

This is a repository copy of *Hallucinations Beyond Voices : A Conceptual Review of the Phenomenology of Altered Perception in Psychosis*.

White Rose Research Online URL for this paper:

<https://eprints.whiterose.ac.uk/185368/>

Version: Published Version

Article:

Pienkos, Elizabeth, Giersch, Anne, Hansen, Marie et al. (9 more authors) (2019)
Hallucinations Beyond Voices : A Conceptual Review of the Phenomenology of Altered Perception in Psychosis. *Schizophrenia bulletin*. S67-S77. ISSN 0586-7614

<https://doi.org/10.1093/schbul/sby057>

Reuse

This article is distributed under the terms of the Creative Commons Attribution-NonCommercial (CC BY-NC) licence. This licence allows you to remix, tweak, and build upon this work non-commercially, and any new works must also acknowledge the authors and be non-commercial. You don't have to license any derivative works on the same terms. More information and the full terms of the licence here:
<https://creativecommons.org/licenses/>

Takedown

If you consider content in White Rose Research Online to be in breach of UK law, please notify us by emailing eprints@whiterose.ac.uk including the URL of the record and the reason for the withdrawal request.

Hallucinations Beyond Voices: A Conceptual Review of the Phenomenology of Altered Perception in Psychosis

Elizabeth Pienkos^{*1}, Anne Giersch², Marie Hansen³, Clara Humpston⁴, Simon McCarthy-Jones⁵, Aaron Mishara⁶, Barnaby Nelson^{7,8}, Sohee Park^{9,10}, Andrea Raballo^{11,12}, Rajiv Sharma^{13,14}, Neil Thomas¹⁵, and Cherise Rosen¹³

¹Graduate Institute of Professional Psychology, University of Hartford, 200 Bloomfield Avenue, West Hartford, CT 06117; ²INSERM U1114, Pôle de Psychiatrie, Fédération de Médecine Translationnelle de Strasbourg (FMTS), Centre Hospitalier Régional Universitaire of Strasbourg, Université de Strasbourg, Strasbourg, France; ³Department of Clinical Psychology, Long Island University Brooklyn, Brooklyn, NY; ⁴Department of Psychological Medicine, Institute of Psychiatry, Psychology and Neuroscience, King's College London, London, UK; ⁵Department of Psychiatry, Trinity College, Dublin, Ireland; ⁶Clinical Psychology Department, The Chicago School of Professional Psychology, Los Angeles, CA; ⁷Orygen, The National Centre of Excellence in Youth Mental Health, Parkville, Victoria, Australia; ⁸Centre for Youth Mental Health, The University of Melbourne, Parkville, Australia; ⁹Department of Psychology, Vanderbilt University, Nashville, TN; ¹⁰Kyung Hee University, Seoul, Korea; ¹¹Department of Psychology, Psychopathology and Development Research Unit, Norwegian University of Science and Technology (NTNU), Trondheim, Norway; ¹²Department of Medicine, Division of Psychiatry, Clinical Psychology and Rehabilitation, University of Perugia, Perugia, Italy; ¹³Department of Psychiatry, University of Illinois at Chicago, Chicago, IL; ¹⁴Jesse Brown Veterans Affairs Medical Center, Chicago, IL; ¹⁵Centre for Mental Health, Swinburne University of Technology, Hawthorn, Victoria, Australia

*To whom correspondence should be addressed; tel: 315-268-2331, fax: 315-268-7118, e-mail: epienkos@gmail.com

Recent psychiatric research and treatment initiatives have tended to move away from traditional diagnostic categories and have focused instead on transdiagnostic phenomena, such as hallucinations. However, this emphasis on isolated experiences may artificially limit the definition of such phenomena and ignore the rich, complex, and dynamic changes occurring simultaneously in other domains of experience. This article reviews the literature on a range of experiential features associated with psychosis, with a focus on their relevance for hallucinations. Phenomenological research on changes in cognition, perception, selfhood and reality, temporality, interpersonal experience, and embodiment are discussed, along with their implications for traditional conceptualizations of hallucinations. We then discuss several phenomenological and neurocognitive theories, as well as the potential impact of trauma on these phenomena. Hallucinations are suggested to be an equifinal outcome of multiple genetic, neurocognitive, subjective, and social processes; by grouping them together under a single, operationalizable definition, meaningful differences in etiology and phenomenology may be ignored. It is suggested that future research efforts strive to incorporate a broader range of experiential alterations, potentially expanding on traditional definitions of hallucinations. Relevance for clinical practice, including emphasizing phenomenologically responsive techniques and developing targeted new therapies, is discussed.

Keywords: hallucinations/voice hearing/phenomenological psychiatry/psychosis/schizophrenia

Introduction

Recent trends in psychiatric research and treatment initiatives have focused on specific symptoms or experiential features of psychiatric syndromes, while de-emphasizing conventional diagnostic or classification frameworks. This includes the National Institute of Mental Health's Research Domain Criteria, a strategic initiative that encourages the adoption of a trans-diagnostic matrix of units of analysis (ie, from molecules to self-report) regardless of the syndromic/diagnostic context.¹ In addition, research groups like the International Consortium on Hallucination Research (ICHR) have encouraged new projects that focus on hallucinations across a range of physical and psychiatric conditions as well as nonclinical populations.² These and other initiatives have the advantage of supporting high-quality research on segmented aspects of human experience, deliberately avoiding the assumption that diagnostic syndromes represent the most valid and useful object of enquiry.³ However, such a focus risks losing sight of the complex and dynamic experiential context(s) in which hallucinations (or any construct) may arise, which might be essential for determining etiologies, treatments, and other clinical concerns.^{4,5}

In parallel, a limitation of much research in this area is the dominance of operationalized definitions and measurement tools to maximize reliability and simplify diagnostic criteria. While this emphasis on operationalization may help to achieve reliable and interpretable data, it risks a premature simplification of psychopathology.⁶ This has prioritized the most easily operationalized symptoms such as hallucinations and delusions over those that involve more individually variable or less easily communicated subjective experiences.^{7,8} In addition, what counts as a “symptom” is impacted by cultural paradigms and expressions; Western medical models, and perhaps the language of Western society in general, may not supply the words or concepts for people to relate subtle and fluctuating forms of experience, potentially restricting the psychiatric phenomena that are reported by patients or attended to by clinicians.^{9,10} Hallucinations are especially prone to these issues due to the apparent simplicity of their mainstream definition. Their seemingly straightforward characterization belies an experiential complexity that, while not new to literature on these phenomena, is currently borne out by many strands of contemporary research.^{11–14} Indeed, as Berrios and Marková¹⁵ note, the conceptual history of hallucinations is a long and complex one, and includes debates about the representational vs nonrepresentational nature of hallucinations, their equivalency with sensory perception, and the distinction (if any) between hallucinations found in psychiatric vs neurological or other organic conditions.

