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The dreaming brain/mind, consciousness and psychosis [☆]

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ABSTRACT

Several independent lines of research in neurobiology seem to support the phenomenologically-grounded view of the dreaming brain/mind as a useful model for psychosis. Hallucinatory phenomena and thought disorders found in psychosis share several peculiarities with dreaming, where internally generated, vivid sensorimotor imagery along with often heightened and incongruous emotion are paired with a decrease in ego functions which ultimately leads to a severe impairment in reality testing. Contemporary conceptualizations of severe mental disorders view psychosis as one psychopathological dimension that may be found across several diagnostic categories. Some experimental data have shown cognitive bizarreness to be equally elevated in dreams and in the waking cognition of acutely psychotic subjects and in patients treated with pro-dopaminergic drugs, independent of the underlying disorder. Further studies into the neurofunctional underpinnings of both conditions will help to clarify the use and validity of this model.

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1. Introduction

Although almost all the founding pioneers of the modern scientific approach to mental disorders have in some way or another commented on the similarities between dreaming and insanity (Bleuler, 1966; Freud, 1958; Jung, 1936; Kraepelin, 1906; Minkowski, 1997), only few contemporary researchers have attempted to bind these complex phenomena (Gottesmann, 2006; Hobson, 2004). Indeed, most of the evidence supporting this observation belongs to a phenomenological perspective, which intrinsically lies on debatable premises due to its reliance on the verbalization of subjective experiences (Mishara, 2007; Parnas, Sass, & Zahavi, 2008). However, several recent neurobiological findings on both the architecture of dream sleep and severe mental disorders offer intriguing opportunities to bridge mental functioning to underlying brain activity across states.

Sigmund Freud was amongst the first to consider dreams at the centre of a complex theorization of mental functioning, and whether or not such theory may now be reconciled with neurobiology remains open to debate (Carhart-Harris, 2007; Hobson, 2004; Solms, 2004). Indeed, psychiatry's current loss of interest in dreaming may in part be attributed to a refusal of the central tenet of psychoanalysis, that has often been considered the extreme opposite of a rational scientific approach to the mind. Moreover, dreaming is usually considered a physiological phenomenon of little use in the clinical approach to mental disorders, although several psychologically-oriented investigators have shown statistically significant disorder-specific variations in the dreams of psychiatric patients (Cartwright, Agargun, Kirkby, & Friedman, 2006; Sauteraud & Menny, 1997; Schredl & Engelhardt, 2001; Zanasi, Calisti, Di Lorenzo, Valerio, & Siracusano, 2010). Dreaming is one of several

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subjective experiences which may yield significant insight into the functioning of the brain/mind, but two peculiar aspects make it particularly useful in terms of experimental evaluation. First of all, dreaming is generated by the brain in absence of interaction with the external world, possibly the purest form of mental production of a healthy brain (Revonsuo, 2006). Secondly, dreaming recurs with high frequency and little interindividual variability in most human subjects. Although an obvious inter- and intra-individual variability can be found in terms of dream content, the formal organization of this type of mentation appears to be fixed (Scarone et al., 2008; Stickgold, Rittenhouse, & Hobson, 1994). It has been suggested that themes, emotions and plots of dreams and their intrinsic bizarreness are as much generic to human consciousness as to individual consciousness (Hobson & Kahn, 2007). Two recent theories on dreaming both consider this phenomenon a biologically determined system that has served an evolutionary function for mankind (Hobson, 2009; Revonsuo, 2000). Although they have been reached from different perspectives, Antti Revonsuo's Threat Simulation Theory and Allan Hobson's Protoconsciousness Theory both imply that the phenomenology of dreams is generic and shared amongst individuals.

In this paper we will review evidence in support of the view that the dreaming brain/mind resembles psychosis independent of diagnostic categorizations, and may as such be considered a useful experimental model of this complex phenomenon. We believe a convergence of phenomenological and neurobiological observations to be necessary in order to clearly identify these two states of consciousness and their connections.

2. Phenomenology

The term psychosis has been variously defined in psychiatric literature, and both researchers and clinicians struggle to converge on a common definition of this phenomenon that may be considered satisfying. The Fourth edition of the Diagnostic and Statistical Manual of Mental Disorders opted for a restrictive definition of psychosis, to be preferably used as a term encompassing those serious mental disorders where the individual "loses touch with reality" (APA, 2000). Although the Manual itself stresses the need to consider such a definition as an operative simplification given the complexity and variety of clinical presentations, this view of psychosis seems to adequately follow in the European tradition of psychopathologists such as Eugène Minkowski (alienation), Kurt Schneider (passivity) and Karl Jaspers (loss of critical capacities and judgment over one's experience). Today, it is broadly accepted that psychosis may occur in the context of several clinical conditions, ranging from schizophrenic and affective disorders to neurological, metabolic and substance-related conditions. However, having the term psychosis often been conceptually bound to schizophrenia, it is not uncommon to find these two terms used as synonyms both in clinical practice and in research settings. Recent dimensional approaches seem to clarify the relationship, with psychosis considered the positive-symptom dimension of schizophrenia, with cognitive impairment and negative symptoms being the two other most common (van Os & Kapur, 2009). In our view, positive symptoms such as abnormal senso-perceptual experiences or thought processes ranging from ideas of reference to highly structured delusions, share substantial similarities with dream phenomenology.

Any form of conscious experience referred by a subject upon awakening, that can be assumed to have occurred during sleep, can be considered a dream. Such experience may be described along a continuum ranging from simple images, emotions or wake-like thoughts to full blown, complex, hallucinoid scenes within which the dreamer is immersed and within which often articulate storylines unravel, with intense interactions with animate and inanimate objects. The capability of the brain/mind to generate a full hallucinoid scenographic representation of reality (indeed, a form of virtual reality) is undermined by several elements of impossibility and incongruence of which the dreamer however is aware only upon awakening. Several experimental data point to bizarreness as a key feature of dream mentation, which may be viewed in its formal outline as a loosening of associations whereby incongruous elements are continuously juxtaposed in the dream sequence, be they emotional or related to characters, objects or actions. Such peculiarity has been related to an absence of language-dependent cognitive processes in dreaming such as self-reflective awareness, abstract thinking and metacognition (Hobson, 2009). In dreaming, the blockade of interactions with the external world is determined by modifications in underlying sleep physiology, giving rise to quantitatively and qualitatively varying percepts involving all sensory modalities. Psychotic symptoms in clear wakefulness may be viewed as a dynamic interplay between the external reality feedback and similar emotion and perception-related internal sources. The subject's inability to assess the internal origin of such sources could be attributed to a deficit of self-monitoring mechanisms that has been extensively related to schizophrenic psychoses (Stephan, Friston, & Frith, 2009; Wiffen & David, 2009).

3. Neurobiology

Although dreaming was originally associated with REM sleep, many convincing data have shown that some type of mental activity is possible during other stages of sleep. Human experience may be divided in three broad mental states: waking consciousness, dream consciousness and non-consciousness. In terms of brain neurophysiology, these three states are supposedly sustained by wakefulness, dream sleep and dreamless sleep (Tononi, 2000). Non-consciousness may also be found in pathological conditions such as coma and anaesthesia, although some form of consciousness may be present (Mashour, 2006). Indeed, within such theoretical framework, intermediate states of consciousness must be considered possible, as those found in neurological disorders affecting the brainstem, where a fluctuating consciousness determines oscillations in vigilance and orientation that contribute to emerging abnormal mental phenomena (D'Agostino and Limosani, 2009).

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