

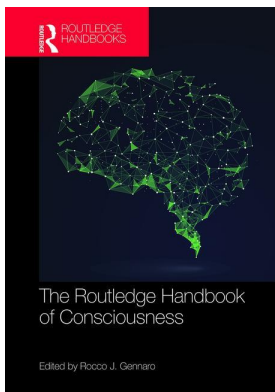
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CONSCIOUSNESS AND DREAMS

From Self-Simulation to the Simulation of a Social World

Jennifer M. Windt

1 Introduction

Sleep is phenomenologically rich, supporting diverse kinds of conscious experience as well as transient loss of consciousness. Sleep is also cognitively and behaviorally rich, with different sleep stages supporting different kinds of memory processing (Rasch and Born 2013; Stickgold and Walker 2013) as well as sleep behaviors ranging from subtle muscle twitches (Blumberg et al. 2013) to seemingly goal-directed behaviors, as in sleepwalking, sleep talking, and REM-sleep behavior disorder (Howell and Schenck 2015). This phenomenological, cognitive, and behavioral richness is flanked by a complex and cyclically organized sleep architecture, with sleep stages characterized by different levels of electroencephalogram (EEG) activity, regional patterns of brain activity, eye movements, and muscle tone (Pace-Schott 2009). Yet, how changes in conscious experience are associated with sleep stages and behavior continues to be poorly understood (Windt et al. 2016).

Progress in dream research was long hampered by lack of agreement about the target phenomenon. Different definitions—ranging from narrow definitions focused on certain types of narratively complex dreams to broad definitions classifying any kind of conscious experience in sleep as dreaming (Pagel et al. 2001)—were paralleled by disagreement about the sleep-stage correlates of dreaming. Early dream researchers assumed that dreaming can be identified with rapid eye movement (REM) sleep and that the contrast between REM and NREM (or non-REM) sleep marked the presence vs. absence of consciousness (Dement and Kleitman 1957). It is now, however, widely recognized that dreams occur in all stages of sleep (Nielsen 2000). There are also theoretical and empirical reasons for thinking that kinds of sleep experience exist that are distinct from dreaming (Windt et al. 2016).

This progress has been enabled by important conceptual and methodological advances. There is now increasing convergence on simulation views (Metzinger 2003, 2009; Nielsen 2010; Revonsuo 2006; Revonsuo et al. 2015; Windt 2010, 2015a; Windt et al. 2016; Thompson 2014, 2015), in which dreaming is defined by the experience of a self in a world. Methodologically, serial awakening paradigms (Noreika et al. 2009), in which participants are awakened multiple times throughout the night from different sleep stages and at short time intervals, coupled with high-density EEG recordings, are shedding light on the neural correlates of dreaming vs. non-dreaming (Siclari et al. 2013, 2017). Together with a fine-grained framework for describing types

of dreamful and dreamless sleep experiences, this can enable a more precise mapping to neural and behavioral events during sleep.

In this chapter, I endorse a version of the simulation view that focuses on minimal forms of dreaming and argue that these coincide with minimal phenomenal selfhood, or the simplest form of experiencing oneself as a self. Yet the experience of being or having a self can take different forms in dreams, and I use examples from dream research to suggest how this minimal version of the simulation view can be scaled up to accommodate them. I then discuss this framework in light of current work on self-consciousness, suggesting that the analysis of self-experience in dreams can extend and enrich existing theories.

2 Probing the Phenomenology of Dreaming: Conceptual and Epistemological Considerations

Dreaming is notoriously heterogeneous, with different kinds of dreams having distinct phenomenological profiles. For example, lucid dreams, in which dreamers become aware that they are now dreaming, often additionally involve the ability to control the ongoing dream (Voss et al. 2013; Voss and Hobson 2015). There is also variation in dreams from different participant groups. While the vast majority of dreams involve visual imagery, congenitally blind subjects report spatial but nonvisual dreams (Kerr and Domhoff 2004). And there are developmental changes, with the degree of narrative organization and overall complexity gradually increasing from childhood into adolescence (Foulkes 2009).

This phenomenological diversity is flanked by different kinds of questions, often relating to diverging research interests and distinct disciplinary perspectives. In philosophy, the best-known discussion of dreaming is the epistemological problem of dream skepticism. Here, the question is how we can ever be certain that we are now awake rather than dreaming. In the *Meditations*, Descartes (1641/1901: I.4) tells us that we cannot: perceptually-based beliefs about the external world are potentially misleading. Descartes' assertion that he has *often* had the wake-like experience of sitting dressed by the fire even though he was in fact lying asleep in bed makes scenarios of dream deception psychologically gripping (Windt 2016). Yet what is needed to justify the theoretical possibility of dream deception is just that dreams can *potentially* mimic wake-like experience, not that they frequently or even typically do so (Windt 2016).

