Measuring consciousness in dreams: The lucidity and consciousness in dreams scale

Ursula Voss [a,b,*], Karin Schermelleh-Engel [a], Jennifer Windt [c], Clemens Frenzel [d], Allan Hobson [e]

[a] J.W. Goethe University, Deptartment of Psychology, Frankfurt, Germany
[b] Vitos Hochtaunus GmbH, Waldkrankenhaus Koeppern, Germany
[c] Johannes Gutenberg University Mainz, Germany
[d] Rheinische Friedrich-Wilhelms University, Deptartment of Psychology, Bonn, Germany
[e] Harvard Medical School, Boston, MA, United States

ABSTRACT

In this article, we present results from an interdisciplinary research project aimed at assessing consciousness in dreams. For this purpose, we compared lucid dreams with normal non-lucid dreams from REM sleep. Both lucid and non-lucid dreams are an important contrast condition for theories of waking consciousness, giving valuable insights into the structure of conscious experience and its neural correlates during sleep. However, the precise differences between lucid and non-lucid dreams remain poorly understood. The construction of the Lucidity and Consciousness in Dreams scale (LuCiD) was based on theoretical considerations and empirical observations. Exploratory factor analysis of the data from the first survey identified eight factors that were validated in a second survey using confirmatory factor analysis: INSIGHT, CONTROL, THOUGHT, REALISM, MEMORY, DISSOCIATION, NEGATIVE EMOTION, and POSITIVE EMOTION. While all factors are involved in dream consciousness, realism and negative emotion do not differentiate between lucid and non-lucid dreams, suggesting that lucid insight is separable from both bizarreness in dreams and a change in the subjectively experienced realism of the dream.

© 2012 Elsevier Inc. All rights reserved.

1. Introduction

The current study is aimed at providing a reliable and valid tool to measure consciousness in dreams. In developing the Lucidity and Consciousness in Dreams scale (LuCiD), we contrasted different types of rapid eye movement (REM) sleep dreams varying in levels of consciousness: non-lucid and lucid dreams. Our research questions concern the defining properties of these distinct sub-states within the state of sleep. Which cognitive functions can our brain access in normal (non-lucid) dreaming? Do lucid dreams differ measurably from non-lucid dreams and if so, how much and in which respects?

1.1. Dream consciousness

Dreams are altered states of consciousness in which the brain constructs a virtual world of vivid images that we are unable to identify as hallucinogenic. The dream's hallucinatory or virtual nature goes unnoticed despite its utterly bizarre and inconsistent elements. Due to an attenuated activation of the prefrontal cortex during rapid eye movement sleep (REM sleep), the dreamer is deprived of his ability to think logically or to make meaningful decisions (cf. Dang-Vu et al., 2010; Voss,

---

Holzmann, Tuin, & Hobson, 2009). Yet he often feels as if he was able to exploit his mental resources, and he is intensively engaged in the dream experience, which is often overwhelmingly emotional. Consequently, the dream world is taken to be real even though it is not. Moreover, the dreamer fails to notice the irrational quality of his own thoughts and actions, thus mistakenly taking himself to be a rational agent. In both respects, non-lucid dreams bear high similarity to delusions and hallucinations accompanying psychotic and delirious states (Freud, 1900/2011; Hobson, 1999).

According to our primary-secondary hypothesis (Hobson & Voss, 2010, 2011), the delusional character of dreams is caused by a predominance of the primary mode of consciousness, a distinct space in the consciousness continuum commonly referred to as lower-level consciousness. Primary consciousness is characterized by a fusion of past, present, and future. It is governed by what is immediately present. In the primary mode, the dreamer is deprived of the ability to control and influence the ongoing experience. His only choice is to cope with the immediate and constantly changing scenery. Upon awakening, the subject enters the secondary mode (higher-order consciousness), which enables him to plan ahead, to reflect on his past and to contemplate his future.

