To Sleep, Perchance to Dream - Crash Course Psychology #9

Crash Course: Psychology
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===== Intro =====

Comedian Mike Birbiglia was having trouble with sleep.

Though not with the actual sleeping part - one night, while staying in a hotel, he dreamed that a guided missile was on its way to his bed, and in his dream, he jumped out the window to escape it.

Unfortunately, he also did this not in his dream.

From the second floor. Adornment. Far from it. In truth, sleep is just another state of consciousness. And only in the past few decades have we begun to really plumb its depths - from why we sleep in the first place, to what goes on in our brains when we do, to what happens when we can't sleep.

===== Physiological Function (8:30) =====

And there is a lot that science has to say about your dreams!

Talk about weird! It's like Sigmund Freud meets Neil Gaiman.
So, even though it may seem like you're dead to the world, when you sleep, your perceptual window remains slightly open.

And kinda like Mike Birbiglia's hotel room window, a trip through it can make for a pretty wild ride.

But for your safety and enjoyment, I'm here to guide you through this state of consciousness, where you'll learn more than a few things about human mind, including your own.

And here's hoping you won't need any stitches when we're through.

===== Four Stages of Sleep =====

Technically speaking, sleep is a periodic, natural, reversible and near total loss of consciousness, meaning it's different than hibernation, being in a coma, or in say, an anesthetic oblivion.

Although we spend about a third of our lives sleeping, and we know that it's essential to our health and survival, there still isn't a scientific consensus for why we do it.

Part of it probably has to do with simple recuperation, allowing our neurons and other cells to rest and repair themselves. Sleep also supports growth, because that's when our pituitary glands release growth hormones, which is why babies sleep all the time. Plus, sleep has all kinds of benefits for mental function, like improving memory, giving our brains time to process the events of the day, and boosting our creativity.

But even if we're not quite sure of all the reasons why we sleep, technology has given us great insight into how we sleep.

And for that we can thank little Armond Aserinsky. One night in early 1950s Chicago, eight-year-old Armond was tucked into his bed by his father. But this night, instead of getting a kiss on the forehead, little Armond got some electrodes taped to his face.

Armond's dad was Eugene Aserinsky, a grad student looking to test out a new electroencephalograph, or EEG machine, that measures the brain's electrical activity.

That night, as his son slept peacefully, he watched the machine go bonkers with brain wave patterns, and - after making sure that his machine wasn't somehow broken - discovered that the brain doesn't just "power down" during sleep, as most scientists thought.

Instead, he had discovered the sleep stage we now call REM or rapid eye movement, a perplexing period when the sleeping brain is buzzing with activity, even though the body is in a deep slumber.

Aserinsky and his colleague Nathaniel Kleitman went on to become pioneers of sleep research. Since then, sleep specialists armed with similar technology have shown that we experience four distinct stages of sleep, each defined by unique brainwave patterns.

Say you're just going to bed. All day your endocrine system has been releasing "awake" hormones like cortisol. But with nightfall comes the release of sleepy melatonin hormones from the pineal gland. Your brain is relaxed, but still awake, a level of activity that EEGs measure as alpha waves.

You're feeling sleepy, your breath slows, and suddenly you're asleep. This exact moment is clearly evident on an EEG reading, as those alpha waves immediately transition to the irregular non-Rapid Eye Movement stage one (NREM-1) waves. It's in this first stage of sleep you might experience hypnagogic sensations - those brief moments when you feel like you're falling, and your body jerks, startling you.

As you relax more deeply, you move into NREM-2 stage sleep, as your brain starts exhibiting bursts of rapid brain wave activity called sleep spindles. You're now definitely asleep, but you could still be easily awakened.

NREM-3 comes with slow rolling delta waves. We now know that you can have brief and fragmentary dreams in the first three stages of sleep, but eventually you'll get to the most important stage: full REM sleep, that famous stage of sugarplum slumber that makes eyeballs go nuts, grants vivid visual dreams, and provided the namesake for a certain famous rock band.

REM sleep is kinda paradoxical. Your motor cortex is jumping all over the place, but your brainstem is blocking those messages, leaving your muscles so relaxed that you're basically paralyzed. Except for your eyes. That whole sleep cycle repeats itself every 90 minutes or so, transitioning back and forth between the stages of sleep.

===== Why We Dream (4:29) =====

Obviously sleep is super important, and lack of sleep is terrible for your health, mental ability, and mood. In fact it's a predictor for depression, and has been linked to things like weight gain, as your hunger-arousing and -suppressing hormones get out of whack. Sleep deprivation also causes immune system suppression, and slowed reaction time which is why you should not drive sleepy.

Of course, a bad night's sleep here and there is part of life, but there are a host of bona fide sleep disorders out there that can really make life pretty terrible, or in Mike Birbiglia's case, land you in the emergency room.

We've got insomnia, which is persistent problems of falling or staying asleep. And kind of its opposite, narcolepsy, whose sufferers sometimes experience brief, uncontrollable attacks of overwhelming sleepiness, called "sleep attacks." This, as you can imagine, can get in the way of all sorts of things that you might enjoy doing, like driving, eating, pole-vaulting.