Emphasis on the *typical* features characterizing a *majority* of dreams plays an important role in scientific theories. For instance, Allan Hobson's (2009; Hobson et al. 2000) influential neuroscientific model characterizes dreaming through the predominance of visual imagery over other modalities, of negative over positive emotions, bizarreness, deficient reasoning and short- and long-term memory, and lack of metacognitive insight into the fact that one is now dreaming. The point here is not that strictly all dreams are captured by this definition, and lucid dreaming is a clear counterexample to the metacognitive deficit (Voss and Hobson 2015). Instead, the idea is that these stereotypical features can be mapped onto characteristic changes in neural activation patterns in sleep (Hobson et al. 2000).

This strategy can yield general insights into changes and continuities in experience across sleep-wake states, but cannot provide a strict definition in terms of necessary and sufficient conditions. For this type of project, it is more helpful to ask whether, underlying the variability of dreaming, there is something like a common phenomenal core that characterizes different types of dreams and dreams from different participant groups. To answer this question, it is more useful to focus on *minimal* forms of dreaming.

Elsewhere, I have argued that a plausible candidate for identifying the phenomenal core of dreaming is its immersive structure (Windt 2010, 2015a). Numerous studies have shown that

dreams consistently involve the presence of a self (Strauch and Meier 1996; see also Occhionero et al. 2005; Speth et al. 2013).¹ Presence and the related concept of self-location can be given both a spatial reading (the experience of being located *here*, at a particular point in a larger spatial expanse) and a temporal reading (an experienced *now* plus the sense of duration). Dreams are organized around an internal first-person perspective, and the origin of the first-person perspective is what retrospectively, in dream reports, is described as the self.

Like other versions of the simulation view (Revonsuo et al. 2015), this focus on the immersive, *here-and-now* structure of dreaming highlights the similarity between dreams and presence in standard wake states, but also in virtual reality. However, the view I am proposing abstracts away from the features that are thought to standardly characterize both dreaming and waking self-experience. While most dreams involve visual imagery and strong emotions, they do not do so necessarily. Spatiotemporal self-location underwrites the subjective sense of presence as well as retrospective descriptions of having had a dream self even in the absence of modality-specific (visual or auditory) imagery (Windt 2010). This simplified account of presence brings us closer to a minimal definition that can also accommodate the variability of dreaming.

An important theoretical and methodological question concerns the relation between dream experience and dream reports. These can be verbal (written or oral) descriptions, but also drawings or answers to specific questions; together, they form the primary source of data about the phenomenology of dreaming. Skeptics have sometimes claimed that dream reports (Dennett 1976; see also Malcolm 1962) might equally well be the product of memories inserted into consciousness at the moment of awakening.² Even sincere reports describing the impression of having had certain experiences during sleep would then be systematically misleading. Such skepticism would undermine the use of dream reports to investigate the experience of dreaming. To make any substantial claims about the occurrence and phenomenal character of experience in sleep, dream reports must be transparent windows on what it is *actually* like to dream (Windt 2013, 2015a: chs. 3 and 4).

This does not mean that we should blindly trust dream reports, which would clearly be at odds with the elusive nature of dream recall. Laboratory research shows that spontaneous dream recall is a poor indicator of actual dream activity: most people only rarely remember their dreams and can recall no more than one dream per night. By contrast, dream recall in laboratory studies utilizing timed awakenings is much higher, reaching around 80% for REM sleep and about 40% for NREM sleep (Nielsen 2000). This suggests that we dream much more than we spontaneously remember, but also leads to the idea that at least under ideal conditions—for instance in the laboratory—dream reports are indeed trustworthy sources of evidence, for instance about the frequency of dreaming in different sleep stages.

Different factors can enhance or diminish the trustworthiness of dream reports. Most agree that to counteract dream amnesia—the fact that dreams are quickly forgotten unless special steps are taken to recall them—reducing the time lag between dream experience and dream reporting is important. Further factors may include the method of awakening, the way in which the dream is reported (oral vs. written), or motivational factors such as personal interest (Windt 2015a: ch. 4; Domhoff 2013). What counts as ideal reporting conditions is dependent on the specific research question, and further improving the collection and analysis of dream reports is an important goal for future research.

3 Dreaming the Self: Minimal Phenomenal Selfhood and Bodily Experience in Dreams

In the version of the simulation view I endorse, spatiotemporal self-location is the phenomenal core both of different kinds of dreaming and of the experience of being or having a self

(Windt 2010, 2015a). This is so because dreaming, as we have seen, is inextricably bound to the experience of presence, of being a self in a world. This core phenomenology of presence underlies richer forms of self-experience as well as different kinds of dreaming; but importantly, there are also instances in which self-experience can take the form of pure *here-and-now* experience. Dream reports may describe, for example, the feeling of identifying with an unextended point in space:

I was inside a gigantic photocopying machine. I knew I was inside this machine, not as a physical human being but as an abstract entity, as a mind, so I couldn't see myself.

