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Taking subjectivity seriously: towards a unification of phenomenology, psychiatry, and neuroscience

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Abstract

Nearly all psychiatric diseases involve alterations in subjective, lived experience. The scientific study of the biological basis of mental illness has generally focused on objective measures and observable behaviors, limiting the potential for our understanding of brain mechanisms of disease states and possible treatments. However, applying methods designed principally to interpret objective behavioral measures to the measurement and extrapolation of subjective states presents a number of challenges. In order to help bridge this gap, we draw on the tradition of phenomenology, a philosophical movement concerned with elucidating the structure of lived experience, which emerged in the early 20th century and influenced philosophy of mind, cognitive science, and psychiatry. A number of early phenomenologically-oriented psychiatrists made influential contributions to the field, but this approach retreated to the background as psychiatry moved towards more operationalized disease classifications. Recently, clinical-phenomenological research and viewpoints have re-emerged in the field. We argue that the potential for phenomenological research and methods to generate productive hypotheses about the neurobiological basis of psychiatric diseases has thus far been underappreciated. Using specific examples drawing on the subjective experience of mania and psychosis, we demonstrate that phenomenologically-oriented clinical studies can generate novel and fruitful propositions for neuroscientific investigation. Additionally, we outline a proposal for more rigorously integrating phenomenological investigations of subjective experience with the methods of modern neuroscience research, advocating a cross-species approach with a key role for human subjects research. Collaborative interaction between phenomenology, psychiatry, and neuroscience has the potential to move these fields towards a unified understanding of the biological basis of mental illness.

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AUTHOR CONTRIBUTIONS

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INTRODUCTION: AN UNFINISHED PROJECT

As Karl Jaspers noted in his 1912 paper *The phenomenological approach in psychopathology*, "in the examination of a psychiatric patient it is usual to distinguish between objective and subjective symptoms" [1]. This schism between objective and subjective is not unique to psychiatry but has long plagued the study of the mind. Jaspers' contemporary, Sigmund Freud, wrote hopefully that "our provisional ideas in psychology will presumably one day be based on an organic substructure" [2]. Instead of this predicted unity, two largely siloed approaches to conceptualizing and treating the pathologies of mental life predominate: the psychological conceptions of the mind underpinning the psychotherapeutic approach, and the more biologically-oriented conceptions of the brain underpinning the psychopharmacologic and interventional approaches. Thus, progress towards a unified understanding of the mind continues to elude both psychiatry and neuroscience. Leaders in both fields have increasingly called for new approaches to overcome this impasse, including through a re-examination of subjective experience [3] and the neurobiology of internal emotional states [4, 5]. Nonetheless, moving closer to understanding the biological basis of mental illness will require a critical examination of our collective assumptions while forging novel paths forward.

The development of the Diagnostic and Statistical Manual (DSM), and particularly the revision and publication of DSM-III in 1980, sought to provide clinicians and researchers with a reliable framework for diagnostic categorization. To achieve this goal and minimize variability in diagnostic interpretation, the DSM emphasized specific criteria, many of which are outwardly observable behaviors. The DSM-III and subsequent editions have been largely successful in standardizing communication and diagnoses across clinicians and researchers. However, they have drawn criticism for prioritizing reliability over validity [6], and our understanding of the pathophysiology of the wide variety of mental illnesses characterized in the DSM remains limited. Contemporary efforts, such as the Research Domain Criteria (RDoC) [7], exemplify a recognition of this issue, though this framework also focuses mainly on observed behavioral phenotypes [8].

While we acknowledge the benefits of a reliable, standardized diagnostic manual, it is perhaps because of this reliability and subsequent emphasis on the DSM during clinical training that the explicit diagnostic criteria have implicitly been taken to effectively characterize the key features of each diagnosis, restricting how we conceptualize each illness. In parallel, research into the neurobiology of psychological constructs has been restricted due to the historical influence of the behaviorist school of thought, which sidelined subjective reports as biased or irrelevant [3]. We fear that these approaches have ultimately reinforced the distinction highlighted by Jaspers above between objective and subjective and drawn our focus away from additional, diverse aspects of psychopathology that may be more suggestive or informative of neurobiological mechanisms.

