Sleep, Light & Circadian Rhythm

Huberman Lab Keypoints

Episodes in this pack: 9

Dr. Matt Walker: The Science of Dreams, Nightmares & Lucid Dreaming | Huberman Lab Guest Series

Guest: Dr. Matt Walker
Date: 2024-05-08 · Duration: 2:33:05
URL: https://www.youtube.com/watch?v=Jy4rJcYmtUM

KEYPOINTS

1. Vivid, story-like dreams come mainly from REM sleep, and humans have unusually high amounts
Walker explains that bizarre, hallucinatory, emotional dream narratives are reported principally from REM sleep. Most primates spend about 9% of sleep in REM, while humans average about 20%, an anomaly he links to our move from sleeping in trees, where REM's loss of muscle tone is dangerous, to sleeping on the ground. Across species, REM appears in birds and mammals and seems to have evolved twice independently, while insects, reptiles, amphibians and fish mostly show only non-REM sleep.

2. Dreaming brains switch off logic and noradrenaline
During REM, visual, motor, memory and emotional regions become more active, but the dorsolateral prefrontal cortex, which supports rational thought, is quieted. That explains why absurd dream events feel normal. Noradrenaline drops to floor levels, which Walker connects to dreams' loose, distorted, 'fuzzy logic' quality. In rodents, memory replay during REM runs at about half speed, which may relate to time stretching in dreams, though this hasn't been confirmed in humans.

3. Dreaming of the specific problem is what helps
REM sleep is necessary but not sufficient for creative insight and emotional processing. Walker's rule is that benefits depend on dreaming of the specific content you're working through. Emotional concerns and people of significance run like a 'red thread' from waking life into dreams, which is why he calls dreaming 'overnight therapy' and 'emotional first aid.'

4. Nightmare disorder is defined by daytime impact
Occasional nightmares are normal. Nightmare disorder applies when they recur frequently and their emotional residue 'drenches' the following day. Huberman describes a recurring nightmare he has had countless times.

5. Image rehearsal therapy rewrites a nightmare's ending
With a therapist, you write out the nightmare, then craft and repeatedly rehearse a new ending. Walker's example: instead of crashing at a junction, you gradually apply the handbrake, stop safely and call for help. Each reactivation followed by sleep 'edits' the stored memory, like revising a document over several days, so nightmare frequency falls. It helps about 66% of patients.

6. Lucid dreaming is real, but its value is unsettled
Lucid dreamers in sleep labs signal with pre-agreed left-right eye movements, since the eyes aren't paralyzed during REM. A German group's brain scans confirmed that 'moving my right hand' in a lucid dream activates the same motor regions as real movement. During lucidity, the frontal regions normally offline in REM come back on. Walker argues both sides. Lucid dreaming is rare, which questions its necessity, and some lucid dreamers report less refreshing sleep, possibly a shallower, more active REM. The evidence isn't in.

7. Lost sleep can't be fully repaid
After sleep deprivation, people sleep longer on the following nights but recover only a fraction. Walker cites roughly two to four extra hours, and usually closer to two, or about 25% of a lost eight hours. That means you always carry some debt.

8. Older adults: delay bedtime and consider targeted medications
Late-night sleep becomes fragile with age, and the circadian rhythm shifts earlier, causing 4 a.m. wake-ups. Walker suggests gradually pushing bedtime later, which builds sleep pressure that can carry you later into the morning, plus CBT for insomnia. Speaking as a scientist, not a physician, he says some medications show promise: trazodone (more for falling asleep, with some pushback), DORAs (dual orexin receptor antagonists), and low-dose doxepin (3–6 mg, sometimes as about 0.5 mL of liquid) for staying asleep.

9. Menopause disrupts sleep mainly through hot flashes
Hot flashes heat the body when it needs to stay cool to remain asleep. Non-drug options are a cool bedroom and cooling mattresses, which Walker says many menopausal women have found helpful based on feedback relayed by a mattress company's CEO. He mentions bioidentical hormone replacement as a contested medical option to discuss with a physician.

EXAMPLES

1. Rosalind Cartwright's divorce study
Cartwright recorded sleep and dream reports in people going through painful events such as bitter divorces, then followed them for a year. About half achieved clinical remission from their depression. The difference wasn't simply dreaming, but whether they dreamed about the painful experience itself.

2. Boosting nightmare therapy from 66% to 92%
Sophie Schwartz's group at the University of Geneva paired image rehearsal therapy with targeted memory reactivation. A pleasant piano chord played about every 10 seconds while patients rehearsed the new ending, then was replayed quietly during REM sleep. Effectiveness rose from about 66% to 92%.

