



ELSEVIER

Contents lists available at [ScienceDirect](http://www.sciencedirect.com)

Consciousness and Cognition

journal homepage: www.elsevier.com/locate/concog

Crossing the invisible line: De-differentiation of wake, sleep and dreaming may engender both creative insight and psychopathology



Professor Sue Llewellyn

Faculty of Humanities, University of Manchester, UK

ARTICLE INFO

Article history:

Received 30 July 2016

Accepted 13 September 2016

Available online 6 October 2016

Keywords:

De-differentiation

Dream

Creative insight

Psychopathology

Sleep

Chaos

ABSTRACT

Writing about dreaming, the poet Raymond Carver said “I feel as if I've crossed some kind of invisible line”. In creative people, the “line” between wake, dreaming and psychopathology may be porous, engendering a de-differentiated, super-critical, hybrid state. Evidence exists for a relationship between creativity and psychopathology but its nature has been elusive. De-differentiation between wake, sleep and dreaming may be the common substrate, as dream-like cognition pervades wake and wake-like neurophysiology suffuses sleep. Chaos theory posits brain states as inherently labile, transient and dynamically unstable. Over and above transient dissociations, an enduring and, sometimes, progressive, de-differentiation may be possible. Evidence indicates that sleep and dreaming facilitate creative insight. In consequence, a mild to moderate form of de-differentiation may enhance creativity but if wake-like neurobiology permeates sleep this may disrupt sleep-dependent memory processing and emotional regulation. If de-differentiation is progressive and enduring, various forms of psychopathology may result.

© 2016 Elsevier Inc. All rights reserved.

1. Introduction

The brain is a complex, self-organizing system which achieves phenomenal consciousness (Fingelkurts, Fingelkurts, & Neves, 2013; Freeman, 1991, 1999; Kelso, 1997; Singer, 1986, 2009). Here, phenomenal consciousness is equated with the appearance of a world and the experience of a self within this world (Metzinger, 2004, 2009). Remarkably, across every 24 h, we achieve two, self-organized, highly activated, states of phenomenal consciousness: waking and rapid eye movement (REM) dreaming. In both states a world appears which is experienced as real and present, i.e. not experienced as a model constructed by the brain (Revonsuo, 2006; Windt & Metzinger, 2007). Within this world, in both states, the self has central positioning.

Yet both the world and the self are somewhat different between waking and dreaming. Notably in REM dreaming, executive control is lost, directed attention is reduced, primary emotions are more prevalent and the mind/brain shifts from a more linear-logical, analytic mode to a highly associative one (Hobson, 2002; Llewellyn, 2011; Nir & Tononi, 2010; Stickgold, Scott, Rittenhouse, & Hobson, 1999). Differentiation between REM dreaming and waking is, primarily, through differential neuromodulation and input-output gating, brain activation is similar in both states (Hobson, 1992; Hobson & Pace-Schott, 2002; Kahn, Pace-Schott, & Hobson, 1997). Inherent in the attainment of these dual, differentiated states is the possibility of de-differentiation i.e. that differentiation may be lost, at least to a degree. In other words, the “invisible

E-mail address: Sue.Llewellyn@manchester.ac.uk

<http://dx.doi.org/10.1016/j.concog.2016.09.018>
1053-8100/© 2016 Elsevier Inc. All rights reserved.

line” (Carver, 1995) between wake, sleep and dreaming (W/S/D) becomes leaky and thin, raising the question of the consequences of de-differentiation.

The hypothesis which motivates this paper is: de-differentiation of the boundaries between W/S/D can engender either creative insight or psychopathology or both, dependent upon its degree and progression in particular individuals. The research and evidence in support of this hypothesis comes from rather disparate domains. Consequently, the central argument is, briefly, rehearsed here.

1.1. Central argument

Creative insights are thought to emerge from discrete brain processes. A distinction between problem solving through either non-insight or insight has long been proposed and discussed: a non-insight system based on deliberate, incremental, linear-logical, analytic reasoning, in contrast to an insight system which engenders sudden recognition of a possible solution (De Neys, 2006; Evans, 2008, 2011; Evans & Stanovich, 2013; Frankish, 2010; Sloman, 1996, 2002). Creative insights, which reach waking consciousness suddenly, may result from a period of spreading neural activation to make unconscious, non-obvious, remote associations amongst memory (or knowledge) elements (Baird et al., 2012; Dijksterhuis & Meurs, 2006; Dijksterhuis & Nordgren, 2006; Ritter & Dijksterhuis, 2014; Yaniv & Meyer, 1987). Wallas (1926) is thought to have been the first to term this period of unconscious, associational activity “incubation”, a process following the acquisition of any conscious memory (or knowledge) content which presented as a complex problem. The problem invites resolution through insight- following a period of incubation to discern a non-obvious, associative pattern in events or knowledge (Bowden, Jung-Beeman, Fleck, & Kounios, 2005; Jung-Beeman et al., 2004; Stokes, 2007). Some such insights may make an original, creative contribution to arts or science or, more prosaically, provide a solution to a difficult problem.