Though researchers have begun to more openly question the exclusion of subjective experience [3], we have not entirely overcome the influences noted above. The field continues to wrestle with finding the proper methods and avenues by which to integrate subjective experiences into modern neuroscience. Rather than being something simply to

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explain, subjective experiences themselves can provide a crucial window into the underlying mechanisms of brain function.

Here, we argue that in order to come to a more robust and biologically informative understanding of psychiatric phenomena, we must return to the phenomena themselves. The techniques and methods rooted in phenomenology, an approach focused on the detailed description of subjective experience, may help us to bridge the gap between mind and brain. Indeed, recent work has highlighted the utility of a phenomenologically-oriented approach in clinical settings [9-16]. We argue that the full benefits of this approach have not yet been realized—specifically, its ability to advance our understanding of neurobiological mechanism. In this Perspective, we advocate that a more thorough investigation of subjective experiences will generate productive and testable hypotheses about their biological basis that can provide fertile ground for modern neuroscientific investigation. Additionally, we advocate for a wider adoption of phenomenologically-oriented clinical methods and outline a strategy for integrating such methods into neuroscience research, with the goal to move us closer to an explanatory framework that can account for both subjective experience and objective neurophysiological processes equally well.

PHENOMENOLOGY AND PSYCHIATRY: LEVERAGING OLD IDEAS FOR A NEW PATH FORWARD

The field of phenomenology traces its origins to the early 20th century and the work of German philosopher Edmund Husserl. Husserl detailed specific methods for the examination of subjective experiences as such, describing how the contents of our conscious experience appear to us from a first-person perspective while suspending any judgments about how those contents relate to the natural world. Husserl's work shaped the theories and practices of influential 20th-century psychiatrists including Karl Jaspers, Eugéne Minkowski, and Ludwig Binswanger. We will say more about Minkowski's and Binswanger's work below, but all three argued that focusing only on objective, observable traits while ignoring subjective experience will inevitably lead to an incomplete understanding of the true nature of both lived experience and psychopathology [1, 17].

Contemporary advocates of a phenomenological approach to psychopathology share the view that an operationalized account of mental illness emphasizing objective traits may lead clinicians to miss critical experiential aspects of disease states [12, 18, 19]. Phenomenological psychiatrists often conduct semi-structured interviews that allow the patient to more fully describe their lived experience [20]. These interviews can then be analyzed using methods including qualitative thematic analysis [21, 22], where responses are reviewed for prevailing themes and coded (in either a hypothesis-driven or discovery-driven manner) to explore commonalities and differences. Recent phenomenologically-oriented research in psychopathology has been facilitated by validated rating scales for quantifying anomalous experience of self and other [23, 24] and has yielded compelling insights. For instance, patients with a broad range of psychiatric disturbances experience alterations in sense of self [16, 25], embodiment, and the experience of time [26, 27]. There have also been recent calls to use phenomenological techniques to imbue current clinical phenotyping

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with more detailed and nuanced information [11]. Yet many of these discussions leave unrealized what we find to be perhaps the most promising aspect of a renewed and more thorough emphasis on phenomenological investigation in psychiatry—its capacity to inform our thinking about neurobiological mechanisms. We demonstrate this capacity, first, through two examples of how such methods can impact upon existing approaches, and second, by describing how such approaches might be further modified to overcome some key limitations, thereby moving us closer to a unified understanding of the mind.