3. Targeted memory reactivation with sounds
In a memory card-pair game, each pair is linked to a congruent sound (a fire engine siren, a whistling kettle). Replaying half the sounds below waking threshold during sleep strengthens those specific pairs relative to the unreplayed ones. Walker compares it to a 'bespoke playlist' for consolidating what matters.

4. Rick Rubin's dream tip

Huberman shares an untested tip from Rick Rubin that he says has worked every time for him. To recall a good dream, lie completely still with your eyes closed and it will come back. After a nightmare, get up, move and even turn on lights to shake off the emotional residue.

OTHER RELEVANT

1. Short-circuit bedtime rumination

Use meditation or other methods that get 'your mind off itself.' If you wake in the night and can't drift off, reframe the time as welcome rest instead of panicking. Otherwise, get up rather than teaching your brain that bed means wakefulness.

2. Hide the clock

Repeatedly checking the time at a habitual waking hour, like 3:30 a.m., reinforces that wake-up through learning. Remove visible clock faces from the bedroom.

3. Avoid back sleeping and screen for snoring

Sleeping on your back raises the risk of airway collapse. Walker uses the SnoreLab app, which records breathing and lets you replay snoring spikes, and suggests a few nights of recording. Alcohol worsens snoring. If snoring is confirmed, see a doctor. He says about 80% of people with sleep apnea are undiagnosed, and treatment can feel like 'wiping a fogged glass clear.'

4. Supplements are the last few percent

Walker cites some evidence for magnesium (if deficient, possibly by relaxing muscles), chamomile, glycine at about 1.5–2 g, and phosphatidylserine, which blunts cortisol in athlete studies and might help insomniacs whose cortisol spikes at sleep onset. Valerian's data don't hold up. His single biggest tip is regularity: a consistent schedule that matches your chronotype.

Dr. Matt Walker: Improve Sleep to Boost Mood & Emotional Regulation | Huberman Lab Guest Series

Guest: Dr. Matt Walker
Date: 2024-05-01 · Duration: 2:15:14
URL: https://www.youtube.com/watch?v=S_SrHS8FvMM

KEYPOINTS

1. No psychiatric condition comes with normal sleep
Walker says that in about 20 years of research his lab hasn't found a single psychiatric condition in which sleep is normal. Sleep problems appear in the diagnostic criteria of every major psychiatric disorder. The relationship runs both ways, and good sleep pushes toward mental wellness, not just away from illness.

2. Sleep loss boosts amygdala reactivity by about 60%
After a night without sleep, healthy people viewing neutral-to-unpleasant images showed roughly 60% more amygdala response than rested people. The threshold also dropped, so mildly emotional images started triggering reactions. A Japanese group later replicated the effect with under six hours of sleep for five nights.

3. The brake disconnects from the gas pedal
With sleep, the medial prefrontal cortex, the region behind the middle of your forehead, is strongly coupled to the amygdala and regulates it. Without sleep that connection is effectively severed: 'all emotional gas pedal and too little regulatory control brake'. That's why loud voices, cold water or extra requests grate when you're tired.

4. Sleep deprivation overreacts in both directions
A sister study found sleep-deprived people were also hypersensitive to rewarding images, with dopamine-related circuits overactive. That fits higher impulsivity, sensation-seeking and addiction potential when underslept. With Carl Hart, Walker found poor sleep predicted relapse during cocaine abstinence.

5. The 'loose hinge'
Huberman pictures the autonomic nervous system as a seesaw. Walker's data showed that sleep-deprived people at rest sit in a flat, parasympathetic, unmotivated state; one of the earliest effects of sleep loss is low motivation. But the hinge is so loose that a small challenge flips them into strong sympathetic arousal, with no balanced middle.

6. REM sleep strips emotion from memories
People who slept after forming emotional memories showed reduced amygdala reactivity when recalling them; those who stayed awake the same length of time didn't. More REM sleep meant more softening. Walker calls it 'overnight therapy', removing the 'bitter emotional rind' while keeping the informational orange, so you sleep to remember and sleep to forget.

7. Why REM is a safe space
REM is the only time in 24 hours when noradrenaline is completely shut off in the brain; serotonin also falls. Acetylcholine rises, by about 30% above waking in some regions, while the hippocampus and amygdala stay very active. Emotional memories are replayed in a neurochemically calm environment.

8. Anxiety tracks sleep quality and deep sleep
After a night of total sleep deprivation, anxiety rose exponentially past about 16 hours awake. By morning, almost 50% of previously non-anxious participants reached the diagnostic threshold for an anxiety disorder. In everyday tracking, sleep quality (fewer awakenings), not quantity, predicted next-day anxiety. Contrary to the lab's REM hypothesis, deep non-REM sleep predicted overnight relief and re-engaged the frontal lobe.