(Cicogna and Bosinelli 2001)

This report is striking because it explicitly describes the feeling of lacking a body, or of being a *phenomenally disembodied self*. But bodily experience can also be lacking in dreams by way of an unnoticed absence. In such dreams, there is still the experience of spatiotemporal self-location, but the minimal sense of self this gives rise to is *phenomenally indeterminate* with respect to bodily experience: there is no *experienced* fact of the matter as to whether one has a body or not (Windt 2015a: ch. 6).

To make this point more vivid, try moving a playing card from the periphery of the visual field towards its center while fixating your eyes straight ahead. Notice how information about the card's suit, color, and value becomes available gradually. At least at the beginning, your visual experience is indeterminate with respect to color. As there is no reason to think that fixating your eyes straight ahead while attending towards the periphery causes the presence vs. absence of color, this simple experiment shows that indeterminacy with respect to color pervades a large part of the visual field (Dennett 1991)—it is just that in standard situations, we remain oblivious to this fact.

Phenomenal indeterminacy is probably more pervasive in dreams (but also, for instance, in memory and waking visual imagery) than in perception, which arguably inherits some of its detail from the external world. Phenomenal indeterminacy is also closely related to the epistemic notion of indeterminacy blindness (Windt 2015a: 329): phenomenal indeterminacy is pervasive, but inconspicuously so. Even in wakefulness, special attention (as in the playing card example) is required to notice phenomenal indeterminacy. In dreams, the attenuation of critical reflection and metacognitive insight might make phenomenal indeterminacy even harder to detect. A prediction would be that phenomenal indeterminacy should be more easily noticed and hence more frequently reported in lucid dreams, which are associated with metacognitive insight into the fact that one is now dreaming. While this question has not, to my knowledge, been studied systematically, it does seem that reports of phenomenal disembodiment, but also of visual imagery fading or taking on a washed-out quality often overlap with lucidity (LaBerge and DeGracia 2000). This leads to another important insight: an experienced absence (of the body, as in phenomenal disembodiment, or of color, as in the playing card example) is more sophisticated than an unnoticed absence in experience (cf. Dennett 1991: 359). The simplest way of lacking bodily experience is to remain oblivious to its absence.

Even if phenomenal indeterminacy, for instance for bodily experience, turns out to be more pervasive in dreams than in wakefulness, it would be false to say that bodily experiences are wholly lacking in most dreams. Movement sensations are frequent in dreams, second only to visual imagery. By contrast, thermal, tactile, pain, nausea, ticklish, and proprioceptive sensations are described in only 1–4% of laboratory reports (Hobson 1988; Schwartz 2000). Assuming these reports are transparent, this suggests that in a majority of dreams, bodily self-representation is schematic, associated mostly with movement, while sensations linked to detailed representations

of individual body parts are rare. This is nicely illustrated by the dreams of specific participant groups.

First, dream reports of congenitally paraplegic subjects describe frequent whole-body movements such as walking, running, bike riding, or flying, and these descriptions are so similar to those from healthy participants that blind judges are unable to distinguish between them (Voss et al. 2011; Saurat et al. 2011). If we assume that whole-body movements in dreams exactly replicate their waking counterparts, it would be quite hard to explain how participants who have never had these experiences first-hand could nonetheless dream of them in a realistic and richly detailed way. Consider the example of a subject with congenital paraplegia for 40 years, who described a dream of learning to dance ballet, moving with a light step and wearing a tutu (Saurat et al. 2011: 1427). In wakefulness, such an experience would be associated with a sense of posture and limb position, tactile sensations, feelings of weight and balance, of effort and perhaps of losing one's breath. By contrast, in dreams, schematic movement representations, plus in some cases visual imagery of the body, may be enough. Phenomenal indeterminacy plus indeterminacy blindness would endow such experiences with a realistic gloss, while also relaxing the requirement for mimicking the exact phenomenological profile of their waking counterparts.

The second example is dreams of phantom limb patients. Following the loss of a limb, many people continue to have the vivid experience that the lost limb is still present. They also often continue to dream of having an intact body (Brugger 2008; Mulder et al. 2008). Both in waking and in dreaming, phantoms can vary in size, often shrinking over time. In dreams phantom limbs are mostly visually represented (Frank and Lorenzoni 1989), whereas the unpleasant bodily sensations (such as prickling, tingling, or pain) that characterize waking phantoms are typically missing (Vetruigno et al. 2009; Alessandria et al. 2011). In simplified terms, dream phantoms can be seen and moved but not felt, whereas waking phantoms are invisible and often paralyzed, as if frozen in an uncomfortable or even painful position. This nicely illustrates how the pattern of bodily experience in dreams departs from waking experience in systematic ways: the dream body is not just a whole-body analogue of waking phantom limbs.