A RICHER PHENOMENOLOGY PROMISES A RICHER PATHOPHYSIOLOGY

The case of manic temporality

Despite having a set of established diagnostic criteria for manic and depressive episodes, we lack a unified understanding of the pathophysiology of bipolar spectrum illnesses [28], and many preclinical models of the disorder focusing on affective states and circadian regulation have struggled to firmly establish face validity [29]. A closer examination of the subjective experiences of individuals experiencing a manic episode, inspired by the methods of phenomenology, appears to provide an alternate path forward. Temporality, the subjective experience of time, pertains not simply to experiences of time passing but to a broader variety of temporal features inherent to lived experience—for instance, how our experience unfolds as a stream of consciousness, rather than a discontinuous series of snapshots. It is a key domain of investigation in phenomenological psychiatry, yet it receives little explicit focus in clinical practice. Nonetheless, many of the terms that describe features of affective disorders make frequent use of temporally-inflected language [26]. We speak of psychomotor *slowing* in depression and its opposite, *agitation*, in mania, along with a *flight* of ideas, *racing* thoughts, and *rapid* speech.

If we pay close attention to how individuals experiencing a manic episode describe their experience, as did Martin et al. [26], temporal qualities feature prominently in the nature of lived experience in a manic episode. The patients in their study, who underwent a phenomenologically-based psychiatric interview followed by thematic analysis, all exhibited a distinctive and highly positive attitude towards both the immediate and longer-term future [26]. Martin and colleagues discuss how this finding fits well with hypotheses originally put forward by Minkowski and Binswanger about how disturbances in temporality could account for the experiential and behavioral changes that typify the manic state. Their hypotheses are rooted in Husserl's early phenomenological descriptions of temporal experience, which noted that closely examining our experience of the present reveals that it has elements of just-past and immediately-anticipated-future as well. Husserl designated the element of just-past as *retention* and that of the immediately-anticipated-future as *protention* (Box 1). Martin et al. [26] identify what they label a "manic protention", a form of protention "of a future with a uniformly positive valence", which "extends not only to the next few seconds" but to the "future as a whole". The authors argue that this may help to explain certain well-recognized features of manic episodes, including a lack of awareness of the episode and a propensity for involvement in high-risk activity [26]. Thus, bringing a phenomenologically-oriented approach to the experiences of individuals during a manic

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episode reveals a difference in the structure of the temporality of their subjective experience, which helps to explain multiple characteristics typical of a manic state.

We argue that the principal benefit of cross-pollination between phenomenology, psychiatry, and neuroscience will be to generate novel, testable hypotheses regarding the neurobiology of mental illness (Fig. 1). For example, how might we leverage the principal conclusion of Martin et al. [26]—that an altered temporality, and specifically an altered protention, represents a core feature of mania—to further our neurobiological understanding of the disease?

As noted above, animal models of bipolar mania have struggled to establish face validity [29]. For example, mice with a mutation in the Clock gene (ClockΔ19) are perhaps the best-studied animal model of bipolar disorder [30], yet many of the observed behaviors of these mice can be explained by an increase in general locomotor activity [31]. A more phenomenologically-informed hypothesis, following from the notion of manic protention, which portends “a future with a uniformly positive valence”, [26] would be that valid models of bipolar disorder should exhibit increased positively-valenced reward prediction (e.g., experiencing neutral stimuli as rewarding or appetitive), which could be tested in the ClockΔ19 mouse model. One might further hypothesize that such alterations in reward prediction are a core neurobiological deficit underlying the pathophysiology of mania, in which case, constructing animal models around altered reward prediction mechanisms would be more informative and exhibit improved face validity. Further, clinical populations with bipolar disorder exhibit steeper delay discounting (i.e., increased preference for immediate rewards over larger, delayed rewards) [32], which can be reliably tested in animal models [33]. An animal model that exhibits both steep delay discounting and a bias towards positively-valenced reward prediction may ultimately recapitulate many of the features associated with bipolar mania in clinical populations.

The strength of an animal model that exhibits this extended face validity, one that encompasses observations stemming from phenomenological psychiatry as well as traditional operationalized notions of mental illness, is that further molecular and cellular investigations utilizing the cutting-edge methods of modern neuroscience can subsequently be pursued. While valproic acid, a commonly used treatment in mania, reversed some of the more overt behavioral changes in ClockΔ19 mice [34], might this drug, or other typically prescribed mood-stabilizing medications, alter phenotypes related to the temporal nature of reward sensitivity and/or delay discounting? What circuits are involved in this behavior, when interrogated with opto- or chemogenetics? What molecular pathways, when investigated with RNA interference and other molecular genetic techniques, underlie the altered responsivity of these circuits?