9. Sleep disruption precedes suicidal thoughts and attempts
Short or poor sleep predicts suicidal thinking, attempts and deaths, and the disruption comes before each one, making it a possible early-warning biomarker. Insufficient sleep carries roughly two to three times the risk; nightmares carry roughly five to eight times. Research by Michael Perlis and Michael Grandner shows suicidal acts cluster around 1–4 a.m., near the circadian low.

10. Depression: early REM and a puzzling sleep-deprivation effect
In depression, the first REM period arrives abnormally early, and many antidepressants delay or reduce REM. Walker notes the debate over antidepressants and takes no side. Sleep deprivation lifts mood in only about 30–55% of depressed patients, may worsen others, and the benefit vanishes after the next sleep. Walker suggests it works by temporarily raising reward sensitivity, which depression's anhedonia lacks.

EXAMPLES

1. Dement's REM-deprivation experiments
In the 1960s, William Dement woke volunteers each time they entered REM. They went from six or seven REM attempts on the first night to about 17–18 by night five. By around day three they showed paranoia and hallucinations, and by day five signs bordering on psychosis.

2. Prazosin and PTSD nightmares
PTSD patients show high noradrenaline even during sleep. At a conference, psychiatrist Murray Raskind described veterans on the generic blood-pressure drug prazosin, which crosses into the brain, reporting that their nightmares stopped and their REM sleep recovered. Walker says replication has been mixed, and a psychological therapy for repetitive nightmares appears at least as effective.

3. Cannabis and REM rebound

Walker describes a listener who stopped after about seven years of cannabis use and had an 'explosion' of vivid dreams. He explains that THC (not CBD) suppresses REM, so stopping produces a rebound above normal levels.

4. NSDR in addiction recovery

At a trauma and addiction center run by Ryan Soave, patients started each morning with an hour of non-sleep deep rest (NSDR), especially in their first days, when they are badly sleep-deprived. Huberman notes there are no randomized trials yet.

OTHER RELEVANT

1. Sleep 20 minutes later for more REM

Most REM falls in the last quarter of the night, so extend sleep at the end, not the start. Avoid alcohol and THC, which suppress REM. Avoid 'social jet lag': a two-to-three-hour weekend shift is like flying Los Angeles to New York and back every weekend.

2. Boost deep sleep for anxiety

Keep a regular schedule, exercise and sleep in a cool room. A warm bath or shower before bed especially increases deep sleep. Alcohol fragments the first four hours of sleep, when deep sleep dominates, and raises anxiety over the long run.

3. Start with timing if you change one thing

For depression, Walker says circadian misalignment has some of the strongest evidence. Take the free Morningness-Eveningness Questionnaire and adjust your schedule toward your chronotype. Huberman reports lower mood when he goes to bed at midnight or later versus 8:30–9 p.m.

4. Bright days, dark nights, no 'junk light'

Huberman cites a Nature Mental Health study, which he recalls covering more than 80,000 people, linking more daytime light to fewer mental health symptoms. Dim or dark evenings had an independent benefit. Walker adopts Huberman's phrase 'junk light' for nighttime artificial light.

Dr. Matt Walker: Using Sleep to Improve Learning, Creativity & Memory | Huberman Lab Guest Series

Guest: Dr. Matt Walker
Date: 2024-04-24 · Duration: 2:28:28
URL: https://www.youtube.com/watch?v=F9KrZd_-ge0

KEYPOINTS

1. You need sleep before learning to absorb new information

In Walker's brain-scanning study, people kept awake all night showed a 40% deficit in forming new memories compared with those who slept. Replications with visual and textbook-style material put the deficit at 20–40%. Animal studies show why: sleep-deprived animals' hippocampus, the brain's short-term memory store, becomes 'stubborn' and won't form new synaptic connections.

2. A nap can refresh your capacity to learn

Two groups learned a large set of facts at noon, then learned a new set at 6 p.m. The group that stayed awake learned progressively worse. The group given a 90-minute nap (enough for a full cycle of non-REM and REM sleep) showed no decline, a difference of about 20%. Sleep spindles, short bursts of activity in non-REM sleep, predicted how much learning ability was restored. Walker compares the hippocampus to a USB stick that sleep empties for new files.

3. You also need sleep after learning to keep memories

Cramming gets material through tomorrow's exam, but a month later almost none of it remains, because without sleep it never moves into long-term storage. Walker's rule is to sleep both the night before and the night after learning something important.

4. Sleep improves physical skills without extra practice

People practiced typing a number sequence (such as 4-1-3-2-4). Twelve hours awake brought no improvement. After a night's sleep the same people were about 20% faster and nearly 37% more accurate. 'Practice with a night of sleep makes perfect.' The gain tracks stage 2 non-REM sleep and its spindles, and naps produce it too, so it's caused by sleep rather than by nighttime.

