Enter the Twilight Zone: the Hypnagogic State

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Hack #90

Enter the Twilight Zone: the Hypnagogic State

On the edge of sleep, you may enter hypnagogia, a state of freewheeling thoughts and sometimes hallucinations.

Hypnagogia, or the hypnagogic state, is a brief period of altered consciousness that occurs between wakefulness and sleep, typically as people “doze off” on their way to normal sleep. During this period, thoughts can become loosely associated, whimsical, and even bizarre. Hallucinations are very common and may take the form of flashes of lights or colors, sounds, voices (hearing your own name being called is quite common), faces, or fully formed pictures. Mental imagery may become particularly vivid and fantastical, and some people may experience synaesthesia, in which experiences in one sense are experienced in another—sounds, for example, may be experienced as visual phenomena.

It is a normal stage of sleep and most people experience it to some degree, although it may go unnoticed or be very brief or quite subdued in some people. It is possible, however, to be more aware of the hypnagogic state as it occurs and to experience the effects of the brain’s transition into sleep more fully.

In Action

Although there is no guaranteed technique to extend or intensify the hypnagogic state, sometimes it can be enough to simply make a conscious effort to be aware of any changes in consciousness as you relax and drop off, if practiced regularly. Trying to visualize or imagine moving objects and scenes, or passively noting any visual phenomena during this period might allow you to notice any changes that take place. Extended periods of light sleep seem more likely to produce noticeable hypnagogia, so being very tired may mean

you enter deep sleep too quickly. For this reason, afternoon dozing works well for some.

Some experimenters have tried to extend or induce hypnagogia by using light arousal techniques to prevent a quick transition into deep sleep. A microphone and speaker were used in one study to feed the sound of breathing back to the sleeper. Another method is the use of "repeat alarm clocks" (like the snooze function on many modern alarm clocks)—on entering sleep, subjects are required to try and maintain enough awareness to press a key every 5 minutes; otherwise, a soft alarm sounds and rouses them.

Try this yourself on public transport. Because of the low background noise and occasional external prompting, if you manage to fall asleep, dozing on buses and trains can often lead to striking hypnagogic states. In spite of this, this is not always the most practical technique, as you can sometimes end up having to explore more than your own consciousness if you miss your stop.

How It Works

Very little research has been done on brain function during the hypnagogic state, partly because conducting psychology experiments with semiconscious people is difficult at the best of times and partly because many of the neuroimaging technologies are not very soporific. fMRI ("Functional Magnetic Resonance Imaging: the State of the Art" [Hack #4]) scanning tends to be noisy and PET scanning ("Positron Emission Tomography: Measuring Activity Indirectly with PET" [Hack #3]) often involves having a drip inserted into a vein to inject radioactive tracer into the bloodstream—hardly the most relaxing of experiences. As a result, most of the research has been done with EEG (electroencephalogram) readings ("Electroencephalogram: Getting the Big Picture with EEGs" [Hack #2]) that involve using small scalp electrodes to read electrical activity from the brain.

Hideki Tanaka and colleagues [1] used EEG during sleep onset and discovered that the brain does not decrease its activity evenly across all areas when entering sleep. A form of alpha wave activity (electrical signals in the frequency range of 8–12 Hz that are linked to relaxed states) spreads from the front of the brain to the other areas before fading away. The frontal cortex is associated with attention (among other things), and it may be that the hypnagogic state results from the progressive defocusing of attention. This could cause a reduction in normal perception filtering, resulting in loosely connected thoughts and unusual experiences.

Electroencephalography (EEG) measures electrical activity from the brain, through small electrodes attached to the skull. The electrical signals are generated by neurons and the amount of synchronous neural activity results in characteristic EEG waveforms. Beta activity (above 14 Hz) is usually linked to high levels of mental effort and cortical activation, characteristic of the waking EEG. As mental activation decreases and sleepiness appears, both alpha (8–13 Hz) and theta (4–7 Hz) activity become more prominent. Delta activity (activity below 4 Hz) is associated with deep, “slow-wave” sleep.

Some scientists have argued that the hypnagogic state is not necessarily sleep-related and may be the result of a reduction in meaningful perceptual information, perhaps leading to defocused attention or other similar effects. A study published in 2002 [2] aimed to test this by comparing hypnagogic states with a condition in which awake participants were fed unstructured sensory information in the form of white noise and diffuse white light. The researchers used EEG recordings and found that, although participants in both conditions reported unusual visual experiences, the pattern of brain activation were quite different, suggesting that hypnagogia is more than just the result of relaxation and lack of structured sensory input.

One problem with recording electrical activity from the scalp is that activity from structures that lie deep in the brain may not be detected. This means we could be missing important information when it comes to understanding what happens as we slip from consciousness into sleep, and even back again into wakefulness (known as the hypnopompic state)—particularly as deep structures (such as the brain stem, pons, thalamus, and hypothalamus) are known to be crucial in initiating and regulating sleep.

An ingenious study published in Science did manage to investigate the role of some of the deeper brain structures in hypnagogia [3], specifically the medial temporal lobes, which are particularly linked to memory function. The researchers asked five patients who had suffered medial temporal lobe damage to play several hours of Tetris. Damage to this area of the brain often causes amnesia, and the patients in this study had little conscious memory for more than a few minutes at a time. On one evening, some hours after their last game, the players were woken up just as they started to doze and were asked for their experiences. Although they had no conscious memory of playing the game, all of the patients mentioned images of falling, rotating Tetris blocks. This has given us some strong evidence that the hypnagogic state may be due (at least in part) to unconscious memories appearing as unusual hypnagogic experiences.

In Real Life

Many authors and artists have been fascinated by this state and have tried to extend or use it to explore ideas or gain inspiration. To name a couple, Robert Louis Stevenson's The Strange Case of Dr. Jekyll and Mr. Hyde and many of Paul Klee's paintings were reportedly inspired by hypnagogic experiences.

See Also

1. Tanaka, H., Hayashi, M., & Hori, T. (1997). Topographical characteristics and principal component structure of the hypnagogic EEG. *Sleep*, 20(7), 523–534.

2. Wackermann, J., Putz, P., Buchi, S., Strauch, I., & Lehmann, D. (2002). Brain electrical activity and subjective experience during altered states of consciousness: ganzfeld and hypnagogic states. *International Journal of Psychophysiology*, 46(2), 123–146.

3. Stickgold, R., Malia, A., Maguire, D., Roddenberry, D., & O'Connor, M. (2000). Replaying the game: Hypnagogic images in normals and amnesics. *Science*, 290(5490), 350–353.

4. Although this is quite an old paper now, it is still one of the best reviews of the history, phenomena, and techniques associated with the hypnagogic state. Schacter, D. L. (1976). The hypnagogic state: A critical review of the literature. *Psychological Bulletin*, 83(3), 452–481.

—*Vaughan Bell*