Delusions and schizophrenia spectrum illness

While we provide the detailed example of manic temporality above as a case study, the benefits of our approach are broadly applicable. For example, contemporary psychiatric clinical practice and research tend to view delusions as fixed, false beliefs that are assumed (either implicitly or explicitly) to lie at the extreme end of the distribution of normal belief structure [35]. While many have noted the shortcomings of this approach,

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recent critiques have specifically highlighted that the current conception of delusions ignores key experiential aspects of delusional thought [9]. Specifically, proponents of a phenomenological approach highlight that, rather than resulting from deficits in reasoning abilities, delusions instead often arise in the context of more pervasive alterations to our foundational subjective experience, captured in part by the concept of “delusional mood” or “atmosphere” [9, 15, 36]. When viewed from this perspective, delusions may be better viewed as ‘a-ha’ moments stemming from radical deviations from our usual subjective experience of being-in-the-world [37].

Clinical-phenomenological researchers have begun to characterize these pervasive experiential changes in more detail. A recent study of patients with prominent delusions in the setting of schizophrenia-spectrum illness (SSI) found that delusional thinking almost universally occurred alongside more extensive changes in experience, identifying, more specifically, changes in the basic structure of reality and meaning [10]. Further investigation of experiential alterations in SSI has identified disturbances in self-experience as a core deficit. [14, 38, 39] Indeed, such disturbances are predictive of the transition to schizophrenia in high-risk individuals [13, 38, 40-42]. These self-experience disturbances relate to a pre-reflective sense of the self as an experiencing subject with altered feelings of agency or ownership of one’s thoughts, perceptions, and actions, as well as instabilities in self-other boundaries [9, 14, 15, 36, 38, 41-43]. Hyper-reflexivity, an exaggerated self-awareness that undermines this pre-reflective sense of self- such as feeling one’s body as more like an external object—has been proposed as one of the key processes underlying these basic disturbances in self-experience [44]. These phenomenological findings support certain existing strands of research as likely to be relevant and productive for our neurobiological understanding of SSI, but also point us in new directions.

Recent research has made advances towards a neurobiological understanding of delusions and hallucinations by drawing on accounts of predictive processing, where discrepancies between top-down cortical predictions and bottom-up sensory input result in prediction-error signals that guide subsequent predictions [45, 46]. Predictive processing and related concepts such as active inference offer a potential means to naturalize subjective experience within an objective framework [47], allowing the processes that generate experience to be systematically queried while casting further doubt on a dualistic conception of the mind [48, 49]. Proponents of these approaches have highlighted their potential to unify subjective and objective data and better account for the lived experience of patients [50].

Predictive processing and active inference, broadly, are compatible with a phenomenologically-informed approach to delusions [15, 51], as experiences that occur alongside pervasive experiential alterations may take on a high degree of salience that inform future beliefs which appear impervious to rational restructuring [51]. This approach may further account for the more background alterations of “delusional mood” and altered self-experience found in SSI [10, 43, 51, 52]. Additionally, predictive processing-inspired neurobiological investigations have generated hallucination-like experiences in humans [53] and animal models [54]. Powers et al. [53] utilized functional MRI (fMRI) and computational modeling to show that auditory hallucinations can be explained by strong priors (predictions about self and environment generated from past experience) in people

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who hear voices. In a separate study, Schmack et al. [54] generated hallucination-like percepts in both humans and mice as well as a cross-species computational model to explain these hallucinations. They then showed that increased striatal dopamine predicted hallucination-like percepts in mice, and their model supported the hypothesis that strong priors could bias perception to predispose individuals to hallucination-like experiences [54]. These experiments demonstrate tractable, empirical ways of applying modern computational and neuroscientific methods to unify the subjective and objective domains in a common explanatory framework.