5. Time learning to your circadian rhythm

There are good learning windows in the morning and again after the post-lunch dip, which usually falls somewhere between 1 and 4 p.m. and lasts 60–90 minutes. Many people get a 'second wind' around 9 p.m. that lasts roughly 45–70 minutes. Walker advises riding it out with dim lights and a calm wind-down rather than taking it as a sign you aren't tired.

6. Short sleep hurts athletic performance and motivation

Under 6 hours of sleep reduces peak muscle output and vertical jump, and time to exhaustion can fall by up to 30%. Perhaps most striking, it lowers the motivation to exercise at all. The relationship works in both directions: daytime exercise deepens sleep that night.

7. Dieting on too little sleep costs muscle instead of fat

When you diet while underslept, you still lose weight, but almost 60% of it can come from lean muscle rather than fat. As Walker puts it, you keep what you want to lose and lose what you want to keep.

8. REM sleep fuels creative connections

In Walker's anagram study, people woken from REM sleep solved about 30% more puzzles than when woken from non-REM sleep, and they solved them in a looser, more intuitive way, with answers seeming to just pop out. Non-REM sleep strengthens individual facts, while REM links distant ideas, which is the overnight alchemy behind 'sleeping on a problem.'

EXAMPLES

1. Later school start, higher scores and fewer crashes

A school district outside Minneapolis moved its start time from 7:25 to 8:30 a.m. The top 10% of students' average SAT score rose from 1,288 to 1,500 the next year. Walker notes some doubt about that source, but consistent data show better grades, fewer mental health problems and less truancy. Car crashes among 16–18-year-olds fell 70%.

2. Sleep-deprived doctors

Residents on 30-hour shifts make about 460% more diagnostic errors in intensive care. Surgeons who have slept under 6 hours in the previous 24 are about 70% more likely to make a surgical error. Driving home after such a shift carries a 168% higher risk of a crash.

3. Sleep paralysis after alcohol

Alcohol suppresses REM sleep, building up a REM 'debt.' Falling asleep afterward can send you straight into REM, and waking before the body's paralysis lifts produces sleep paralysis, mildly stressful to terrifying. A separate problem, REM sleep behavior disorder (acting out dreams), becomes more likely after 50, especially in men.

4. Athletes and extended sleep

In Cheri Mah's Stanford study, basketball players who spent more time in bed improved point scoring and court sprint speed. Walker's lab then confirmed with controlled tests that complex motor skills benefit from sleep as well.

5. Sleepwalking versus acting out dreams

Sleepwalking and sleep talking come from deep non-REM sleep when a partial awakening is triggered. They are different from REM sleep behavior disorder, in which the brainstem's normal paralysis during dreaming breaks down so people physically act out their dreams.

OTHER RELEVANT

1. Protect the first minutes after waking

Because sleep, especially REM, recombines ideas, Huberman tries not to look at his phone for at least 30 minutes after waking. That leaves room for overnight ideas to surface before other people's input crowds them out. He often hurries to write something down while making his morning tea.

2. Beware 'orthosomnia'

Becoming so anxious about getting perfect sleep scores from a tracker that the worry harms your sleep. With pro athletes in the playoffs, Walker collects sleep data but shares it only after the series so it can't undermine confidence.

3. Caffeine may aid memory, but not in place of sleep

Some work suggests caffeine enhances the hippocampus's ability to take in information. No one has tested whether it rescues learning after sleep deprivation, and the sleep-deprived hippocampus may resist the benefit.

4. Edison napped strategically

Thomas Edison is often held up as a short sleeper, yet he napped habitually on his workbench and in his garden, using sleep deliberately as a creative tool. Keep a notebook handy to capture ideas on waking.

Dr. Matt Walker: How to Structure Your Sleep, Use Naps & Time Caffeine | Huberman Lab Guest Series

Guest: Dr. Matt Walker
Date: 2024-04-17 · Duration: 2:18:58
URL: https://www.youtube.com/watch?v=4F_RBc1akC8

KEYPOINTS

1. Humans move from polyphasic to monophasic sleep as they grow up
Infants sleep in many bouts. Sleep starts consolidating at night around ages two to three, kindergarteners are often biphasic (night sleep plus an afternoon nap), and by age five or six most children are monophasic. Newborns spend about 50% of their sleep in REM versus roughly 20% in adults. Walker calls infant REM an 'electrical fertilizer' for building synapses, citing classic animal studies in which REM deprivation stunted brain development.

2. A built-in afternoon dip makes a short siesta biologically natural
Alertness drops between roughly 1 and 4 p.m. (the post-prandial dip), earlier for morning types. Hunter-gatherer groups Walker and others have studied often nap in the hot season, fall asleep about two hours after sundown, and wake just before sunrise, cued by falling temperature rather than light. He doubts the historical 'first sleep, second sleep' pattern is biological.

