). Modeling Responses to Auditory Feedback Perturbations in Adults, Children, and Children With Complex Speech Sound Disorders: Evidence for Impaired Auditory Self-Monitoring? Journal of Speech, Language, and Hearing Research, 66(5), 1563–1587. https://doi.org/10.1044/2023_jslhr-22-00379
17. Waters, F. (2003, August 1). Inhibition in schizophrenia: association with auditory hallucinations. Schizophrenia Research, 62(3), 275–280. https://doi.org/10.1016/s0920-9964(02)00358-4
18. Wenzel, J. M., & Cheer, J. F. (2014, September 1). Endocannabinoid-Dependent Modulation of Phasic Dopamine Signaling Encodes External and Internal Reward-Predictive Cues. Frontiers in Psychiatry, 5. https://doi.org/10.3389/fpsyt.2014.00118
19. Devilbiss, D. M., Waterhouse, B. D., Berridge, C. W., & Valentino, R. (2012, April 18). Corticotropin-Releasing Factor Acting at the Locus Coeruleus Disrupts Thalamic and Cortical Sen-

sory-Evoked Responses. Neuropsychopharmacology, 37(9), 2020–2030. https://doi.org/10.1038/npp.2012.50

20. Anthony, D. (2004, February). The cognitive neuropsychiatry of auditory verbal hallucinations: An overview. Cognitive Neuropsychiatry, 9(1–2), 107–123. https://doi.org/10.1080/13546800344000183
21. El Haj, M., & Allain, P. (2012, June). Relationship between source monitoring in episodic memory and executive function in normal aging. Gériatrie Et Psychologie Neuropsychiatrie Du Viellissement, 10(2), 197–205. https://doi.org/10.1684/pnv.2012.0342
22. Carter, C., Robertson, L., Nordahl, T., Chaderjian, M., & O'Shora-Celaya, L. (1994, May). Left superior temporal gyrus dysfunction and auditory hallucinations in schizophrenia: A cognitive neuropsychological study. Biological Psychiatry, 35(9), 659. https://doi.org/10.1016/0006-3223(94)90818-4
23. Copolov, D., Seal, M., Maruff, P., Waite, M., Wong, M., Ulusoy, R., & Egan, G. (2000, January). Temporal lobe activation in response to auditory hallucinations and external speech in schizophrenic subjects: A pet correlation study of auditory hallucinations. Schizophrenia Research, 41(1), 25. https://doi.org/10.1016/s0920-9964(00)90356-6
24. Morrison, A. P. (2001). Cognitive therapy for auditory hallucinations as an alternative to antipsychotic medication: A case series. Clinical Psychology & Psychotherapy, 8(2), 136–147. https://doi.org/10.1002/cpp.269
25. Rimmer, A. (2020, April 2). How can I keep calm during self-isolation? BMJ, m1376. https://doi.org/10.1136/bmj.m1376
26. Hallmayer, J. (2005, May). Repetitive transcranial magnetic stimulation over temporoparietal cortices in the treatment of refractory auditory hallucinations in patients with schizophrenia. Current Psychiatry Reports, 7(3), 160–161. https://doi.org/10.1007/s11920-005-0048-x
27. Wiech, K. (2023, July). Same but different: how agency modulates pain perception. Trends in Cognitive Sciences, 27(7), 601–602. https://doi.org/10.1016/j.tics.2023.04.011