Generalizing from these examples, we can conclude that dreams are *weakly phenomenally embodied states* (Windt 2015a: 338ff.). In a majority of dreams, visual and motor imagery predominate over tactile sensations, and body-part representations may occur in the absence of detailed whole-body representations. Also, where bodily experience in wakefulness is multimodal (de Vignemont 2014), dreams are often characterized by disturbances in multisensory integration, for example where a body part can be seen or moved but not felt. Just as bodily experiences vary across dreams, we should also expect phenomenal indeterminacy to be unevenly distributed: weak phenomenal embodiment and phenomenal indeterminacy complement each other. Figuratively speaking, we might describe body parts or bodily sensations in dreams as islands of determinacy occurring against a backdrop of phenomenal indeterminacy that, in turn, is clouded by indeterminacy blindness.

The next natural question to ask is how bodily experience in dreams relates to the physical body. Sleep is a state of reduced behavioral activity, and the processing of environmental stimuli and bodily sensations is attenuated. This is especially pronounced in REM sleep, which is associated with the most frequent, vivid, and narratively complex dreams (Hobson et al. 2000). Yet even in REM sleep, the processing of environmental and peripheral stimuli is not completely blocked. A familiar example is integrating the sound of an alarm clock into a dream. Incorporation rates are especially high for bodily stimulation. For example, a blood pressure cuff inflated on the leg leads to incorporation in 40–80% of dreams (Sauvageau et al. 1998; Nielsen et al. 1993). Vestibular stimulation (as when sleeping in a rotating chair or in a hammock) can lead to flying dreams or increased lucidity (Hoff and Plötzl 1937; Leslie and Ogilvie 1996), and

thermal stimulation (Baldrige 1966; Baldrige et al. 1965) and sprays of water on the skin (Dement and Wolpert 1958) can prompt associated dream imagery.³

Sleep also involves a range of overt muscular activity, ranging from seemingly purposeful, goal-directed behaviors (as in sleepwalking or sleep talking) to subtler muscle twitching (Blumberg 2010; Blumberg and Plumeau 2016). These behaviors may have varying degrees of concordance and discordance with conscious experience in sleep. In so-called dream-enactment behaviors, there seems to be a particularly close correspondence between overt behavior and internally experienced dream movements (Nielsen et al. 2009). The common description of dreams as global offline states (Metzinger 2003, 2009; Revonsuo 2006; Hobson 2009) therefore seems oversimplified. Bodily self-experience in dreams typically does not arise completely independently of input from the sleeping body and muscular activity, but can be placed on a continuum with bodily illusions in wakefulness. Moreover, the unique pattern of bodily experience in dreams is best explained by appealing to the altered functional relationship between the physical body and the brain in sleep. Based on the available evidence, it seems plausible that dreams are both *weakly phenomenally* and *weakly functionally embodied states* (Windt 2015a: 382ff.).

The idea that illusory own-body perception plays an important role in dreams has a long history (for discussion of *Leibreiztheorie* or somatic source theory, see Wundt 1880; Schönhammer 2005). My proposal is not that dreams are caused by or strictly dependent on real-body stimulation, or that own-body perception characterizes all types of dreams and dream imagery. What I am suggesting is that investigating changes in the processing of external stimuli and motor behavior and how they are reflected on the level of dream experience is a fruitful explanatory and research strategy. Looking beyond the brain to real-body influences on dreams can yield a fine-grained framework for describing different kinds of (bodily) self-experience and inform a novel theory of dream imagery formation.

4 Dreaming Which Self? Self-Other Distinctions, Vicarious Dreams, and the Waking Self

Dreams are not just simulations of a self in a world, but of rich social realities. Dreams contain an average of 2–4 dream characters (Kahn et al. 2000), yet only one of these, at a given time, is experienced as the self. Self-other distinctions therefore play a central role in dreams: world simulation—both in a spatial and in a social sense—is necessarily grounded in the experience of a single self at its center. How then can we explain the experience of dream characters as distinct from the self? Rather than advancing a fully developed theory, I will just hint at some interesting parallels to self-experience in dreams.

Varying degrees of concordance between dream experience, bodily stimuli, and muscular activity in sleep may extend beyond the dream self to the experience of non-self dream characters. Of particular interest are cases where bodily sensations are projected to dream characters other than the self. Consider the following report from sleep onset:

Someone in front of me is doubled over toward me, praying. Someone else reaches around from behind this person and quickly lifts him into an upright position. At the same time I feel my head nodding slightly forward and it awakens me.

(Nielsen 1992)

Here, the forward movement of the head is not just externalized, but represented visually. Such externalization can also occur during full-fledged dreams in response to experimental body stimulation (Sauvageau et al. 1998; Nielsen et al. 1993). In a way, this is the flip side of

weak phenomenal-functional embodiment: where self-experience in dreams is less strongly constrained by the physical body than in wakefulness, self-other distinctions are more porous, allowing real-body sensations to shape dream characters experienced as distinct from the self.