3. Naps measurably restore learning and emotional balance
In Walker's study, a 90-minute midday nap preserved learning capacity, while the group that stayed awake declined; by 5 p.m. the gap was about 20%. The learning benefit tracked sleep spindles. In a separate study, non-nappers rated fearful and angry faces as more intense by evening, while a nap that included REM sleep blunted those reactions and made happy faces look more positive.

4. The downside of napping is spent sleep pressure
Adenosine builds the longer you're awake, and sleep clears it. A nap releases some of that pressure like a valve on a pressure cooker — 'snacking before the main meal.' Walker's firm advice for people with insomnia is not to nap, which is part of cognitive behavioral therapy for insomnia (CBT-I). Late naps can also make nighttime sleep shallower and harder to return to after waking.

5. About 20 minutes is the sweet spot for a quick boost
Dose-response studies show 5–10 minute naps give a brief bump that fades. From about 15–17 minutes, gains in alertness, concentration and motivation last into the evening. Deep non-REM starts around 30–40 minutes, so longer naps risk sleep inertia (grogginess). They can bring bigger benefits if you accept up to an hour of feeling worse first. Walker's rule of thumb is no naps after about 3 p.m.

6. Daytime napping in older adults may signal poor night sleep rather than cause harm
In large epidemiological studies, napping after about 65 predicts worse health and earlier death. Walker thinks the naps are mostly a proxy for poor night sleep. Deep sleep starts declining in the mid-to-late 30s, is about 50% of teenage levels by 50, and is about 5% by 75, so he is not ready to tell all older adults to stop napping.

7. Caffeine masks adenosine; it doesn't remove it
Caffeine blocks adenosine receptors while adenosine keeps building, so when it wears off you get the original load plus the extra hours' worth: the crash. It also makes the brain more metabolically active, which may produce more adenosine. Walker says only sleep, particularly non-REM, clears adenosine; light, movement and cold override it rather than reducing it.

8. Walker has softened his stance on coffee, with guardrails
Coffee carries strong health signals, which he largely attributes to its antioxidants, since decaf shows many of the same benefits. His limits: no more than about three cups a day, with a cutoff of roughly 8–10 hours before bed for people who aren't sensitive and 14–15 hours (and one cup) for sensitive people. Caffeine sensitivity varies with a known genetic polymorphism affecting clearance.

9. Polyphasic 'biohacker' schedules fail on the evidence
Uberman, Everyman and triphasic schedules trace back to Buckminster Fuller's 'Dymaxion' sleep described in Time magazine in 1943. A Harvard review Walker cites found no support for claimed gains in mood, cognition or productivity. It did find less total sleep, poor sleep efficiency, reduced REM, and impaired judgment, mood and glucose regulation.

EXAMPLES

1. NASA's nap culture
For astronauts seeing 10–20 sunrises a day, short naps produced roughly a 20% boost in alertness and almost 50% in task productivity, according to Walker. The practice spread to NASA's staff on the ground.

2. Why it's called a 'power nap'
David Dinges and Mark Rosekind found that long-haul pilots did best napping early in the flight rather than just before landing. The FAA balked at the term 'prophylactic napping' for a mostly male pilot culture, so 'power nap' was coined.

3. The Japanese nap-stacking study
Five groups: no nap, nap, nap plus caffeine, nap plus cold face and hand washing, and nap plus 2,000-lux bright light. Every addition improved on the nap alone. Caffeine's extra effect was smaller than the nap's own. No group combined everything.

4. Wall Street traders' uppers and downers
Walker's recent study found that traders who leaned heavily on caffeine during the day relied more on alcohol at night to come down, creating a cycle of stimulants and sedatives.

5. Drowsy driving

Walker said sleeping under about six hours raises crash risk by about 30%, with risk climbing exponentially as sleep drops further. He compared it to choosing between two taxis, one 30% likelier to crash — his main warning for polyphasic sleepers.

OTHER RELEVANT

1. The 'nappuccino'

Caffeine takes about 12–17 minutes to reach meaningful blood levels, and early relief from the first sips is partly placebo and the warmth of the drink. Drink a small espresso, nap 20 minutes, and wake as caffeine rises, getting the nap without the grogginess. For the 'nap-plus-plus' version Walker extrapolates (untested as a combo), add cold water on hands and face plus 5–10 minutes of daylight.

2. Make a nap easier to fall into

If you're not a natural napper you don't have to start. If you want to, mimic night: darkness or an eye mask, earplugs, shoes off, lie down under a blanket (lying flat helps the core body temperature drop), and set an alarm.

3. Test changes with an on-off-on design

If late naps seem to hurt your sleep, move them earlier, such as just after lunch, for about two weeks. Then return to the old schedule. Walker is more convinced if things get worse when you stop than if they improved when you started.