The predictive processing framework can also accommodate earlier hypotheses which posited that deficits in the neural mechanisms of efference copy or corollary discharge underlie the development of some symptoms of psychosis [51, 55-58]. An efference copy is a self-generated copy of a motor signal sent to sensory brain regions that enables prediction of the sensory consequences of the motor action, thereby providing a basis of comparison for self and other and our sense of agency [42, 51]. Deficits in these mechanisms may thus underlie aspects of the self-experience disturbances noted in clinical-phenomenological work on SSI [13, 40, 43]. One hypothesis that follows, then, is that animal models of deficits in efference copy, and other models that lead us to a better understanding of the principles of predictive coding more generally, are likely to advance our understanding of the basic physiologic mechanisms underlying important aspects of the experience of psychosis [42, 51]. Some of these models have already gained traction. Specifically, persons suffering from SSI show deficits in monitoring self-generated speech and other sounds [59, 60], and reverse-translational work in animals has begun to unravel the neural mechanisms of self-generated sound suppression [61]. While much remains to be discovered in this line of inquiry, it serves to demonstrate how phenomenologically-inspired observations can lead to experimental insights.

A more direct neurobiological hypothesis stemming from recent phenomenological work in SSI is that hyper-reflexivity, as defined above, may relate to abnormalities in dorsal striatal dopamine which have been observed in patients with SSI [62]. As Nelson et al. [42] note, hyper-reflexivity involves a “heightened awareness of aspects of one’s experience that are normally tacit and implicit”, or more procedural. The dorsal striatum is a particularly compelling target as this region serves as an interface between movement initiation and reward-directed action [63, 64], and lesions in this region lead to altered procedural motor sequence initiation [65]. Specifically, aberrant striatal dopamine signaling may lead to altered salience, drawing attention to movements and sensations that normally operate in the experiential background, in turn altering one’s sense of agency and contributing to aspects of hyper-reflexivity. Thus, in the case of SSI, we can see the utility of a critical dialogue between phenomenology and the neurosciences, stimulating new ideas with the potential to move the field forward.

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NEUROPHENOMENOLOGY: INTEGRATING CLINICAL-PHENOMENOLOGICAL RESEARCH WITH NEUROSCIENCE

Our proposal plots a path for the integration of phenomenology within neuroscience, and particularly with regards to the role of phenomenology in inspiring preclinical research that might bring us closer to understanding psychopathology. However, one of the main limitations of the approach as outlined above is that subjective reports cannot be obtained or used directly in animal studies. As a result, in such studies, we cannot be certain of how specific neurophysiological processes relate to specific changes in subjective experience. To explore how phenomenological data can be validated and integrated into neuroscientific studies of psychopathology, we propose a modified research program which addresses this issue through the more direct involvement of human subjects research in this process and provide a renewed call for a broader adoption of these methods.

To this end, we draw on a framework formulated by the Chilean philosopher and biologist Francisco Varela. Varela defined the term *neurophenomenology* in order to integrate the detailed study of first-person subjective experience with third-person objective neuroscientific measures, calling into question the implicit notion that the study of first-person experience cannot rise to the level of objectivity necessitated by the hard sciences [66]. Varela and colleagues went a step further and demonstrated their approach empirically [67]. They trained human subjects on an illusory perception task and collected first-person data (for example, asking subjects “what did you feel before and after the image appeared?”). They sorted this data into experiential categories termed *phenomenological clusters* using methods similar to thematic analysis, and then used this information to analyze EEG data collected during the task for possible correlates of subjective experience. The experimenters observed distinct patterns of brain activity corresponding to each phenomenological cluster, and they emphasized that these dynamical neural signatures would not have been apparent without the measurement of first-person reports [67].