Self-other distinctions are also more fluid in dreams. An example is vicarious dreams, in which one dreams of being a different person than one is in wakefulness (Rosen and Sutton 2013).⁴ Some of these dreams contain shifts in self-identification, with different dream characters successively being experienced as the self. An intriguing possibility is that these shifts again have a real-body basis. In the following report, again from sleep onset, it is almost as if a leg jerk, first represented visually and then in the form of motor imagery, were transporting the dreamer from the role of a passive observer to a self present in the dream.

I am watching someone else walking. Then it is as if I was walking and I find myself about to start quickly up some stairs. I awaken with a very strong leg jerk.

(Nielsen 1992: 360)

In keeping with the minimal version of the simulation view introduced earlier, a further and more basic factor underlying shifts in self-identification are shifts in experienced self-location:

The person in the dream that so far had been me, now was suddenly my classmate J. Somehow I became (physically) detached from myself and I noticed that I was not me but him. This was accompanied by a funny feeling.

(Revonsuo 2005: 213ff.)

It is tempting to attribute this funny feeling to a sudden perspectival shift in the phenomenal *here*.⁵

This brings us to another parallel between self- and other-experience in dreams. Just as the simplest form of self-experience in dreams requires only spatiotemporal self-location, there is also a purely spatial variant of experiencing non-self dream characters. Felt presence can occur in a number of conditions including heightened stress and emotional arousal (Nielsen 2007), but is particularly frequent in the vicinity of sleep. The experience that someone is present in the room can be associated with visual and auditory imagery—as in seeing shadows on the wall or hearing footsteps—but can also take an amodal, purely spatial form.

It often happens that a hallucination is imperfectly developed: the person affected will feel a ‘presence’ in the room, definitely localized, facing in one particular way, real in the most emphatic sense of the word, often coming suddenly, and as suddenly gone; and yet neither seen, heard, touched, nor cognized in any of the usual ‘sensible’ ways.

(James 1902/2003: 51)

Amodal, purely spatial variants of felt presence have been described as precursors to more complex experiences involving modality-specific imagery (Cheyne and Girard 2007a, 2007b; Nielsen 2007); yet even these minimal forms have a distinctly social flavor, with the presence being experienced not just as an undefined object, but as an agent having a definite spatial location as well as (frequently menacing) intentions towards the self. Felt presence therefore may involve a basic form of social imagery (Nielsen 2007). The convergence between purely spatiotemporal imagery and perceived intentions in felt presence complements the convergence between spatiotemporal self-location and the experience of selfhood in minimal forms of dreaming. Where in felt presence, spatiotemporal imagery underwrites the attribution of

agency to another, in minimal dreams, spatiotemporal self-location underwrites the experience of selfhood. And because felt presence often occurs during sleep onset and precedes full-fledged dreaming, we might then say that the activation of *amodal agent models* (Windt 2015a: 570ff.) in felt presence is a prequel to *amodal self-models* in minimally immersive dreams. Likewise, shifts in self-identification towards a non-self dream character, either at sleep onset or within dreams, might minimally require shifts in spatiotemporal self-location.

As is the case for the dream self, this is not to say that dream characters typically take this minimal form. Just as more complex forms of self-experience are both possible and frequent in dreams, non-self characters are often embedded in a more complex dream narrative. They frequently represent people familiar to the dreamer and their identity is often recognized based on visual appearance and behavior (Kahn et al. 2000). Social interactions are even more frequent in dream reports than in randomly timed waking reports (McNamara et al. 2005) and are often described as subjectively realistic and emotionally engaging (Kahn et al. 2002; Revonsuo et al. 2015). Dreams of being chased, which are a common dream theme (Nielsen et al. 2003), are a good example. Dream characters are also treated as if they had a mind of their own, with the dream self often ascribing beliefs and desires to other dream characters (McNamara et al. 2007).

Yet, focusing on minimal kinds of self- and other experience in dreams can pave the way towards a parsimonious account that does not require dreams to exactly replicate waking experience. Tellingly, non-self dream characters are also often recognized by *just knowing* (Kahn et al. 2000, 2002), suggesting large-scale phenomenal indeterminacy may again complement more detailed, modality-specific representation of appearance or behavior. Both the dream self and non-self dream characters may be much flimsier, phenomenologically speaking, than their waking counterparts—and due to indeterminacy blindness, there may be a natural tendency to overlook this fact.

5 What Kind of Self? From Self-Simulation in Dreams to Theories of Self-Consciousness

Because dreams occur both frequently and spontaneously, their investigation can help identify core features of self-experience that are independent of behavioral state changes, such as the transition from wakefulness to sleep. Dreams therefore offer a contrast condition for standard and altered wake states.

Simulation views of dreaming have a natural affinity to virtual reality (VR) research. Here, a central question is under which conditions a virtual environment turns into an experienced reality. Again, a key concept is that of presence: the subjective experience of *being there*, in a world that is virtual but experienced as real. Dreaming has in fact been described as a natural experiment in presence and the gold standard to which VR design should aspire (Moller and Barbera 2006). Because participants in VR experiments maintain intellectual insight into the fact that what they are experiencing is not real, presence in VR is perhaps best compared to lucid dreaming.

