



We Might Rehearse for Life in the VR of Dreams

By Katja Valli, PhD

In the past couple of decades, the idea that dreaming simulates the waking perceptual world has become widely accepted among dream scientists. The spatial and temporal organization of dreams – with characters, objects, physical settings, events, and interactions among characters – follows the same basic principles as waking reality.

Theories that dreaming has an evolutionary purpose take a different approach than psychological theories, which focus on the psychological well-being and mental health of an individual and suggest that dreams help us feel better, eventually, by helping us function better psychologically. The evolutionary theories regard dreams as simulations, and suggest that what is simulated in dreams, and how, will help us to understand why we dream – what function they serve.

Function in the evolutionary sense simply means that dreaming about particular things in a particular way would have helped our ancestors practice skills that enhanced their chances of survival and reproduction. Dreams are thus understood as virtual reality (VR) in which various aspects of waking life are not only simulated but also practiced, without any of the risks associated with training. However, this means that dreams might not be psychologically beneficial or help us feel better in any way – even the contrary: dreaming might be all about difficult processes of survival.

But what exactly is being practiced in dreams? This is where the various evolutionary simulation theories differ.

Dreams as the first form of consciousness

The protoconsciousness theory, proposed by psychiatrist J. Allan Hobson in 2009, focuses on the form and organization of dreams, not so much on the specific content.

“Proto-” means beginning, or first-formed. We know that in children and adults, the most vivid and elaborate dreams occur in the rapid eye movement (REM) stage of sleep. Babies cannot be studied in the same way, but we do know that fetuses spend much of their time in a REM-sleep-like state. Hobson suggests that this means consciousness, in its primitive form, arises for the first time in utero. He speculates that protoconscious REM sleep provides a virtual world model where the proto-self is embedded in an internally generated environment, which includes perceptions, sensations, and emotions.

An idea called predictive processing says the brain constantly adjusts and fine-tunes this same sort of simulated model based on feedback from external, real-world scenarios, using the model to predict what’s going to happen next. REM sleep in utero, Hobson suggests, is the first and most primitive form of this predictive processing. The role of dreams and REM sleep in the predictive coding theory is to maintain and enhance the inner world model by improving predictions and integrating waking experiences into the model. However, experimental tests of the theory are impossible with current technologies, and we have no means to investigate experiences in fetuses and babies. Whether protoconsciousness exists, and what it is like if it does exist, remains therefore a mystery at the moment.

Dreams as threat and social simulation

While the protoconsciousness theory doesn’t say much about the content of dreams, other simulation theories are based on the most prominent dream content.

The threat simulation theory, proposed by cognitive neuroscientist Antti Revonsuo in 2000, suggests that dream consciousness specializes in the simulation of various threatening events that our evolutionary ancestors were exposed to. Encounters with real, threatening events are stored into long-term memory; when we sleep, the dream production system automatically selects for simulation the memories containing the highest negative emotional charge, and does so over and over. Thus, the experience of threats in waking life triggers the threat simulation system by offering it raw materials. This threat simulation function is most evident in post-traumatic dreams, but applies to all dreaming.

The central idea is rehearsal: that dreams practice recognizing the threat and avoiding or coping with it, and that practice enhances the functioning of the brain pathways involved. This way, dreams lead to enhanced performance in waking reality. There is plenty of evidence from dream content studies that dreams frequently do include both the perception and the recognition of things that have threatened in waking life, and the choice and use of ways to counter the threats. Thus, the threat simulation theory is supported by empirical evidence.

Another theory is the social simulation theory, which Antti Revonsuo, Jarno Tuominen, and I first presented in 2016. According to this view, in our dreams we practice perceiving, recognizing, and interacting with other people. The social nature of our species is hardwired in our brain, and

the social environment was likely as important for our ancestors' survival as skills of threat perception and avoidance. The most socially adept individuals tend to have more friends who can offer support and assistance when needed, and also have higher status and better access to resources. The simulation of social interactions in dreams could serve to rehearse pro-social behaviors that, in waking life, strengthen important social connections – helping the dreamer survive as well as satisfy the social need to belong to groups.

The social simulation hypothesis is, to some extent, compatible with what we know about the social content of dreams. Our dreams often present human characters and give plenty of opportunities to practice social perception and interactions. Nevertheless, the social simulation theory has not yet been thoroughly tested. Whether it will receive empirical support remains to be seen.

A simulation theory that is compatible with both the threat simulation and the social simulation hypotheses is that dreaming is a form of play. This theory was suggested by psychologist Kelly Bulkeley in 2004, and is based on the observation that species that engage the most in play tend to have large brains, a long childhood, and dense social networks. These features reflect the need and capacity to learn many different skills important to survival. Play behaviors provide a safe environment where young animals can practice the instinctually driven behaviors typical for their species (such as fighting, procreating, and bonding socially), which they will need in adulthood to survive. Dreams do the same thing, in the safe environment of sleep.

And yet...

Although the simulation theories have opened new vistas to the possible evolutionary function of dreaming, there is always the possibility that dreams have no function in a biological sense. Our dreams might be merely reflections of waking thoughts and experiences, without providing any training benefits. Whether or not dreams have a biological function remains unresolved.

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Banner images: (Center) Etologic horse study, Chauvet's cave, Flickr/Thomas T., [CC BY-SA](#). (Left) Plate 1. Sir Charles Bell, *The anatomy of the brain*, 1802. [Wellcome Collection](#), [CC BY](#).

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