Creative insight is thought to be facilitated by sleep and dreaming. The brain makes non-obvious, creative, remote associations amongst memory elements more readily during rapid eye movement (REM) sleep and dreaming than either in wake or NREM sleep (Cai, Mednick, Harrison, Kanady, & Mednick, 2009; Sterpenich et al., 2014; Stickgold et al., 1999; Walker, Liston, Hobson, & Stickgold, 2002). These associations may result from spreading neural activation during REM (Landmann et al., 2015). There are anecdotal reports of dreams engendering conscious creative insight immediately after sleep, see, for example, (Barrett, 2001; Mazzarello, 2000). More commonly, creative associations portrayed through mental imagery in REM may be retained at an unconscious level (Llewellyn, 2013, 2015; Llewellyn & Hobson, 2015). Several studies suggest that sleep mentation or its neural substrates impact on subsequent thought and action during wake (Diekelmann & Born, 2010; Stickgold & Walker, 2013; Verleger, Rose, Wagner, Yordanova, & Kolev, 2013), for impact to occur during wake there must be retention from the sleep state. Retained mental imagery is not something that is “looked at”, rather such unconscious imagery should be thought of as a “search-image” (Freeman, 1983), or, analogously, as “vision for action” (Goodale & Milner, 1992, 2013; Milner & Goodale, 2008) where the image is essential for motor action during wake, see Cuthbert, Vrana, and Bradley (1991) for a review.

Higher-level unconscious processes, for example, goal pursuit, are consequent upon prior conscious thought (Bargh & Chartrand, 1999; Bargh & Ferguson, 2000; Bargh, Schwader, Hailey, Dyer, & Boothby, 2012). Implicitly, it is assumed that this prior conscious thought occurs during wake but, REM is a conscious state also (Hobson & Pace-Schott, 2002; Hobson, Pace-Schott, & Stickgold, 2000). Conscious non-obvious, pattern identification through making remote associations between experiential memories during REM may engender mental imagery to portray this pattern (Llewellyn, 2013). A pattern is something that repeats in time and space (Coward, 1990). Repetitions must be identified and associated to recognise a pattern. REM mental imagery may appear bizarre whenever it depicts the *associative pattern* between experiential memories rather than the memories themselves (Llewellyn, 2013). Identifying a pattern between past events enables prediction, thus REM-based mental images may be retained to enable unconscious goal pursuit during wake (Llewellyn, 2015). Such complex pattern identification, reliant on visual processing, is also thought to underpin creative insight (Finke & Slayton, 1988; Hong, 2013; Kazemzadeh, 2012; Mottron, Dawson, & Soulières, 2009).

Brain states (W/S/D) are inherently labile, transient and dynamically unstable (Friston, 2000a, 2000b, 2001) governed by “edge of chaos” or “instability point” dynamics (Rabinovich & Abarbanel, 1998; Skarda & Freeman, 1987). During wake the transient state of “daydreaming” or the default network frequently occurs (Greicius, Krasnow, Reiss, & Menon, 2003; Gusnard, Akbudak, Shulman, & Raichle, 2001; Raichle et al., 2001; Shulman et al., 1997). Brain activation during the default network resembles that during dreaming (Domhoff & Fox, 2015; Wamsley & Stickgold, 2010). Less common, but still transient, is lucid dreaming during REM (Dresler et al., 2011; LaBerge, 1990; LaBerge, Nagel, Dement, & Zarccone, 1981; Voss, Holzmann, Tuin, & Hobson, 2009). Over and above these transient dissociations, an enduring and, sometimes progressive, de-differentiation of W/S/D may be possible. (Llewellyn, 2011). The composition of neuronal cell membranes is poised at the “edge of chaos” between solid and liquid states (Lewin, 1993) (p51). In line with chaos theory, small shifts in this positioning may disrupt the reciprocity between the neuromodulatory systems which achieve differentiation between wake and REM (Llewellyn, 2011).

De-differentiation of W/S/D may allow REM dream-like cognition to pervade wake. In moderation, such REM dream-like cognition may enable a creative, associational state, sometimes resulting in the Aha! experiences which accompany insights during wake. The intrusion of dream-like cognition into wake is only “one side” of the de-differentiation equation, however. Wake-like cognition may also suffuse sleep and dreaming resulting in sleep disturbances and phase transitions between REM, NREM and wake which may impede sleep-dependent memory processing and emotional regulation.

Download English Version:

<https://daneshyari.com/en/article/5041809>

Download Persian Version:

<https://daneshyari.com/article/5041809>

[Daneshyari.com](https://daneshyari.com)