The above experiment has been cited as a litmus test of sorts for the neurophenomenological research program [68, 69]. This study shows that first-person data can be combined with third-person data collection, in this case through EEG, and additionally that subjective reports may provide alternative ways to cluster data that facilitate the emergence of previously unrecognized patterns. This approach has since been extended to other domains [70-73], including towards better understanding the pathophysiologic processes of epileptic seizures [74]. This method could be adapted and used to study subjective phenomena of relevance to psychiatric illness as well, in order to foster the type of interplay between subjective reports and objective approaches required to overcome the limitation described above.

We therefore suggest implementing a research program with the explicit goals of (i) increasing our knowledge base of phenomenological clusters or invariants relevant to psychiatric illness; (ii) identifying and validating neural signatures or correlates associated with these phenomenological clusters in human subjects; and (iii) investigating these neural processes in a more mechanistic manner in animal models. Subjective data should be collected using the methods for investigating and analyzing subjective reports that recent

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clinical-phenomenological studies have used, including thematic analysis and interpretative phenomenological analysis [10, 20, 75, 76] (see Fayaerts et al. [10] and Nordgaard et al. [20] for examples of phenomenologically-oriented interviews and how they differ from a structured diagnostic interview). While the scope of individuals' subjective experiences is vast, both Lutz et al. [67] and recent clinical-phenomenological work have shown that these interviewing methods and analysis techniques can be used to helpfully refine and distill important themes, making this space tractable and productive for research purposes while simultaneously elucidating further aspects of subjective experience. Once such themes, or phenomenological clusters, are identified, Lutz et al. [67] provides an example of how they can be incorporated into human subjects research to identify objective correlates of subjective experience in neural data (see also Colombetti (2014), especially Chapter 6, for a more thorough discussion of this type of integration within affective neuroscience [68]). Lastly, the neural circuits and activity patterns identified through this approach could then be investigated in a cross-species manner, allowing researchers to more directly query the molecular and cellular mechanisms that play a pivotal role in the subjective experience of psychopathology. Recent work on self-generated sound suppression [61] and the generation of hallucination-like experiences [54] cited above serve as examples of the type of cross-species research we would expect to be further enabled and enriched through the adoption of this approach.

CHALLENGES AND FUTURE DIRECTIONS

Enacting this research program will require certain challenges to be overcome. First-person subjective reports are often characterized as unavoidably or unproductively biased. However, it is primarily subjects' reports on the causes of, and processes leading to, particular experiences that appear to be unreliable, rather than subjects' reports on the contents of their subjective experiences [68, 77]. Importantly, it is the latter which is relevant for the research program proposed here. Thus, future work should incorporate studies in which concurrent self-reports can be obtained, or, alternatively, where retrospective reports focus on interrogating in-the-moment aspects of a subject's experience at a given time point in the task (see also Colombetti (2014) [68] pg. 149–162 for further discussion of this topic).

Another challenge pertains to related concerns that qualitative research methods, such as thematic analysis, are similarly biased. While thematic analyses allow for the possibility that different themes may be identified by different researchers, they need not sacrifice methodological rigor [21, 78-80]. For instance, there are methods for assessing and increasing interrater reliability [81] and standards for reporting methodological details used in all phases of qualitative research [82-84]. Indeed, documentation and transparency are key to ensuring credibility and assessing the reliability and validity of qualitative research, and academic journals can facilitate this process by adopting methods-reporting requirements. Recent clinical-phenomenological work exemplifies these best practices [10, 85].

A major challenge will be in orchestrating the large-scale collaborative efforts, linking work in clinical populations, human subjects research, and neurophysiological studies in animals, that our proposed research framework will require. Indeed, the clinical and preclinical domains should exist in constant conversation, refining existing hypotheses and providing

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the type of *mutual constraints* which Varela proposed would move us toward a unified understanding of the mind [66] (Fig. 1). We are hopeful that the research program we have outlined in this Perspective will help provide the impetus to overcome these challenges and bring us closer to a unified understanding of experience and its biological underpinnings.