Narcolepsy may have several different causes, including a deficiency in the neurotransmitter hypocretin, which helps keep you awake. But in more rare cases, brain trauma, infection, and disease may contribute to it as well.

So, that's rare, but you probably know someone with sleep apnea, the disorder that causes sleepers to temporarily stop breathing, until their decreased oxygen levels wake them up.

Birbiglia, meanwhile, turned out to have a REM sleep behavior disorder, which we don't fully understand yet, but appears to be associated with a dopamine deficiency.

Then we've got night terrors, which are as terrible as they sound... spurring increased heart and breathing rates, screaming, and thrashing that's seldom remembered upon waking. Night terrors are most common in children under seven, and may be spurred by stress, fatigue, sleep deprivation, and sleeping in unfamiliar surroundings. Much like sleepwalking and sleep talking, night terrors occur during the NREM-3 stage of sleep, and are NOT the same as nightmares, which occur, like most dreaming, during REM sleep.

But oh, in REM sleep, what dreams may come...
There you are, running naked as your teeth fall out, being chased down the beach by a Matt Damon centaur. You wake up, feel around your mouth thinking what? What? What?! WHAT?!

Welcome to your dreams, those vivid, emotional images racing through your sleeping brain, often providing a backdrop so bizarre that it may seem like David Lynch, Terry Gilliam, and Tim Burton are trying to out-weird each other in a film festival. A really, really long festival, considering the average person spends about six years of their lives dreaming.

So yeah, sometimes you have really crazy dreams. But mostly, your average dream usually just sort of unpacks and reshuffles what you did that day. For example last night I dreamt about Tumblr, cause I spent a lot of time on Tumblr yesterday.

If you played Tetris all afternoon, you might dream of blocks falling from the sky. If something traumatic happened to you, your brain might provide you with a nightmare to help extinguish your daytime fears - Thanks, brain!

Then again...you might be unable to stop dreaming about the trauma, which we'll look at in the future when we discuss post-traumatic stress disorder.

Our two-track minds of course allow us to register more stimuli than we outwardly acknowledge during the day, and in that way, the sounds of car alarms or stinky dog farts that you might not even have noticed may get incorporated into your dream, too.

And that's all interesting and weird and sometimes a little gross, but what's the real purpose of dreaming? Why do we do this? Well, as you might have guessed, there's more than one idea out there.

The study of dreams is is a mix of neuroscience and psychology known as oneirology. Oneiros is the Greek for dream, and if you're a Neil Gaiman fan you may recognize it as one of the Sandman's many names. The one that comes with a toga and Orpheus's head.

But Sandman aside, if you want to talk dreams, we might want to start with our old friend Freud.

In his landmark 1900 book The Interpretation of Dreams, Freud proposed that our dreams offer us wish-fulfillment.

He thought a dream's manifest content, the stuff you remember in the morning, was a sort of censored and symbolic version of whatever inner conflict was really going on in that dream's unconscious, or latent, content.

Not surprisingly, the wish-fulfillment theory lacks scientific chops and has for the most part fallen out of favor - because, really, you can interpret a dream any way you want.
Like, sometimes a cigar is just a cigar.

Luckily we have some other theories to consider. The information processing theory proposes that our dreams help us sort out and process the day's events and fix them into our memories. This may be particularly important when it comes to learning and remembering new information, and some studies show that people recall new tasks better after a good REM sleep full of dreams.

But if brainwave readings show us anything, it's that there's a lot going on in your brain when you dream, and the physiological function theory suggests that dreaming may promote neural development and preserve neural pathways by providing the brain with stimulation. When our brains are stimulated, they expand their connections more. So, babies, for example, spend much of their sleep time dreaming, perhaps in part to help their brain circuitry develop more quickly.

===== Cognitive Development (8:52) =====

This is similar to the idea that dreams are part of our cognitive development. By this model, dreams draw on our knowledge and understanding of the world, mimicking reality, and engaging those same brain networks that light up when we daydream.

===== Neural Activity Model (9:03) =====

And finally, there are theories that focus on the way REM sleep triggers neural activity, and the idea that dreams are just sort of accidental side-effects, the brain's attempt to weave a story out of a bunch of random sights, emotions, and memories - which is how in dreamland you might actually marry that Matt Damon centaur and give birth to a baby with banana fingers and a raccoon tail.

For now scientists continue to debate the function of dreams, but one thing we know for sure is that REM sleep is vital, both biologically and psychologically.

But, hey, you think your dreams are nut-bar? Next week, we're looking at other altered states of consciousness, where you'll learn what your brain really looks like on drugs, and whether you can actually hypnotize someone to do your evil bidding... or just act like a chicken.

===== Summary and Outtro =====

For now, if you've stayed awake during this episode, you learned about the four stages of sleep - NREM 1, 2, 3 and REM itself - as well as some major theories for the psychological purpose of dreaming, including information processing, physiological function, cognitive development, and neural activity models.

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