This article aims to broaden this lens by examining key areas of experience that could contextualize hallucinations within the larger realm of mental or experiential states associated with psychosis or psychotic vulnerability: cognitive experience, perceptual experience, selfhood and sense of reality, temporality, interpersonal experience, and embodiment ([supplementary material note i](#)). In doing so, we hope to be able to capture the vast heterogeneity within diagnostic categories, especially the diagnosis of schizophrenia ([supplementary material note ii](#)). We then discuss phenomenological and neurocognitive models that attempt to integrate these diverse transformations ([supplementary material note iii](#)). Finally, we consider contextual factors that may impact experience, especially the potential role of trauma in the development of psychosis. In doing so, we hope to identify numerous areas for future research that would assist in promoting more effective and valid approaches to assessment, study design, and intervention.

Domains of Experience

Cognitive Experience and Stream of Consciousness

Cognition in schizophrenia is typically discussed in empirical literature with respect to changes in memory, attention, and executive functioning, which are believed to underlie disorganized thought and behavior (eg, derailment, tangentiality). However, the way in which thought, memory, and

attention are *experienced* is also notably altered in schizophrenia. These include features usually associated with acute psychosis such as thought withdrawal and insertion, thought broadcasting, and passivity experiences. They also include more subtle experiences, such as loss of thought ipseity (the sense that thoughts do not belong to oneself) and spatialization of experience (the sense that thought has spatial or dimensional qualities).¹⁶ Such transformations of cognitive experience may be present in all stages of schizophrenia (including the prodrome, acute psychosis, and more long-term or chronic stages)¹⁷ as well as in the nonpsychotic tails of its spectrum conditions (eg, schizotypal personality disorder, schizophrenia in remission). They may also impact standard cognitive processes; eg, memory and attention are likely to be disrupted when thoughts seem alien or foreign, and are no longer felt to be a relatively transparent means of apprehending the world.¹⁸

Some of these cognitive phenomena bear resemblance to the concept of “soundless voices,” which can be traced back to Bleuler’s observations of patients with hallucinations: they did not describe the sensory features of actually “hearing” voices but related them to cognitive intrusions. Those who experience these phenomena are often convinced of the “otherness” of such intrusions and tend not to attribute the origin of these soundless voices to their own thinking processes.¹⁹ On the other hand, thought echo or “audible thoughts” denotes the perceptualization or vocalization of one’s own thoughts into an external space, whereas thought insertion is the inward projection of “other” thoughts into one’s mental space. All three phenomena can be framed as alterations of thought-agency and ownership.²⁰

Along similar lines, Mayer-Gross proposed that thought insertion involves a “becoming sensory” (*Versinnlichung*) of those thoughts.²¹ That is, they are *no longer experienced as thoughts but as material objects inserted by foreign agency*. He further noted that in early schizophrenia there may be the nearly simultaneous experience of verbal and nonverbal hallucinations (akoasms such as buzzing, whistling, and roaring), thought insertion, thoughts becoming loud, etc. Thus, it has been argued that auditory verbal hallucinations and disturbances of thought agency and ownership differ in degree rather than in kind.²² Such theories suggest that focusing on the easily measurable “auditory verbal hallucinations” may obfuscate these subtler variants; more research is necessary to determine whether a broader definition is necessary to encompass these and other variations of hallucinations,¹⁴ and whether they should be viewed as on a continuum with nonpsychotic phenomena.

Perceptual Experience

Although the above section discusses the semi-perceptual qualities of cognition, an additional line of research focuses on perceptual alterations themselves. Heidelberg psychiatrist Mayer-Gross may be regarded as herald of

the “perceptual anomalies” approach to schizophrenia. Mayer-Gross, his Heidelberg contemporary, Viktor von Weizsäcker, and the phenomenological psychiatrists Matussek, Conrad, Binswanger, and Blankenburg all considered changes in perceptual organization to play a fundamental role in schizophrenia.^{21,23} Matussek, eg, emphasized the impact of disruptions of context on the perception of objects, which allows certain perceptual qualities/details to dominate over others and be imbued with unusual significance.²⁴ Rather than circumscribed perceptual alteration, Matussek highlighted a global, Gestalt-like change in the structure of experience.

Mayer Gross’ fellow colleague in Heidelberg, Jaspers²⁵ developed the concept of “pseudohallucinations” (PH), which stood in stark contrast to the perceptual anomalies approach.²⁶ Jaspers adapted his concept from the German psychiatrist Hagen and the Russian psychiatrist Kandinsky (who himself experienced hallucinations). Not considered “real” hallucinations, PH are not perceptual experiences but based on ideas (Vorstellungen). For Jaspers, genuine or true hallucinations are experienced as “objectively” present (*leibhaftig*), and may be experienced alongside real perceptions in external objective space. In contrast, PH are imaginary (*bildhaftig*), not experienced as concretely real, have the character of subjectivity, and appear in inner subjective space. PH have been criticized for conceptual confusion, lack of clinical utility, and historical inaccuracy.^{26–28} Mayer-Gross criticized Jaspers’ overly strict opposition between “objective” perception (genuine hallucination) vs subjective image (PH), or “outer” vs “inner,” which often failed to distinguish actual clinical cases.²⁶ It also does not leave open the possibility that PH may also have their source in low level sensory or sensorimotor processing.

Mayer Gross’ approach is supported by a number of empirical studies, which have found evidence of fragmentation, or changes in perceptual organization, in schizophrenia, including difficulties seeing objects or scenes as whole gestalts.^{29–31} Perceptual fragmentation is associated with worse outcomes,³¹ and may contribute to figure-ground confusion and loss of perceptual stability, with objects appearing to change shape or appearance.^{32,33} Persons with these visual distortions are also more likely to experience visual hallucinations,³⁴ possibly pointing to shared processes contributing to these phenomena. These lines of research suggest that sensory and perceptual anomalies, including perceptual disorganization, may be implicated in phenomena that meet criteria for hallucinations, and investigation of these changes and the processes involved may shed light on the development of hallucinations.

Selfhood and Reality

Much typical human experience consists of being engaged and absorbed in a combination of cognitive,

physical, and affective activity within a world of (animate and inanimate) objects. The first-person perspective or “mineness” of this interaction with the world provides a form of implicit self-awareness (it is *I* who is having these experiences), which is sometimes referred to as *self-presence* or as *self-affection*.³⁵ This can be altered in the schizophrenia spectrum, in which the self may seem to stand distant or alienated from experience, rather than implicitly and constantly present.¹⁸ Various forms of depersonalization, a sense of inner void, and derealization, a feeling that objects or the world are less real or immediately present, can reflect the weakening of self-presence.¹⁶ Numerous studies have found that changes in self- and reality-experience in the form of dissociation predict positive psychotic symptoms, including hallucinations, particularly among individuals who have experienced childhood trauma.³⁶

Explanations for the relationship between dissociation and hallucinatory phenomena are varied, and include the hypotheses that perceptual anomalies increase the risk of dissociation³⁷; that dissociation weakens cognitive inhibition and therefore increases vulnerability to anomalous perceptual experiences³⁶; and that hallucinations may be features of dissociation (ie, inner speech is experienced as separate from oneself).³⁸ Such findings may challenge the notion of the schizophrenia spectrum and even psychosis itself (ie, that such symptoms do not reflect a disturbance of reality testing, but are better understood as dissociative processes),³⁹ although other factors unique to schizophrenia or psychosis may also play a role in increasing vulnerability to hallucinations. Alterations of selfhood and presence, then, may be contributing factors in the development of hallucinations across multiple distinct psychiatric conditions.