4. Check whether coffee is hiding poor sleep

Huberman's suggestion to delay caffeine 90–120 minutes may blunt the afternoon crash. Walker endorses testing it and adds a deeper check: after two weeks of caffeine withdrawal, take your first coffee at about 11 a.m. If you aren't sharp by about 9 a.m. without it, look at your sleep.

Dr. Matt Walker: The Biology of Sleep & Your Unique Sleep Needs | Huberman Lab Guest Series

Guest: Dr. Matt Walker
Date: 2024-04-03 · Duration: 2:59:33
URL: https://www.youtube.com/watch?v=-OBCwiPPfEU

KEYPOINTS

1. Sleep is two types that trade dominance across the night
Non-REM is split into stages 1–4 (1–2 light, 3–4 deep), and REM is the main dreaming stage. They alternate in cycles of roughly 90 minutes, but the ratio shifts: early cycles are dominated by deep non-REM, later cycles by REM.

2. The '90-minute cycle' is an average, not a rule to set alarms by
Individual cycles range from about 75 to 120 minutes, are fairly stable within a person, and men's average cycle runs roughly 15–20 minutes longer than women's. Asked whether you should cut sleep short to wake at the end of a cycle, Walker's answer was simply 'false': sleep as much as you can and be wary of devices that wake you on a supposed 90-minute schedule.

3. Stage 2 is marked by sleep spindles; deep sleep by huge, synchronized slow waves
Spindles are 1–2 second bursts at 12–15 Hz while background activity slows to about 4–8 Hz. In stages 3–4 the brain oscillates only 1–2 times per second, with waves several to ten times larger than waking activity, because hundreds of thousands of cortical neurons fire and fall silent together.

4. Deep sleep calms the body and restocks the immune system
Walker's lab reported that the coordination of slow waves and spindles signals the autonomic nervous system to shift into a parasympathetic state; heart rate and blood pressure fall. Deep sleep also restocks immune cells such as T cells and natural killer cells and increases the body's sensitivity to immune signals.

5. Losing deep sleep alone impairs blood-sugar control from both sides
Using quiet tones just below the waking threshold, researchers can strip out deep sleep while total sleep stays around eight hours. The pancreas then releases less insulin, and cells respond less to the insulin that is released. Deep sleep also helps shift memories into long-term storage and is when the brain clears beta-amyloid and tau, two proteins central to Alzheimer's disease.

6. You must lose about 1°C of core temperature to fall and stay asleep
That is why a too-cold room is easier than a too-hot one. The body sheds core heat by pushing blood to the skin's surface, and it does this best when lying flat. That is one reason reclined sleep is lower in quality.

7. Good sleep has four 'macros': quantity, quality, regularity and timing (QQRT)
Quantity is 7–9 hours for the average adult (the CDC's minimum is 7); Walker quips that most people need about 90 minutes more than they get. Quality includes continuity, measured as sleep efficiency (time asleep ÷ time in bed), where 85% or higher counts as healthy, and the electrical strength of deep sleep, which consumer trackers can't measure. He insists you can't trade off quantity against quality.

8. Regularity may predict mortality even more strongly than duration
Walker defines regularity as consistent lights-out and wake times, within about ±30 minutes, measured from lights out rather than from getting into bed. It is the newest macro to prove its importance (see the UK Biobank analysis below).

9. Chronotype is largely genetic, and fighting it shortens sleep
Sleep science uses five types: extreme morning (about 8 pm to 4–4:30 am), morning (about 9:30 pm to 5:30 am), neutral (about 11 pm to 7:30 am, Walker's own type), evening (about 12:30 am to 9:30 am) and extreme evening (2:30–3 am onward). At least 22 genes shape it. A morning type kept up until midnight still wakes around 4:30 am as their circadian rhythm rises, so they end up short on sleep, which Walker argues makes society's bias against night owls unfair.

10. Sleep pressure, growth hormone and cortisol are all tied to sleep timing
Adenosine builds up as a by-product of brain metabolism, damping wake-promoting regions and boosting sleep-promoting ones; deep sleep lets clearance outpace buildup. Growth hormone release depends on both sleep and night-time: blocking deep sleep cuts it, and day-sleeping shift workers release some but less. Cortisol falls steeply as you get sleepy and climbs toward natural waking.

EXAMPLES

1. Waking two hours early can cost 60–80% of REM
Walker's example is someone who usually sleeps midnight to 8 am but gets up at 6 am. They lose 25% of total sleep, but because REM is concentrated late in the night, perhaps 60–80% of their REM.

2. One night of four hours cut natural killer cell activity by 70%
Walker cites Michael Irwin's UCLA study of healthy adults. Short sleep the week before a flu shot can halve the antibody response.