In another way, however, presence in nonlucid dreams captures a key feature of standard waking experience. Antti Revonsuo's (2006) virtual reality metaphor of consciousness says that even standard waking experience is a kind of online hallucination, similar in its phenomenological features to dreaming and VR but additionally modulated by external sensory input. We don't directly experience mind-independent objects, but internally constructed world- and self-models (Metzinger 2003, 2009). Dreams and wakefulness are different in the degree to which external sensory stimuli modulate these internal models—yet in wakefulness, as in nonlucid dreams, we typically don't become aware of the simulational character of perception.

Do the factors that contribute to the experience of presence in VR play a similar role in dreaming? Or are these factors state-dependent, underlying the experience of presence only under the specific conditions of wakefulness? For presence in VR, three factors are thought to be particularly important: the quality (e.g., the resolution and overall realism) of computer-generated (mostly visual and auditory) inputs; the fluidity of sensorimotor interaction (i.e., the ability to move through the virtual environment and interact with virtual objects); and social interaction (Sanchez-Vives and Slater 2005; Slater 2009). Importantly, enabling participants to interact with avatars in VR increases the sense of presence even if their appearance is not realistic. Dreams might further relax these requirements on realistic, multimodal imagery and wake-like sensorimotor interaction. The importance of these factors for presence may be state-dependent, contingent on the close connection between bodily experience and motor activity that persists in VR but is attenuated during dreams. By contrast, social imagery and self-other distinctions appear to be closely associated with the experience of presence across sleep-wake transitions and may even be a precursor to fully immersive dreams.

The analysis of dreaming can also shed light on the minimal conditions that are both necessary and jointly sufficient for phenomenal selfhood. In the recent literature on self-consciousness, there is a strong emphasis on embodiment (de Vignemont 2016). Using the example of full-body illusions, Blanke and Metzinger (2009; but see Metzinger 2013) propose that embodiment is inextricably linked to even minimal forms of phenomenal selfhood. In these illusions, multisensory conflict is used to induce shifts in self-location and self-identification. In a standard setup, participants are stroked on their backs while seeing, through a head-mounted display, brush strokes being applied to the back of an avatar who appears to be standing in front of them (Lenggenhager et al. 2007). When the felt and seen strokes are applied synchronously, many participants report feeling localized towards the avatar, almost as if they were feeling the strokes where they are seeing them, on the avatar's back. This shift in self-location and self-identification towards the avatar is made possible through the continued feeling of body ownership and carefully administered stimulation of the physical body.

By contrast, in dreams, the relation between bodily experience and the physical body is loosened, and in minimal dreams, phenomenal selfhood does not require the experience of being an embodied self at all. The experience of owning a body is not, therefore, strictly necessary, and minimal phenomenal selfhood can attach to self-location in a purely spatiotemporal sense. Theories of consciousness and phenomenal selfhood focusing mostly on waking consciousness, including pathological wake states, VR, and full-body illusions, may suffer from wake-state bias, in which factors that are dependent on wakefulness are mistaken for general characteristics of conscious experience. To identify the simplest forms of self-experience, it may be necessary to look beyond wakefulness.

While minimal dreams suggest a thinner notion of minimal phenomenal selfhood than originally proposed by Blanke and Metzinger, this notion is still thicker than the concept of the minimal self often used in the phenomenological literature. There, the minimal or experiential self refers to a kind of first-personal givenness or mineness inherent in all conscious experience.⁶ This contrasts with the narrative self, or the sense of being the same person over time (Gallagher 2000; Zahavi 2007, 2010b; Gallagher and Zahavi 2016). Unlike the narrative self, the minimal self cannot be lost or stand apart from the stream of experience, even in principle: an experience that lacked this minimal form of subjectivity would no longer *be* an experience.

Minimal phenomenal selfhood, as I use the term, does not indiscriminately refer to all experiences, but is specifically tied to spatiotemporal self-location. Spatiotemporal self-location characterizes experiences that have a particular perspectival structure: it helps organize experience around an internal, first-person perspective, and the origin of the first-person perspective is

experienced as the self. Unlike minimal subjectivity, this immersive, *here-and-now* structure does not characterize all kinds of phenomenal experience. In particular, the minimal version of the simulation view I defend gives a clear sense to types of experience that lack this structure. Examples are sleep thinking and isolated or static visuospatial or auditory imagery, such as visual imagery of faces arising seemingly out of nowhere but lacking, as is the case for images projected onto a screen, integration into a larger scene. While such experiences can still be perspectival, they are not organized around an *internal* first-person perspective and are not embedded in a larger hallucinatory context. Non-immersive imagery and sleep thinking, common in NREM sleep and at sleep onset, therefore do not fulfill the requirements for counting as even a minimal form of phenomenal selfhood—or of dreaming (Windt et al. 2016).