Temporality

Persons with psychosis may experience a variety of time distortions, such as lack of sense of time continuity, or a dissociation between internal and external time, ie, a mismatch between the speed of inner awareness and the speed of external events ([supplementary material note iv](#)).^{40–47}

Some phenomenologists have theorized that alterations in the sense of time continuity is associated with changes in “minimal” self, ie, the ability to feel oneself as being present here and now.^{43,46} Giersch and Mishara, eg, have proposed that disruption to minimal self in schizophrenia involves abnormalities in unconscious automatic processing, including the processing of time (at intervals far too brief to be experienced consciously; [supplementary material note v](#)).^{48–50} Experimental research indicates that anomalies of temporal processing in schizophrenia patients emerge at very brief time scales (8 and 17 ms),⁵¹ suggesting that “protentions” (ie, anticipations [often nonconscious] that serve as the context for moment-to-moment predictions)

are altered in psychosis and occur very early in the “phenomenological hierarchy” (supplementary material note vi). These results have been proposed to be consistent with impairments in predictive coding,⁵² the notion that sequences of information are predicted in advance to allow for the detection of unexpected events and a fluid perception of the outer world.⁵¹ In addition, Fuchs has argued that the alterations in selfhood in schizophrenia are related to changes in the ability to link the present moment with what is about to happen, and to move into the probable or anticipated future, which may result in the disconnection and fragmentation of perceived events.⁵³

This work on continuity of minimal self points to the possible role of temporal changes in alterations in cognition and perception, such as the sense of ownership and anticipation of self-generated events, thought to be related to hallucinations: when thoughts and sensations are no longer anticipated and embedded in a sense of self that persists over time, they may instead be experienced as externally generated objects rather than “inhabited” aspects of selfhood.

Interpersonal Experience

Alterations in social experience have long been one of the hallmarks of schizophrenia and play a key role in functional outcome. Many phenomenological psychiatrists have emphasized changes in interpersonal attunement and apparent alterations in the commonsense social world in schizophrenia. Bleuler considered autism, the “detachment from reality, together with the relative and absolute predominance of the inner life,”⁵⁴ to be highly specific to schizophrenia, while Minkowski proposed that a “loss of vital contact” with the immediate, social world was the core alteration underlying schizophrenia.⁵⁵ Indeed, many persons with first-episode schizophrenia describe the sense of being different from others,⁵⁶ which cannot be articulated in terms of concrete characteristics, but rather as having more of an ontological dimension⁵⁷; as one individual described it, “I always felt different, as if I belonged to another race.”⁵⁸ In addition, psychosis has long been viewed as an alteration in the boundary between self and other. Laing suggested that persons with psychosis are prone to feelings of “engulfment,” the threat of losing one’s identity to the influence of others, and believed that the core alteration in schizophrenia could be characterized as “ontological insecurity,” or a fundamental difficulty regarding differentiation with the world, autonomy, and continuity of being.⁵⁹

Alterations of both attunement and ego-boundaries may be involved in hallucinatory experiences. Federn,⁶⁰ eg, suggested that psychotic experiences including hallucinations and delusions were indicative of changes in the inner ego boundary, the dynamic interplay between “inner mentality” and external reality or “non-ego.” In addition, some individuals with psychosis describe a tendency to prioritize private (not intersubjectively available) perceptual

phenomena and to trust the reality of those phenomena over consensual, intersubjective reality, while others have described a confusion between what is “real” (ie, perceived by others) and what is imagined, remembered, or dreamed.⁶¹ Research on source-monitoring in schizophrenia—the ability to determine or remember whether a stimulus was internally or externally generated—lends some support to this hypothesis.^{62,63} Furthermore, research on the impact of interpersonal experience on hallucinations suggests that interpersonal context may be at least as important as—and potentially contribute to—perceptual or cognitive transformations; and that therapeutic work on relationships and communication with others and with voices may help individuals cope with hallucinations.^{64,65}

Embodiment

Alterations in bodily self-representation have been suggested to be another core component of schizophrenia, and include sudden changes in size and shape of the body, alterations in body ownership, anomalous agency, and even out-of-body experiences.^{33,66,67} Cenesthetic changes (involving unusual awareness of or changes in bodily sensations), including numbness of the body, electric and thermal sensations, sensation of abnormal pressure or weight, and vestibular sensations, are also observed in schizophrenia and are associated with clinical symptoms.⁶⁸ Such changes in bodily self-presence are present during the prodromal stage and remain salient throughout the course of schizophrenia.^{18,69–73}

Although these phenomena may contribute to a range of hallucinatory somatic experiences, some of the most striking phenomena appear as forms of “autoscopy.” Autoscopy is a loosely related complex of experiences in which one sees (or experiences) a “double” as external to one’s current vantage point. The autoscopic experience may last from seconds to hours or, in some cases, be present for years at a time (supplementary material note vii).⁷⁴ In vulnerable individuals, autoscopic experience can be triggered via a proprioceptive-tactile illusion,⁷⁵ while in the general population, autoscopic phenomena are associated with elevated schizotypy^{75,76} and transliminality (a hypothesized tendency toward multisensory experiences, mystical experience, and absorption).^{77,78} Some voice hearers have indicated that their voices have much more of a physical, embodied quality, rather than being purely auditory (or of another sensory modality).⁷⁹ Such findings on alterations of embodiment and autoscopic experiences suggest the need to focus on the relationship of changes in mental representations of the body to the development of a range of hallucinatory experiences.

Theories of Preflexive Change in Psychosis

Although it is useful for descriptive purposes to categorize subjective phenomena separately, they should not be thought of as clearly distinct from each other, but are

likely to be intimately interrelated ([supplementary material note viii](#)).¹⁶ Some phenomenological researchers of schizophrenia suggest that these features are expressive of a Gestalt or structural shift in subjectivity, ie, an alteration of the entire intentional framework that supports the experience of oneself and the world.⁸⁰ Others have suggested that they may best be viewed as different manifestations of a psychosis spectrum (see Kamens¹⁰ for an overview of alternative models of schizophrenia and psychosis). Here, we briefly present several prominent contemporary phenomenological models of schizophrenia along with their conceptualizations of hallucinations. In addition, we review several neurocognitive theories of psychosis (with and without a schizophrenia diagnosis) and briefly discuss the role of environmental or social factors, particularly trauma, in the development of these experiences.

Iipseity Disturbance Model

One prominent phenomenological theory of schizophrenia is the Iipseity Disturbance Model.¹⁸ This model suggests that the heterogeneous experiential changes in schizophrenia result from changes in basic or prereflective selfhood, or *ipseity*, the fundamental level of consciousness that endows immediate experience with an implicit sense of ownership (“my-ness” or “mineness”) that persists through time.