3. Sleep restriction rapidly ages hormones and blood sugar
Healthy young men limited to four to five hours a night for five nights had testosterone levels typical of men about ten years older; women show disrupted estrogen, FSH and LH. Five hours a night for four nights can push healthy people's glucose handling into the pre-diabetic range. Walker admits the full dose-response curve hasn't been mapped.

4. Daylight saving time as a natural experiment

Losing an hour in spring was linked to a 24% relative rise in heart attacks the next day, and gaining one in autumn to a 21% drop. Walker concedes the effect sizes are debated, but car accidents, suicides and the harshness of judges' sentences also rise after the spring change.

5. UK Biobank: regular sleepers had 49% lower all-cause mortality

In roughly 60,000 people, the most regular quartile showed about 35% lower cancer mortality and close to 60% lower cardiovascular mortality than the least regular. Regularity carried almost twice the predictive weight of sleep duration.

6. Six hours a night for a week altered 711 genes

In Derk-Jan Dijk's study at the University of Surrey, about half the affected genes, mostly immune-related, were turned down. The other half, linked to tumor promotion, chronic inflammation and cellular stress, were turned up.

OTHER RELEVANT

1. Use a roughly 25-minute rule for lying awake

If you can't fall back asleep after about 20–25 minutes, and this happens often, get up and read or listen to something in another room, then return only when sleepy. This is a core idea in cognitive behavioral therapy for insomnia (CBT-I): 'you would never sit at the dinner table waiting to get hungry.' If you still feel you have sleep left in you and your schedule allows it, it's worth trying to get it back this way.

2. Simple self-checks for insufficient sleep

Would you sleep past your alarm if it didn't go off? Do you have lapses, such as not remembering whether a light was red? Can you function well without caffeine before 11 am? Feeling unrefreshed after a 'good' tracker score points to a quality problem. Walker stresses that sleep-deprived people consistently underestimate their own impairment.

3. Use a bedtime alarm as well as a wake alarm, and find your chronotype

Walker uses both alarms to stay regular. To estimate your chronotype, take the free Morningness-Eveningness Questionnaire (search 'chronotype MEQ'), or ask what schedule you'd keep alone on a desert island with no obligations.

4. For snoring or apnea, avoid sleeping on your back

Lying on your back lets gravity collapse the airway. The old clinic trick is a tight T-shirt worn backwards with a tennis ball in the pocket.

5. Protect your evenings from stress

Because cortisol should be dropping at night, stressful news, arguments or work after about 8 pm can disrupt the whole night. This is the 'tired but wired' state often seen in insomnia.

Use Sleep to Enhance Learning, Memory & Emotional State | Dr. Gina Poe

Guest: Dr. Gina Poe
Date: 2023-02-13 · Duration: 2:05:41
URL: https://www.youtube.com/watch?v=BMTt8gSl13s

KEYPOINTS

1. The first 90-minute cycle is timed to your body clock
Most growth hormone is released in one big pulse during the first sleep cycle, along with a surge of protein synthesis that helps build memories. Poe explains that every cell's clock, timed relative to melatonin, expects this pulse at a particular time. If you go to bed late, you may still release some growth hormone, but your tissues have already moved on to the next phase.

2. Alcohol damages the memory-consolidating parts of sleep
Alcohol suppresses REM sleep and the sleep spindles of the stage-two transition into REM. During spindles, the hippocampus (the brain's RAM) writes memories to the cortex (the hard disk). Poe agrees with Huberman's suggestion of no alcohol in the 4–6 hours before sleep, or none at all, while saying she doesn't know the dose-response.

3. Later cycles are a different stage you shouldn't cut short
Each successive cycle contains more REM sleep, while growth hormone and melatonin decline and other hormones rise. Cutting the night short removes REM-heavy sleep, which is involved in consolidating memories and updating your mental models (schemas).

4. REM sleep clears the hippocampus by switching off noradrenaline
The locus coeruleus releases norepinephrine (and seems to be the hippocampus's source of dopamine), which strengthens synapses while you're awake. It falls silent only during REM sleep. Poe says that silence lets synapses weaken, erasing the 'thumb drive' once its contents have been written to the cortex, which is essential for continued learning.

5. In PTSD, the locus coeruleus may not switch off during REM
Norepinephrine levels in people with PTSD look normal during the day and early night but diverge in the early-morning hours, when REM sleep peaks. Heart-rate patterns point the same way. Poe's preliminary rat data agree. The traumatic memory then stays stuck in novelty-encoding structures instead of being erased after it's consolidated.

6. Common antidepressants may work against trauma recovery during sleep
Poe, stressing she isn't a physician, argues that drugs keeping norepinephrine in synapses (such as bupropion) suppress REM sleep, and that any REM sleep you do get is 'noradrenergic' REM. She thinks that may hinder the adaptive REM needed to resolve trauma. She says SSRIs are problematic too.