1.2. Lucid dreaming as a hybrid state of consciousness

In lucid dreams, part of the brain operates in the primary mode while another has access to secondary consciousness. On the phenomenological level, the dreamer is aware of the fact that he is dreaming while the dream continues. Sometimes, he can even gain some control of the dream plot and walk through walls, or purposefully engage in flying. Both lucid insight and plot control are functions of secondary consciousness. Lucid dreams occur naturally in the course of brain maturation and are susceptible to autosuggestion and training (Voss, Frenzel, Koppehele-Gossel, & Hobson, 2012). For this reason, both lucid and non-lucid dreams are important contrast conditions for theories of waking consciousness, giving valuable insights into the structure of conscious experience and its neural correlates during sleep (Windt & Noreika, 2011).

On an objective level, distinct patterns of brain activation have been identified by independent laboratories (Dresler et al., 2012; Voss et al., 2009), validating the existence of lucid dreams as hybrid states with elements of primary and secondary consciousness (adopted from Edelman (2005)). The core criterion of dream lucidity is the dreamer's insight into the virtual reality of the ongoing dream. In addition, lucid dreams are often described as being distinguished from non-lucid dreams along a number of dimensions involving a resurfacing of self-reflection, rational thought, memory, planning and behavioral control. This polarized definition is, of course, useful for laboratory investigations, and as indicated above, both the phenomenological description of lucid dreaming and the identification of distinct brain regions involved suggest that the distinction between primary and secondary consciousness maps onto the distinction between non-lucid and lucid dreams.

This assumption, however, is not as straightforward as one might assume. First, note that the distinction between primary and secondary consciousness was initially applied by Edelman (2003; Edelman, Baars, & Seth, 2005) to the problem of how to identify the hallmarks of consciousness in non-mammalian species. Assessing the presence or absence of primary and secondary (or higher-order) consciousness in animals, however, is importantly different from assessing their presence or absence in the conscious states of humans. In the latter case, but not in the former, it is already clear that humans possess both primary and secondary consciousness; what is not clear, however, is whether or to what extent they manifest during dreams.

Second, the application of primary and secondary consciousness to dreaming is rendered difficult by the fact that non-lucid dreams potentially blur their respective distinguishing features. According to Edelman (2003), animals with primary consciousness—whilst able to "integrate perceptual and motor events together with memory to construct a multimodal scene in the present" (Edelman, 2003, p. 5521), as well as to alter their behavior in an adaptive manner—are unable to go beyond the immediate scene in planning their behavior. By contrast, animals with higher-order (or secondary) consciousness, such as primates and humans, additionally have semantic or narrative capabilities and in virtue of these capabilities are able "to go beyond the limits of the remembered present of primary consciousness" (Edelman, 2003, p. 5522). Thus, self-awareness, metacognition, and the ability to reconstruct past and construct future scenes are all crucially tied to linguistic capabilities. Self-consciousness, in terms of consciousness of consciousness, only "becomes possible via the linguistic tokens that are meaningfully exchanged during speech acts in a community" (Edelman, 2003, p. 5523).

What, then, happens when the distinction between primary and secondary consciousness is applied to dreaming? As indicated above, non-lucid (as opposed to lucid) dreams are marked by their restriction to the immediate scene, as well as by an attenuation of both long- and short-term memory and an inability to engage in deliberate planning or behavioral control (Hobson, Pace-Schott, & Stickgold, 2000). The inability of the dream self to think or plan beyond the immediately unfolding dream events is a well-known feature of dreaming, often referred to as the single-mindedness of dreaming (Rechtschaffen, 1978). In this respect, then, non-lucid dreamers appear to fit the definition of primary consciousness introduced by Edelman. At the same time, however, it would be incorrect to assume that linguistic capabilities tied to the emergence of higher-order or secondary consciousness are completely lost in dreams. Language occurs in dreams quite frequently, namely when the dream self engages in conversations with other dream characters or thinks about the ongoing events in his dream. Kahan (2001) reviews a number of studies, showing that even non-lucid dreamers engage in a variety of different types of thinking, including thinking about their own behavior, intentions, or emotions. So while the scope of such dream thoughts may be limited to the present context of the dream—thus resembling primary consciousness—the linguistic capabilities involved in such thoughts resemble higher-order or secondary consciousness.