When basic selfhood is disrupted, the result may be a decreased sense of self as the immediate and dynamic center of experience (*diminished self-affection* or *self-presence*) and a tendency for the normally tacit background of experience to be taken up as the object of attention, scrutiny, or analysis (*hyperreflexivity*). Such alterations in self experience are likely to be felt long before the appearance of psychotic experiences, but may also evolve into positive, negative, and disorganized symptoms during periods of acute psychosis.^{81,82} A number of studies have found that these more subtle changes are associated with increased risk of developing psychosis,⁷⁰ and that they differentiate schizophrenia spectrum disorders from other psychiatric and personality disorders.^{83–86}

According to this model, hallucinations arise as a result of decreased indwelling (ie, tacitly inhabiting those processes as the medium of experience, rather than explicitly reflecting on them) in one’s cognitive processes and other subjective experiences, as well as an exaggerated tendency to take up these experiences as objects of attention; thus, thought and other processes are “no longer permeated with the sense of selfhood” but take on the perceptual properties of objects in the world.¹⁸

Perceptual Anomalies Approach

The hypothesis that ipseity represents the self-disturbances/disorders (Ichstörungen) in schizophrenia either

historically or phenomenologically remains a topic of debate.^{21,87,88} In contrast, rather than situating the experience of the self as immediate prereflective consciousness, the *perceptual anomalies approach* finds phenomenological and experimental evidence for an alteration of low-level perceptual processing.^{21,88,89} Generally, we experience controlled and automatic processing working together seamlessly in everyday cognition, without giving much thought to how this takes place. However, as Mayer-Gross and other members of the early Heidelberg school suggested, the self-disturbances/disorders are characterized by experiential passivity, or “the nonparticipation in one’s experience,” as if everything plays before the patient on a theater stage.²¹

This model proposes that self-disturbances arise from a disconnection of automatic processing from attendant conscious, controlled processing, due to low-level perceptual anomalies in the temporal ordering of experience.^{21,48,49} Hallucinations are considered part of these self-disturbances to the extent they are perceived as occurring independently from self. There is a separation between self and its automatic processing, experienced as due to foreign agency. Thus, while perception and action are typically strongly coupled, it is proposed that these processes become disconnected in persons with psychosis,^{21,48,49,52,90} and so hallucinations may involve the increasing passivity/absorption of the subject, ie, a diminished embodied participation in one’s perceptual, cognitive, volitional processes, etc.

Contra the ipseity view, then, the self is already mediated by an embodied perception action cycle (Von Weizsaecker’s^{23,91} “Gestalt-circle” or a “revolving door principle” between perception and movement) before becoming conscious, rather than the immediate prereflective self-affection of ipseity. With disruption of the embodied (spatial, temporal and sensorimotor) relationship to the hallucinatory object, there is a loss of perspective and ability to explore the hallucination from different viewpoints.²⁶ Anomalies very early in low-level sensory processing and/or the temporal organization of experience may be involved via this disturbance in perception/action coupling,^{21,48,49} or, perhaps, such bottom-up anomalies may more directly affect the experience of world and self (ie, before a perception action cycle).⁹² This problem requires further interdisciplinary collaboration between the experimental and phenomenological approaches.

Narrative Self Models

The social or narrative level of selfhood is thought to be built on the minimal self, or ipseity.⁹³ At the narrative level, the self goes beyond the fundamental level of sense of ownership and agency and immersion in the surrounding world, and takes on an identity that is situated socially and reflectively. In psychosis, both levels of self can be

significantly altered, albeit in different ways. Lysaker and Lysaker⁹⁴ suggest a primary role for alterations of narrative self, relating schizophrenia to a detachment of narrative from its communicative or dialogical purpose both with oneself and with others.

According to a narrative model, hallucinations are the result not of unusual perceptual experiences, but of one's narrative and subjective position in relation to them ([supplementary material note ix](#)). Thus, it is the attribution of anomalous experiences to perception of an external event, particularly in the context of describing that experience to another person, that allows something to be defined as a hallucination.⁹⁵

Neurocognitive Models of Psychosis

Several theories address the way that changes in brain structure or activity impact various cognitive processes, potentially giving rise to the phenomenological descriptions and theories described above. One core process that has been hypothesized to be involved is working memory (WM), an active, limited-capacity, short-term memory system that temporarily maintains information and provides an interface between perception, long-term memory, and action.⁹⁶ Thus, WM is the cognitive glue that binds our moment-to-moment experiences, and may contribute to a continuous and unified sense of self across time. When WM is compromised, our experience of the internal and external world becomes fragmented, disrupting this continuous sense of self.^{97,98} Deficits in working memory may affect on-line self-monitoring and allocation of attention to the task at hand, potentially contributing to the development of hallucinations as a result of a disconnection between oneself and one's thoughts.

The incorrect assignment of significance to otherwise neutral sensory input, otherwise known as aberrant salience, impacts learning, attention and memory abilities.⁹⁹ In psychosis, hallucinations and delusions may originate from these aberrant salient inputs, with numerous neurocognitive studies supporting this hypothesis.^{100,101} ([supplementary material note x](#)).^{99,102}

Other candidates for neurocognitive mechanisms of psychosis include changes in source monitoring, the ability to distinguish internally from externally generated stimuli or to determine the correct internal source (eg, imagination vs action); predictive coding, the process of making automatic, implicit predictions about events and updating these predictions in response to new information; and activation of the default mode network, the network of brain activation that is active during passive rest and mind-wandering, and is thought to play a role in self-reflection (for reviews, see^{103,104}).

What these phenomenological and neurocognitive models all have in common is their implicit acknowledgment that hallucinations are not isolated experiences,

but are expressions of much broader transformations of one's relationship to oneself and the world. That they are perceived as having distinct features, and taking on certain forms, may have to do as much (or more) with the contexts in which such transformations appear and progress. For example, Larøi et al¹⁰⁵ note that varying cultural definitions of "reality," acceptance of hallucinations as expressions of grief and other reactions to life events, and views of hallucinations as desirable (vs symptoms of illness) may all shape the ways that hallucinations are experienced. Thus, while the above models emphasize changes that occur at the level of the individual, it is essential to consider the role of social, cultural, and environmental factors in these experiential transformations. We therefore close with a discussion of the impact of trauma, one significant environmental and social factor, on the development of hallucinations.

Trauma and Hallucinations

Traumatic events are the prototype of eminently interpersonal, environmental factors that could significantly destabilize and alter subjective experience at various levels.¹⁰⁶ A history of neglect significantly increases the likelihood of developing schizophrenia (and other forms of clinical symptomology)^{107,108}; traumatic and other adverse events are also associated with the development of hallucinations in both clinical and nonclinical samples, and across a range of diagnoses.¹⁰⁹ It has been proposed that several psychological processes may be involved in the development of psychotic symptoms among trauma survivors, including patterns of emotion regulation developed to cope with trauma, unique qualities associated with memories of traumatic events (including encoding, retrieval, and processing), and changes to personal semantic memory.¹¹⁰ Such changes may blur the distinction between what is currently happening and what is being remembered or imagined, and may significantly alter many of the features of experience discussed in this article ([supplementary material note xi](#)).¹¹¹

In addition, research in the area of epigenetics suggests that such changes in response to environmental stressors may occur at the molecular level, leading to changes at the experiential level.¹¹² The epigenetic layer is often conceptualized as the interface between gene and environment, which allows it to recode psychological experiences into a biochemical inventory that retains these events over the longer term in a type of biochemical memory. Thus, stressful early experiences can modify these biochemical arrangements whose imprint remains far beyond the period of the actual stress, which has significant implications for prevention, identification, and intervention in psychosis¹¹³; it also explains findings of a strong relationship between trauma (and other adverse experiences) and the experiential changes involved in psychosis.¹¹⁴

Discussion

We have considered a range of experiential features and hypothesized mechanisms associated with psychosis, with attention to one commonly researched feature of psychosis, hallucinations. In doing so, we hope to have demonstrated not only the variety of manifestations of psychosis, but also the intricate intertwining of experiential domains and the interplay between phenomenology, neurocognitive factors, and environment.