Another group of dreamless sleep experiences may lack not just the phenomenology of selfhood, but any specific imagery or conscious propositional thoughts (Thompson 2014, 2015; Windt 2015b). Experienced meditators who cultivate attention and meta-awareness sometimes report ‘witnessing sleep’; in this state, conscious experience, alongside meta-awareness of the sleep state, is maintained even though any specific thought contents or imagery, including ones pertaining to the phenomenal self, are said to have disappeared (Thompson 2014, 2015). These subjective reports are accompanied by changes in EEG activity as compared to non-meditators (Mason et al. 1997; Ferrarelli et al. 2013; Dentico et al. 2016; Maruthai et al. 2016), including enhanced gamma-band activity—which is also associated with metacognitive insight in lucid dreams (Voss and Hobson 2013). Because such states have phenomenal character—there is something it is like to be in them—they count as minimally subjective. The sense in which they are subjective is, however, purely epistemological, referring to the first-personal mode of givenness of experience and a basic kind of ownership. Still, this does not require additionally experiencing oneself *as* a self. Such states are *phenomenologically* selfless in the sense that they lack the experience of being or having a self. While this may initially sound paradoxical, experiences that are minimally subjective in the epistemological sense can be selfless in the thicker phenomenological sense of lacking a positive representation of self. Distinguishing between such different readings of subjectivity and selfhood might involve looking to states in which they are lost, such as sleep.

The transition between states that are phenomenologically subjective, as is the case for minimal dreams, and those that are merely epistemologically subjective, as in dreamless sleep experience, can be fluid, involving a gradual dissolution of the self (or vice versa). The loss of a sense of self can be coupled with a sense of expansion—as if the phenomenal *here* were gradually expanding to the point at which any distinction from a larger environment is lost. These experiences are often described as having an indeterminate duration, suggesting that there is still some sense of the passage of time.⁷ Indeed, it seems plausible that as long as some kind of phenomenal experience persists, there would still be an experienced *now* and at least a basic sense of duration. Such experiences would lack the spatial organization required for the experience of a phenomenal *here* and an internal first-person perspective, but would still have temporal dynamics. Minimal forms of phenomenologically selfless experience may therefore be associated with purely temporal experience (Windt 2015b).

Finally, just as there are two ways in which minimal phenomenal selfhood in dreams can lack bodily experience—phenomenal disembodiment, or the experience of lacking a body, and phenomenal indeterminacy with respect to the body—there may also be two ways in which minimal phenomenal experience can be phenomenologically selfless. One is the experience of lacking a self; another is phenomenal indeterminacy with respect not just to bodily experience, but even to the minimal kind of phenomenal selfhood associated with purely spatiotemporal self-location. There would then no longer be an *experienced* fact of the matter as to whether there was a self, even

in a minimal sense. And again, the simplest way of lacking a self may be by way of an unnoticed absence. If this is on the right track, cases in which the experience of minimal phenomenal selfhood is lost entirely or becomes phenomenally indeterminate are perched in between dreamful states involving minimal phenomenal selfhood on the one hand and nonconscious sleep states on the other hand. Investigating these intermediate cases may help identify transitions between dreamful states and dreamless, phenomenologically selfless sleep experience, as well as transitions between dreamless sleep experience and nonconscious sleep states.

6 Conclusions

In this chapter, I defend a minimal version of the simulation view in which dreaming is defined by its immersive, *here-and-now* structure. Even in the simplest kinds of dreams, phenomenal selfhood involves spatiotemporal self-location. Because spatiotemporal self-location is inextricably bound to the perspectival structure of dreaming, it underwrites both the phenomenology of selfhood and the experience of a world, including the experience of a social reality. Coupled with phenomenal indeterminacy and indeterminacy blindness, this account of minimal dreams can be scaled up to offer a parsimonious explanation of richer kinds of dreams, including bodily experiences and self-other distinctions. In the last section, I identified several key points of contact between dream research and interdisciplinary research on consciousness and the self.

I want to end with a speculative observation: the ways in which dreams diverge from standard waking experience—including the characteristic flimsiness of self-experience and the fluidity of self-other distinctions—may in some cases function as a vehicle for the subjective significance and emotional impact of dreams on our waking lives. While only a small subset of dreams is subjectively meaningful—recall that most dreams are never even remembered in the first place—these are nonetheless the dreams that throughout history have fascinated theorists and laypersons alike. So I want to close by giving two examples in which the distinctive phenomenological profile of dreams enables them to reach beyond sleep to touch waking lives.⁸

The first example is from Aiha Zemp. Born without limbs, she experienced vivid phantoms in her lower arms and legs from early childhood. Neuropsychological research indicates that these reports of her phantoms were robust; for example, reports of moving her phantom hands correlated with bilateral activation in the premotor and parietal cortex (Brugger 2012). Aiha Zemp was also a skilled lucid dreamer and described how in her lucid dreams, she could perform different kinds of movements, including flying, dancing, jumping, kneeling, and using her hands (Windt 2015a: 344ff.). In these dreams, she also had tactile sensations in her hands, whereas this was not the case in her nonlucid dreams or in wakefulness. Towards the end of her life, when she was terminally ill, she used her lucid dreams in combination with meditation to experience the dissolution of self. She wrote,

It [lucid dreaming] means a lot to me. It has really expanded my conscious awareness. In many of my lucid dreams I dissolve, everything dissolves, that is, these dreams are a way for me to practice dying. This makes me very happy.