CONCLUSION

A more detailed examination of subjective experience, exemplified by the phenomenological approach to psychiatry, has significant potential to generate new insights and richer hypotheses that promise to advance neurobiological research into the nature of psychiatric illness. Progress in understanding the neurobiological basis of psychiatric illness has been inadvertently limited by an emphasis on operationalized diagnostic criteria. We believe that to move forward, we must take subjective experience more seriously, both in the clinic and in the laboratory. We have attempted to show how insights from phenomenology and its applications to psychiatry can provide a more fertile basis for hypothesizing about neurobiological mechanisms underlying psychiatric illness, pointing us in directions we might not otherwise have explored. Specifically, our framework calls for an integration of phenomenological approaches to psychiatric patients with insights from neuroscience, to generate specific, testable hypotheses that can be elaborated with the methods of modern neuroscience. By setting our focus on the precise structure of the lived experiences of patients, psychiatry can more effectively employ neuroscientific investigation and the resulting knowledge to refine our understanding of pathophysiology and ultimately develop new treatments.

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Box 1.

Husserl and temporality

Husserl cites the experience of listening to a melody, where along with the experience of the present note are impressions of the just-past note and the note anticipated-to-come, contained within one unified present. Thus, he describes a three-part structure to our experience of the present moment, comprised of the *primal impression*, representing the narrowest experience of right-this-moment; *retention*, the component of the just-happened or just-having-been-present; and *protention*, our anticipation of the just-about-to-happen, or what-is-to-immediately-follow [86, 87]. Importantly, Husserl differentiates retention from memory, or the act of remembering, in which a past event is re-presented to our present awareness, whereas retention is a process that happens pre-reflectively, as part of our natural experience of present time.

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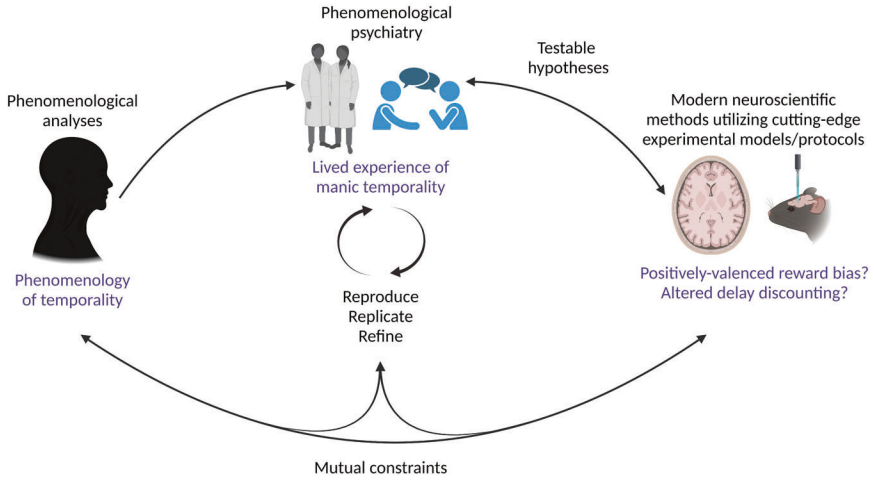

Fig. 1. Reciprocal interactions between phenomenology, psychiatry, and neuroscience.

Here, we demonstrate how increased collaborative interactions between phenomenology, psychiatry, and neuroscience can offer specific, testable hypotheses to further our understanding of the biological bases of mental illness. Specifically, we show that the influence of the phenomenological tradition can inspire phenomenologically-oriented clinical investigations, which we argue should be expanded in order to reproduce findings and refine hypotheses. In parallel, compelling hypotheses generated either directly from phenomenological observations or refined in further clinical studies can be further elaborated using cutting-edge methods of modern neuroscience. The findings of these experiments will then feedback upon the fields of phenomenology and psychiatry, creating *mutual constraints* that then guide future inquiry [66]. In purple, we give the specific example of biological hypotheses generated from phenomenological investigations of manic temporality, discussed in the main text. Figure prepared in BioRender (https://biorender.com/).