It is unlikely that hallucinations or any other experiential alterations traditionally associated with psychosis will be experienced as discrete or static phenomena. Indeed, the findings presented above suggest that hallucinations may occur in multiple perceptual modalities and may be continuous with nonhallucinatory experiences (eg, thought insertion, out-of-body experiences, dissociation, alterations in perception). It is similarly unlikely that the development of hallucinations can be attributed to one core process or causal factor. Genetics, neurocognitive processes, subjective experience, cognitive styles or patterns of interpretation, and cultural and social environments are likely to interact in complex ways, with hallucinations as an equifinal outcome. Given this complexity, it is understandable that research, diagnostic criteria, and clinical interventions would attempt to simplify the defining characteristics of hallucinations. However, doing so risks ignoring a diverse array of associated or interwoven experiences, focusing instead on symptoms with narrow, concrete, and easily agreed-upon definitions.

This review suggests some key ways in which research on hallucinations can evolve. First, there are a number of identifiable subjective experiences co-occurring with hallucinations that do not fit the conventional definition of hallucinations. These are in need of greater research attention, both on their own and in relation to hallucinatory phenomena. As part of this working group, ongoing and future projects will systematically inquire into the full range of experiential modalities that are involved in participants' hallucinations, while other investigations may be facilitated by wide-ranging phenomenologically oriented interviews.^{16,47} Second, patterns of covariation with hallucinations need to be understood, and if clustering together, explanatory and etiological models of hallucinations need to be able to account for their co-occurrence. For example, several researchers are already exploring the relationship between phenomena like thought insertion and voice hearing.^{20,115} In addition, dissociation among voice hearers may moderate various outcomes associated with hallucinations; addressing this factor may reduce unnecessary variability within samples. Third, the breadth of phenomena suggests reconsidering how hallucinations should be defined. Traditional definitions have emphasized sensory qualities and their realness and distinctiveness from mental imagery and verbal thought. The importance of this boundary is questionable when considering findings on this range of

experiential transformations. For example, future research on hallucinations may also benefit from including subjects who experience thought insertion or thought passivity (rather than limiting recruitment to those who meet a narrower definition of hallucinations). There may be value in incorporating other elements into a definition of a broader construct of hallucinations, such as changes in agency or ownership of thought, separation from self-experience, uncertainty about internal vs external phenomena, and anomalous awareness of the presence of others.

Clinical Implications

A potential benefit of broadening the lens of hallucinations is to assist practitioners in attending to, and developing a vocabulary for enquiring about, these broader aspects of experience. Interventions targeting auditory hallucinations have focused on typical verbal characteristics, and the common perception of voices as sentient others.¹¹⁶ These have included cognitive restructuring targeting beliefs about voice power,¹¹⁷ and reducing submissive and hostile interpersonal relationships that develop with voices.^{64,118} While common, these targets are rather specific, and potentially secondary, elements of hallucinations rather than the more fundamental phenomenology of psychosis.

In considering this broader phenomenology, therapeutic approaches may try to more directly target the underlying changes in areas such as self experience and sensory and somatic integration. To date, there has been some development of methods to address depersonalization and derealization experiences in people with psychosis,¹¹⁹ but these remain at an early stage. Approaches that encourage metacognitive awareness may also be helpful. For example, Lysaker and colleagues¹²⁰ have developed interventions designed to foster awareness of different cognitive operations and integrate them into a more coherent experience of self. Finally, this review suggests the need for further investigation of therapies that target the interactive, dynamic, and phenomenologically rich nature of hallucinations, such as Avatar Therapy,¹²¹ Compassion Focused Therapy,¹²² and Voice-Dialogue.¹²³

Conclusions

This article has reviewed domains of experience that extend beyond voices to include self and reality, cognitive experience, perceptual anomalies, temporality, interpersonal experience, and embodiment. In addition, we have reviewed several of the major theories of prereflective change in psychosis to describe the ways these experiential transformations are inter-related. We also considered the impact of trauma on the development of hallucinations, though additional work is necessary to more fully consider the impact of cultural, social, and environmental factors on the construct of psychosis and the expression of associated symptoms. We suggest that all of

these domains should be considered in directing future research or clinical work on hallucinations—or any other aspect of psychosis. While symptom-specific research has resulted in valuable new discoveries and clinical interventions, it is essential not to lose sight of the experiential context out of which hallucinations develop.

Supplementary Material

Supplementary data are available at *Schizophrenia Bulletin* online.

Funding

This work was supported in part by Public Health Service grant (National Institutes of Health; R01MH094358 to R.P.S.) and the University of Hartford.

Acknowledgments

The authors wish to thank Renaud Jardri and Frank Laroi for organizing the International Consortium for Hallucination Research, in Lille, France, November 6–8, 2017, where this review was presented. The authors also wish to thank Sarah Kamens, Angela Woods, and other commenters for their valuable feedback on previous drafts of this work. None of the authors has any conflicts of interest related to this work.

