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DOI 10.1002/wps.20212

Phenomenology *is* Bayesian in its application to delusions

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Sass and Byrom (1) argue that phenomenology “expands the range of testable hypotheses”. This resonates with our view that phenomenology “leads to neurobiological hypotheses, which can be tested experimentally” (2,3). It is also a welcome modification of Sass’ proposal (4) that phenomenology “serves an explanatory function”. If phenomenology “explains” schizophrenia by proposing its core essence as a disturbance of “hyper-reflexivity/ipseity” (4), it claims knowledge about causal relationships without recourse to testing hypotheses about mechanism.

The authors see a conflict between “enactive” or “embodied” approaches to cognition and “more intellectualistic sounding” prediction-error formulation. We suggest that this apparent conflict is related to a misunderstanding of the term *beliefs* in predictive coding accounts. In current accounts of Bayesian hierarchical predictive coding, a belief is considered merely a probability distribution over some unknown state and may or may not be consciously accessible (5). A central claim of hierarchical predictive coding models is that such beliefs are fundamentally embodied even at the lowest levels of sensory processing, clearly not implying intellectual conjecture and refutation. Accordingly, studies of patients with schizophrenia

point to an alteration of predictive mechanisms at low levels of sensory processing. Behavioral and functional neuroimaging studies of illusory visual perception in schizophrenia patients have suggested impaired predictive mechanisms in early visual cortex (e.g., 6,7). Similarly, mismatch-negativity (MMN), an electrophysiological signal that is thought to reflect the automatic registration of irregularities in sensory input, is reduced in patients with schizophrenia (8). The empirical evidence for altered predictive coding seems to contradict the authors’ assumption that the predictive mechanisms involved in delusion formation/maintenance necessarily implicate, or are limited to, cognitive or “intellectualistic” processes.

Furthermore, the authors suggest that the exaggerated prediction-error signaling giving rise to *hypersalience* does not account for *hyposalience* and an associated “anything-goes” attitude, which they propose may be due to a dysfunction in the default-mode network. Apart from possible problems with “reverse inference”, we question the assertion that *hyposalience* as described by the authors is incompatible with the notion of prediction-error dysfunction. To the contrary, predictive coding accounts actually predict that the proposed exaggerated prediction-error signaling (or imbalance in the precision of prediction errors and prior beliefs) (5) results in an impaired distinction between normally expected and unexpected events. This is exemplified by reduced MMN amplitude in schizophrenia conceptualized as a consequence of altered prediction-error signaling. In this context, attenuat-

ed mismatch responses in schizophrenia patients may actually not reflect the failure to register surprising events, but rather the fact that each event is surprising (5,7). Hyper- and *hyposalience* are two sides of the same coin, accounted for by a single factor, prediction-error dysfunction (9).

This is supported by Heidelberg psychiatrist Mayer-Gross’ (1932) observation of reduced anticipatory expectation in the “self disturbances”, due to the ongoing “interruption” of current goal-processing by the “made” or influenced perceptions, movements, thoughts, etc., which characterize those disturbances (10). There is only the compelling sensory evidence of *now*: “no temporal order prevails, each sensory impression is equally valued, replacing its predecessor”. This reduction in top-down, embodied perceptual expectation in the “self disturbances” observed by Mayer-Gross anticipates the predictive coding account of attenuation of visual illusions (e.g., the hollow-mask illusion) in schizophrenia and how this relates to delusions and related symptoms (as discussed by Corlett, Fletcher and Frith, and others).

The phenomenological psychiatrist Binswanger also described the self in schizophrenia as captive in the present moment in a “temporal shrinking” of past and future which resembles dreaming (11). In his fiction, Kafka depicts the reduced expectation in dreamlike-hypnagogic experiences, where protagonists report “expecting” the very events that “surprise” them (12). This is not “bizarre-as-banal”, but *the absence of banal altogether*. It is also not “anything-goes”, but can be formalized in the Bayesian hierarchy as outlined above. Similarly, Binswanger

describes a “monotonous” spreading of the delusion to the entire perceptual field in terms of a “loosening” of context from prior learning (2,11).

Sass and Byrom’s language suggests that “phenomenology” does the work of description and inference (e.g., “phenomenology is acutely sensitive”, “phenomenology is cautious”). Such phrasing may lead to the mistaken assumption that phenomenology is a body of *finalized* results articulated by one individual or group, rather than a rigorous method, which includes an ongoing process of dialogue, refinement, and consensus.

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DOI 10.1002/wps.20213

Phenomenological and neurocognitive perspectives on polythematic and monothematic delusions

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Sass and Byrom (1) end their paper by advising us to doubt the wisdom of viewing delusion as a unitary phenomenon. I share their view. We must make distinctions here. And as far as the phenomenology of delusion is concerned, the most important distinction is between polythematic and monothematic delusional conditions (2,3) – critical here because the various phenomenological features of delusion that Sass and Byrom discuss are characteristic of polythematic delusion, but not of monothematic delusion.

In polythematic delusional conditions, the patient expresses delusional beliefs about a wide variety of unrelated topics. For example, amongst the beliefs expressed by P. Schreber were that “nerves” and “rays” were taking over

his soul, that he changed into a woman, and that he was omnipotent, omniscient and even omnipresent (4). And amongst the beliefs expressed by the Nobel Laureate J. Nash, diagnosed with schizophrenia, were that he would become Emperor of Antarctica, that he was the left foot of God on Earth, and that his name was really Johann von Nassau (5).

In contrast, in monothematic delusional conditions, the patient expresses only a single delusional belief concerning a single topic. Numerous different monothematic delusions have been described in the literature. Eight of these monothematic delusions (6) are: *Capgras delusion* (“one of my closest relatives has been replaced by an impostor”) (7-10); *Cotard delusion* (“I am dead”) (11,12); *Frégoli delusion* (“I am being followed around by people who are known to me but who are unrecognizable because they are in disguise”) (13-16); *mirrored-self misiden-*

tification (“the person I see in the mirror is not me, but some stranger who looks like me”) (17); *reduplicative par- amnesia for persons* (a stroke patient affirmed both that her husband had died and had been cremated four years earlier (true) and that he was currently a patient on the ward in the same hospital that she was in (not true)) (17); *somatoparaphrenia* (the patient denies ownership of a limb insisting that this limb actually belongs to someone else, such as a relative or the clinical examiner) (18); *delusion of alien control* (“someone else is able to control my actions; I am a puppet and someone else is pulling the strings”) (19); *delusion of thought insertion* (“thoughts are put into my mind like ‘Kill God’; it’s just like my mind is working but it isn’t; they come from this chap Chris; they’re his thoughts”) (20).

Sass and Byrom summarize the phenomenological perspective on delusion as follows: “Phenomenological accounts