(Unpublished interview with Aiha Zemp, conducted by Jennifer Windt and Bigna Lenggenhager; my translation)

The second example is from John Hull. He gradually lost his eyesight in adulthood, eventually becoming enveloped in complete darkness. In later years, he also lost visual memories and the ability to intentionally conjure visual imagery. But in dreams, he was sometimes still able to see, and memories that had become lost in wakefulness—such as his wife's face—could resurface. In one dream, he had the experience of seeing his baby daughter for the first time:

I had got out of bed. [...] This toddler came padding in and I could see her quite clearly in the dim light. [...] The first time I had been able to see her. I stared, full of wonder, taking in every detail of her face as she stood there, wreathed in smiles. ‘So this is her, this is the smile they all talk about.’ I had a wonderful sense of renewal of contact. [...] Then the dream faded.

(John Hull, quoted in Cole 1998: 30)

To be sure, such dreams are rare, and they may also, as in the case of Aïha Zemp’s lucid dreams, require attention to and interest in one’s dreams. They may also occur against a backdrop of specific skills, such as long-term meditation practice. But these examples still show how sometimes, dreams can have a personal and emotional significance that reaches beyond sleep, enabling them to be continuous with our waking projects, interests, and concerns, and form part of our narrative self. To achieve this, dreams need not exactly replicate waking experience, including the phenomenology of (embodied) selfhood. Some dreams may owe their impact, in part, to the ways in which their phenomenological profile departs from waking experience. I think this is both a theoretically significant and a strangely beautiful point.

Notes

- 1 In speaking of the dream self, I am referring to the character one identifies with in the dream. The dream self should be distinguished from the dreamer, or the person lying asleep in bed. Speaking of the dream self also does not imply the existence of a substantive self or entity in any strong metaphysical sense. The dream self is just shorthand for the pattern of phenomenal experience that underwrites the sense of selfhood and its retrospective description in dream reports.
- 2 For discussion of how this relates to skepticism about introspection and first-person reports in consciousness research, see Schwitzgebel (2011).
- 3 Autosensory imagery, in which self-generated stimuli from muscle twitches, limb jerks, or snoring are integrated into dream experience, is frequent during sleep onset. While just a subset of sleep onset experiences qualifies as immersive and hence as dreamful (Windt 2015a: ch. 11), the investigation of so-called microdreams can help isolate core aspects of imagery formation, stimulus incorporation, and temporal dynamics that are crucial to full-fledged dreaming (Nielsen 2017).
- 4 An intriguing idea is that rare reports in which the dream self is described as *diverging* from the waking self require more complex kinds of self-representation: where a phenomenally indeterminate self would be described, simply, as *me*, in vicarious dreams a richer representation of self may be needed to ground the experience of being someone *other* than one’s waking self.
- 5 Sudden, discontinuous jumps in dream narratives form a well-known subclass of dream bizarreness (Revonsuo and Salmivalli 1995): as in movies or novels, dream narratives can span spatially, but also temporally distant points. Such dreams can involve shifts in the experienced *here* and *now* without involving a shift in self-identification between different dream characters.
- 6 Zahavi (2010a) suggests that the minimal self is in fact closely bound up with both temporal experience and an embodied first-person perspective. This is closer to the concept of minimal phenomenal selfhood I propose, but does not account for potential dissociations between phenomenal selfhood and embodiment, as in minimal dreams.
- 7 The interlocked changes in self-experience, time, and space that characterize dreamless sleep experience are also reminiscent of certain psychedelic (Tagliazucchi et al. 2016) and deep meditative states (Berkovich-Ohana et al. 2013; Dor-Ziderman et al. 2013).
- 8 Appealing to the characteristic phenomenological profile of dreams is only part of the story. The themes and contents of dreams are often continuous with waking events, thoughts, and concerns (Schredl 2006; Domhoff 2013). There are also important phenomenological and neurophysiological similarities between dreams and spontaneous thought in wakefulness, or waking mind wandering (Fox et al. 2013). A full account will therefore also have to explain the narrative structure of dreams as well as the relationship between dream imagery and thoughts and beliefs, both in dreams and wakefulness (Windt 2015a: chs. 9 and 10).

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