References

- Sanislow CA, Pine DS, Quinn KJ, et al. Developing constructs for psychopathology research: research domain criteria. *J Abnorm Psychol.* 2010;119:631–639.
- Waters F, Woods A, Fernyhough C. Report on the 2nd International Consortium on Hallucination Research: evolving directions and top-10 “hot spots” in hallucination research. *Schizophr Bull.* 2014;40:24–27.
- Ford JM, Morris SE, Hoffman RE, et al. Studying hallucinations within the NIMH RDoC framework. *Schizophr Bull.* 2014;40(suppl 4):S295–S304.
- Waters F, Fernyhough C. Hallucinations: a systematic review of points of similarity and difference across diagnostic classes. *Schizophr Bull.* 2017;43:32–43.
- Raballo A. From perception to thought: a phenomenological approach to hallucinatory experience. *Schizophr Bull.* 2017;43:18–20.
- Maj M. Critique of the DSM-IV operational diagnostic criteria for schizophrenia. *Br J Psychiatry.* 1998;172:458–460.
- Parnas J, Sass LA, Zahavi D. Rediscovering psychopathology: the epistemology and phenomenology of the psychiatric object. *Schizophr Bull.* 2013;39:270–277.
- Kendler KS. Phenomenology of schizophrenia and the representativeness of modern diagnostic criteria. *JAMA Psychiatry.* 2016;73:1082–1092.
- Watters E. *Crazy Like Us: The Globalization of the American Psyche.* New York, NY: Simon and Schuster; 2010.
- Kamens S. Reconceptualizing the “schizophrenia” diagnosis: a transcultural, phenomenological investigation [dissertation]. Bronx, NY: Fordham University; 2016.
- Laroi F, de Haan S, Jones S, Raballo A. Auditory verbal hallucinations: dialoguing between the cognitive sciences and phenomenology. *Phenomenol Cogn Sci.* 2010;9:225–240.
- Handest P, Klimpke C, Raballo A, Laroi F. From thoughts to voices: understanding the development of auditory hallucinations in schizophrenia. *Rev Philos Psychol.* 2016;7:595–610.
- Henriksen M, Raballo A, Parnas J. The pathogenesis of auditory verbal hallucinations in schizophrenia: a clinical-phenomenological account. *Philos Psychiatry Psychol.* 2015;22:165–181.
- Raballo A. The stream of hallucinatory consciousness: when thoughts become like voices. *J Conscious Stud.* 2016;23:132–143.
- Berrios GE, Marková I. The construction of hallucination: history and epistemology. In: Blom J, Sommer I, eds. *Hallucinations: Research and Practice.* New York: Springer; 2012:55–71.
- Parnas J, Møller P, Kircher T, et al. EASE: Examination of Anomalous Self-Experience. *Psychopathology.* 2005;38:236–258.
- Raballo A, Parnas J. Examination of anomalous self-experience: initial study of the structure of self-disorders in schizophrenia spectrum. *J Nerv Ment Dis.* 2012;200:577–583.
- Sass LA, Parnas J. Schizophrenia, consciousness, and the self. *Schizophr Bull.* 2003;29:427–444.
- Parnas J, Urfer-Parnas A. The ontology and epistemology of symptoms: the case of auditory verbal hallucinations in schizophrenia. In: Kendler K, Parnas J, eds. *Philosophical Issues in Psychiatry IV: Classification of Psychiatric Illness.* Oxford: Oxford University Press; 2017:201–216.
- Humpston C, Broome M. The spectra of soundless voices and audible thoughts: towards an integrative model of auditory verbal hallucinations and thought insertion. *Review of Philosophy and Psychology.* 2016;7:611–629.
- Sterzer P, Mishara AL, Voss M, Heinz A. Thought insertion as a self-disturbance: an integration of predictive coding and phenomenological approaches. *Front Hum Neurosci.* 2016;10:502.
- Billon A. Does consciousness entail subjectivity? The puzzle of thought insertion. *Philos Psychol.* 2013;26:291–314.
- Uhlhaas PJ, Mishara AL. Perceptual anomalies in schizophrenia: integrating phenomenology and cognitive neuroscience. *Schizophr Bull.* 2007;33:142–156.
- Matussek P. Studies in delusional perception. In: Cutting J, Shepherd M, eds. *The Clinical Roots of the Schizophrenia Concept.* Cambridge: Cambridge University Press; 1987.
- Jaspers K. Zur analyse der Trugwahrnehmungen (Leibhaftigkeit und Realitätsurteil). *Z Für Gesamte Neurol Psychiatr.* 1911;6:460–535.
- Mishara AL, Zaytseva Y. Hallucinations and phenomenal consciousness. In: Stanghellini G, Raballo A, Broome MR, Fernandez AV, Fusar-Poli P, Rosfort R, eds. *Oxford Handbook of Phenomenological Psychopathology.* Oxford: Oxford University Press.
- Berrios GE, Dening TR. Pseudohallucinations: a conceptual history. *Psychol Med.* 1996;26:753–763.
- Spitzer M. Pseudohallucinations. *Fortschr Neurol Psychiatr.* 1987;55:91–97.

29. Silverstein SM, Keane BP. Perceptual organization impairment in schizophrenia and associated brain mechanisms: review of research from 2005 to 2010. *Schizophr Bull.* 2011;37:690–699.
30. Uhlhaas PJ, Silverstein SM. Perceptual organization in schizophrenia spectrum disorders: empirical research and theoretical implications. *Psychol Bull.* 2005;131:618–632.
31. Keane B, Paterno D, Kastner S, Silverstein S. Perceptual organization in schizophrenia spectrum disorders: empirical research and theoretical implications. *J Abnorm Psychol.* 2016;125:543–549.
32. Silverstein SM, Demmin D, Skodlar B. Space and objects: on the phenomenology and cognitive neuroscience of anomalous perception in schizophrenia (Ancillary article to EAWE domain 1). *Psychopathology.* 2017;50:60–67.
33. Chapman LJ, Chapman JP, Raulin ML. Body-image aberration in schizophrenia. *J Abnorm Psychol.* 1978;87:399–407.
34. Phillipson OT, Harris JP. Perceptual changes in schizophrenia: a questionnaire survey. *Psychol Med.* 1985;15:859–866.
35. Zahavi D. *Self Awareness and Alterity.* Evanston, IL: Northwestern University Press; 1999.
36. Varese F, Barkus E, Bentall RP. Dissociation mediates the relationship between childhood trauma and hallucination-proneness. *Psychol Med.* 2012;42:1025–1036.
37. Postmes L, Sno HN, Goedhart S, van der Stel J, Heering HD, de Haan L. Schizophrenia as a self-disorder due to perceptual incoherence. *Schizophr Res.* 2014;152:41–50.
38. Moskowitz A, Corstens D. Auditory hallucinations: psychotic symptom or dissociative experience? *J Psychol Trauma.* 2008;6:35.
39. Renard SB, Huntjens RJ, Lysaker PH, Moskowitz A, Aleman A, Pijnenborg GH. Unique and overlapping symptoms in schizophrenia spectrum and dissociative disorders in relation to models of psychopathology: a systematic review. *Schizophr Bull.* 2017;43:108–121.
40. Minkowski E. *Lived Time.* Evanston: Northwestern University; 1970.
41. Mcghie A, Chapman J. Disorders of attention and perception in early schizophrenia. *Br J Med Psychol.* 1961;34:103–116.
42. Kimura B. Psychopathologie der Zufälligkeit. *Daseinsanalyse.* 1994;11:192–204.
43. Fuchs T. The temporal structure of intentionality and its disturbance in schizophrenia. *Psychopathology.* 2007;40:229–235.
44. Gross G, Huber G, Klosterkötter J, Linz M. *Bonn Scale for the Assessment of Basic Symptoms.* Aachen, Germany: Shaker Verlag; 2008.
45. Vogeley K, Kupke C. Disturbances of time consciousness from a phenomenological and a neuroscientific perspective. *Schizophr Bull.* 2007;33:157–165.
46. Stanghellini G, Ballerini M, Presenza S, et al. Psychopathology of lived time: abnormal time experience in persons with schizophrenia. *Schizophr Bull.* 2016;42:45–55.
47. Sass L, Pienkos E, Skodlar B, et al. EAWE: Examination of Anomalous World Experience. *Psychopathology.* 2017;50:10–54.
48. Giersch A, Mishara AL. Is schizophrenia a disorder of consciousness? Experimental and phenomenological support for anomalous unconscious processing. *Front Psychol.* 2017;8:1659.
49. Giersch A, Mishara A. Disrupted continuity of subjective time in the milliseconds range in the self-disturbances of schizophrenia: convergence of experimental, phenomenological and predictive coding accounts. *J Conscious Stud.* 2017;24:68–87.
50. Martin B, Wittmann M, Franck N, Cermolacce M, Berna F, Giersch A. Temporal structure of consciousness and minimal self in schizophrenia. *Front Psychol.* 2014;5:1175.
51. Giersch A, Poncelet PE, Capa RL, et al. Disruption of information processing in schizophrenia: the time perspective. *Schizophr Res Cogn.* 2015;2:78–83.
52. Tschacher W, Giersch A, Friston K. Embodiment and schizophrenia: a review of implications and applications. *Schizophr Bull.* 2017;43:745–753.
53. Fuchs T. Temporality and psychopathology. *Phenomenol Cogn Sci.* 2013;12:75–104.
54. Bleuler E. *Dementia Praecox or the Group of Schizophrenias.* New York: International Universities Press; 1950.
55. Minkowski E. The essential disorder underlying schizophrenia and schizophrenic thought. In: Broome MR, Harland R, Owen GS, Stringaris A, eds. *The Maudsley Reader in Phenomenological Psychiatry.* Cambridge, UK: Cambridge University Press; 2012:143–155.
56. Møller P, Husby R. The initial prodrome in schizophrenia: searching for naturalistic core dimensions of experience and behavior. *Schizophr Bull.* 2000;26:217–232.
57. Parnas J, Henriksen MG. Disordered self in the schizophrenia spectrum: a clinical and research perspective. *Harv Rev Psychiatry.* 2014;22:251–265.
58. Stanghellini G, Ballerini M. What is it like to be a person with schizophrenia in the social world? A first-person perspective study on schizophrenic dissociality—part 2: methodological issues and empirical findings. *Psychopathology.* 2011;44:183–192.
59. Laing R. *The Divided Self: An Existential Study in Sanity and Madness.* New York: Pantheon Books; 2010.
60. Federn P. *Ego Psychology and the Psychoses.* New York: Basic Books; 1952.
61. Pienkos E, Silverstein S, Sass L. The phenomenology of anomalous world experience in schizophrenia: a qualitative study. *J Phenomenol Psychol.* 2017;48:188–213.
62. Ditman T, Kuperberg GR. A source-monitoring account of auditory verbal hallucinations in patients with schizophrenia. *Harv Rev Psychiatry.* 2005;13:280–299.
63. Moritz S, Woodward TS, Ruff CC. Source monitoring and memory confidence in schizophrenia. *Psychol Med.* 2003;33:131–139.
64. Hayward M, Jones AM, Bogen-Johnston L, Thomas N, Strauss C. Relating therapy for distressing auditory hallucinations: a pilot randomized controlled trial. *Schizophr Res.* 2017;183:137–142.
65. Hayward M. Interpersonal relating and voice hearing: to what extent does relating to the voice reflect social relating? *Psychol Psychother.* 2003;76:369–383.
66. Priebe S, Röhrlich F. Specific body image pathology in acute schizophrenia. *Psychiatry Res.* 2001;101:289–301.
67. Saks ER. *The Center Cannot Hold: My Journey through Madness.* London, UK: Hachette; 2007.
68. Röhrlich F, Priebe S. Effect of body-oriented psychological therapy on negative symptoms in schizophrenia: a randomized controlled trial. *Psychol Med.* 2006;36:669–678.
69. Lysaker P. Metacognition in schizophrenia spectrum disorders: methods of assessing metacognition within narrative and links with neurocognition. In: Dimaggio G, Lysaker P, eds. *Metacognition and Severe Adult Mental Disorders: From Research to Treatment.* New York: Routledge; 2010:65–82.

70. Nelson B, Thompson A, Yung AR. Basic self-disturbance predicts psychosis onset in the ultra high risk for psychosis “prodromal” population. *Schizophr Bull.* 2012;38:1277–1287.
71. Nasrallah HA. Impaired mental proprioception in schizophrenia. *Psychiatry.* 2012;11:4.
72. Koren D, Reznik N, Adres M, et al. Disturbances of basic self and prodromal symptoms among non-psychotic help-seeking adolescents. *Psychol Med.* 2013;43:1365–1376.
73. Brent BK, Seidman LJ, Thermenos HW, Holt DJ, Keshavan MS. Self-disturbances as a possible premorbid indicator of schizophrenia risk: a neurodevelopmental perspective. *Schizophr Res.* 2014;152:73–80.
74. Mishara AL. Autoscopia: disrupted self in neuropsychiatric disorders and anomalous conscious states. In: Schmicking D, Gallagher S, eds. *Handbook of Phenomenology and Cognitive Science.* Dordrecht: Springer; 2010:591–634.
75. Thakkar KN, Nichols HS, McIntosh LG, Park S. Disturbances in body ownership in schizophrenia: evidence from the rubber hand illusion and case study of a spontaneous out-of-body experience. *PLoS One.* 2011;6:e27089.
76. Germaine L, Benson TL, Cohen F, Hooker CI. Psychosis-proneness and the rubber hand illusion of body ownership. *Psychiatry Res.* 2013;207:45–52.
77. Lange R, Thalbourne MA, Houran J, Storm L. The revised transliminality scale: reliability and validity data from a Rasch top-down purification procedure. *Conscious Cogn.* 2000;9:591–617.
78. Thalbourne MA, Houran J, Alias AG, Brugger P. Transliminality, brain function, and synesthesia. *J Nerv Ment Dis.* 2001;189:190–192.
79. Woods A, Jones N, Alderson-Day B, Callard F, Fernyhough C. What is it like to hear voices? Analysis of a novel phenomenological survey. *Lancet Psychiatry.* 2015;2:323–331.
80. Parnas J. A disappearing heritage: the clinical core of schizophrenia. *Schizophr Bull.* 2011;37:1121–1130.
81. Parnas J. The self and intentionality in the pre-psychotic stages of schizophrenia: a phenomenological study. In: Zahavi D, ed. *Exploring the Self: Philosophical and Psychopathological Perspectives on Self-Experience.* Amsterdam: John Benjamins; 2000:115–148.
82. Parnas J, Sass L. Self, solipsism, and schizophrenic delusions. *Philos Psychiatry Psychol.* 2001;8:101–120.
83. Haug E, Lien L, Raballo A, et al. Selective aggregation of self-disorders in first-treatment DSM-IV schizophrenia spectrum disorders. *J Nerv Ment Dis.* 2012;200:632–636.
84. Raballo A, Saebye D, Parnas J. Looking at the schizophrenia spectrum through the prism of self-disorders: an empirical study. *Schizophr Bull.* 2011;37:244–251.
85. Nordgaard J, Parnas J. Self-disorders and the schizophrenia spectrum: a study of 100 first hospital admissions. *Schizophr Bull.* 2014;40:1300–1307.
86. Schultze-Lutter F, Ruhrmann S, Pickler H, von Reventlow HG, Brockhaus-Dumke A, Klosterkötter J. Basic symptoms in early psychotic and depressive disorders. *Br J Psychiatry Suppl.* 2007;51:s31–s37.
87. Grosz E. Being-in-the-world and schizophrenia. In: Goodman D, Freeman M, eds. *Psychology and the Other.* New York: Oxford University Press; 2015:247–269.
88. Mishara AL, Lysaker PH, Schwartz MA. Self-disturbances in schizophrenia: history, phenomenology, and relevant findings from research on metacognition. *Schizophr Bull.* 2014;40:5–12.
89. Mishara A, Bonoldi I, Allen P, et al. Neurobiological models of self-disorders in early schizophrenia. *Schizophr Bull.* 2016;42:874–880.
90. Mishara AL. Is minimal self preserved in schizophrenia? A subcomponents view. *Conscious Cogn.* 2007;16:715–721.
91. von Weizsäcker V. *Der Gestaltkreis. Theorie Der Einheit von Wahrnehmen Und Bewegen 4.* Stuttgart: Georg Thieme Verlag; 1950.
92. Silverstein S, Demmin D, Bednar J. Computational modeling of constraint sensitivity and orientation tuning in first-episode and chronic schizophrenia. *Comput Psychiatry.* 2017;1:102–131.
93. Nelson B, Fornito A, Harrison BJ, et al. A disturbed sense of self in the psychosis prodrome: linking phenomenology and neurobiology. *Neurosci Biobehav Rev.* 2009;33:807–817.
94. Lysaker PH, Lysaker JT. Narrative structure in psychosis: schizophrenia and disruptions in the psychological self. *Theory Psychol.* 2002;12:207–220.
95. Naudin J. Définir l’hallucination acoustico-verbale comme trouble de la conscience de soi. *Evol Psychiatr (Paris).* 2000;65:311–324.
96. Baddeley A. Working memory: looking back and looking forward. *Nat Rev Neurosci.* 2003;4:829–839.
97. Goldman-Rakic P. Circuitry of the prefrontal cortex and the regulation of behavior by representational knowledge. In: Plum F, Mountcastle V, eds. *Handbook of Physiology.* Bethesda, MD: American Physiological Society; 1987:373–417.
98. Goldman-Rakic P. Prefrontal cortical dysfunction in schizophrenia: the relevance of working memory. In: Carroll BJ, Barrett J, eds. *Psychopathology and the Brain.* New York: Raven Press; 1991:1–23.
99. Kapur S. Psychosis as a state of aberrant salience: a framework linking biology, phenomenology, and pharmacology in schizophrenia. *Am J Psychiatry.* 2003;160:13–23.
100. Nelson B, Whitford TJ, Lavoie S, Sass LA. What are the neurocognitive correlates of basic self-disturbance in schizophrenia? Integrating phenomenology and neurocognition: part 2 (aberrant salience). *Schizophr Res.* 2014;152:20–27.
101. Cicero DC, Becker TM, Martin EA, Docherty AR, Kerns JG. The role of aberrant salience and self-concept clarity in psychotic-like experiences. *Personal Disord.* 2013;4:33–42.
102. Rosen C, Jones N, Chase KA, Gin H, Grossman LS, Sharma RP. The intrasubjectivity of self, voices and delusions: a phenomenological analysis. *Psychosis.* 2016;8:357–368.
103. Griffin JD, Fletcher PC. Predictive processing, source monitoring, and psychosis. *Annu Rev Clin Psychol.* 2017;13:265–289.
104. Sass L, Borda J, Madeira L, Pienkos E, Nelson B. Varieties of self disorder: a bio-pheno-social model of schizophrenia. *Schizophr Bull.* 2018;44:720–727.
105. Larøi F, Luhrmann TM, Bell V, et al. Culture and hallucinations: overview and future directions. *Schizophr Bull.* 2014;40(suppl 4):S213–S220.
106. Rosen C, Jones N, Longden E, et al. Exploring the intersections of trauma, structural adversity, and psychosis among a primarily African-American sample: a mixed-methods analysis. *Front Psychiatry.* 2017;8:57.
107. Freedman R. Investigating trauma as a risk factor for psychosis. *Schizophr Bull.* 2017;43:1–2.
108. Read J, van Os J, Morrison AP, Ross CA. Childhood trauma, psychosis and schizophrenia: a literature review with theoretical and clinical implications. *Acta Psychiatr Scand.* 2005;112:330–350.
109. Longden E, Madill A, Waterman MG. Dissociation, trauma, and the role of lived experience: toward a new conceptualization of voice hearing. *Psychol Bull.* 2012;138:28–76.

110. Hardy A. Pathways from trauma to psychotic experiences: a theoretically informed model of posttraumatic stress in psychosis. *Front Psychol.* 2017;8:697.
111. Ratcliffe M. *Real Hallucinations*. Cambridge, MA: MIT Press; 2017.
112. Sng J, Meaney MJ. Environmental regulation of the neural epigenome. *Epigenomics.* 2009;1:131–151.
113. Sharma RP, Gavin DP, Chase KA. Heterochromatin as an incubator for pathology and treatment non-response: implication for neuropsychiatric illness. *Pharmacogenomics J.* 2012;12:361–367.
114. van Os J, Kenis G, Rutten BP. The environment and schizophrenia. *Nature.* 2010;468:203–212.
115. Jones N, Luhrmann T. Beyond the sensory: findings from an in-depth analysis of the phenomenology of “auditory hallucinations” in schizophrenia. *Psychosis.* 2016;8:191–202.
116. Thomas N, Hayward M, Peters E, et al. Psychological therapies for auditory hallucinations (voices): current status and key directions for future research. *Schizophr Bull.* 2014;40(suppl 4):S202–S212.
117. Birchwood M, Michail M, Meaden A, et al. Cognitive behaviour therapy to prevent harmful compliance with command hallucinations (COMMAND): a randomised controlled trial. *Lancet Psychiatry.* 2014;1:23–33.
118. Leff J, Williams G, Huckvale MA, Arbuthnot M, Leff AP. Computer-assisted therapy for medication-resistant auditory hallucinations: proof-of-concept study. *Br J Psychiatry.* 2013;202:428–433.
119. Farrelly S, Peters E, Azis M, David A, Hunter EC. A brief CBT intervention for depersonalisation/derealisation in psychosis: study protocol for a feasibility randomised controlled trial. *Pilot Feasibility Stud.* 2016;2:47.
120. Lysaker PH, Buck KD, Carcione A, et al. Addressing meta-cognitive capacity for self reflection in the psychotherapy for schizophrenia: a conceptual model of the key tasks and processes. *Psychol Psychother.* 2011;84:58–69; discussion 98.
121. Leff J, Williams G, Huckvale M, Arbuthnot M, Leff A. Avatar therapy for persecutory auditory hallucinations: what is it and how does it work? *Psychosis.* 2014;6:166–176.
122. Mayhew SL, Gilbert P. Compassionate mind training with people who hear malevolent voices: a case series report. *Clin Psychol Psychother.* 2008;15:113–138.
123. Corstens D, Longden E, May R. Talking with voices: exploring what is expressed by the voices people hear. *Psychosis.* 4:95–104.