7. Sleep spindles track learning
Baseline spindle density correlates with intelligence. Whatever your baseline, an increase in spindles the night after learning almost perfectly predicts how well you consolidate the new information into existing knowledge. People with schizophrenia have very few spindles. Work by Julie Seibt and Anita Lüthi links spindles to plasticity in distal dendrites, which Poe thinks may support creativity.

8. You probably can't oversleep
In a study Poe describes where people could stay in bed 12 hours, they first slept 10–11 hours to pay back debt, then settled at about 8 hours 15 minutes and spent the rest of the time awake. Adolescents and other developing brains are the exception: let them sleep, because development has its own windows.

9. Opioid withdrawal leaves the stress system without its brake
Long-term opioid use reduces the number of opioid receptors. When the drug is withdrawn, your own opioids can't calm the locus coeruleus, which fires constantly, disrupts sleep and feels like anxious depression. Poe calls sleep disturbance a strong predictor of relapse, and her group (with Pamela Kennedy at UCLA) is testing whether restoring sleep reduces relapse in animals.

EXAMPLES

1. Psychedelics as a REM-like state
Poe describes psychedelic states as REM-sleep-like, though with major differences. She argues that current psilocybin and MDMA trials should be studying sleep, since none that Huberman knows of focus on it.

2. Children and fire alarms
Children's slow-wave sleep is so deep that loud fire alarms often fail to wake them. Poe notes efforts to design alarms that say the child's name, which is quieter but more meaningful to them.

3. Estrogen after trauma
Female rats' locus coeruleus fails to quiet fully in REM during three phases of the estrous cycle and quiets properly only during the high-estrogen phase. Poe cites retrospective studies of women in emergency rooms: those who happened to be taking a pill containing estrogen were much less likely to develop PTSD after a trauma.

4. Meditation and REM-like theta
Theta activity, which occurs during learning and REM sleep, increases during transcendental meditation. Poe suggests meditation might mimic some REM functions, but it's unknown whether norepinephrine and serotonin switch off, which erasing the hippocampus requires.

5. Sleep inertia
Waking from deep slow-wave sleep causes grogginess. Poe doesn't use an alarm except for flights and recommends waking

naturally when possible, while Huberman suggests timing alarms near the end of a 90-minute cycle.

OTHER RELEVANT

1. Pay back sleep debt with extra sleep

Poe says cognitive deficits build up with each night of sleep deprivation, and recovery requires actually sleeping more. That's also why the people in the 12-hour study slept 10–11 hours at first before settling at their natural amount.

2. Keep your bedtime consistent

Because the growth hormone pulse is tied to your circadian clock, regular bedtimes matter. Huberman says he's now keeping his bedtime within about ±30 minutes and reports better sleep scores and daytime vigor.

3. Go to bed calm, not anxious or wired

Going to sleep anxious or hyped up keeps the locus coeruleus active and can make sleep maladaptive. Poe suggests meditation, deep breathing, a warm bath or a comforting book, something neither too exciting nor too boring.

4. Use NSDR or yoga nidra for insomnia and middle-of-the-night waking

Relaxing the facial muscles, breathing with long exhales and doing body scans all push away from locus coeruleus activation and help you fall back asleep, though nothing replaces sleep itself. Poe notes insomnia feeds on itself: anxiety about not sleeping becomes the thing that keeps you awake.

Sleep Toolkit: Tools for Optimizing Sleep & Sleep-Wake Timing

Date: 2022-08-08 · Duration: 1:41:54
URL: https://www.youtube.com/watch?v=h2aWYjSA1Jc

KEYPOINTS

1. Good sleep starts in the morning with an early cortisol peak
Huberman organizes the toolkit around three daily critical periods: the morning, the afternoon, and the evening and night. A healthy rhythm puts the daily cortisol pulse near waking. That same signal starts a timer for sleepiness about 16 hours later, supports metabolism, and suppresses leftover melatonin. Most of what you do in the first 60–90 minutes of the day carries through to how you sleep that night.

2. View sunlight within 30–60 minutes of waking, outdoors and not through glass
Aim for about 5 minutes on a clear day (3 one day and 7 the next is fine), about 10 minutes under cloud, and 20–30 minutes on dense overcast or rainy days. Windows and windshields filter the relevant light. A free light-meter phone app pointed at an overcast sky often reads 5,000–10,000 lux, sometimes up to 90,000, which is far more than indoor lights that seem bright. If you wake before sunrise, use bright artificial light until the sun is up.

3. Use cold, movement or both to wake up
A 1–3 minute cold shower or plunge releases adrenaline from the adrenals and the locus coeruleus. Paradoxically, it also makes core body temperature rise more steeply afterward, and that rise drives alertness. Morning movement does the same. Huberman skips rope 10–20 minutes outside while getting sunlight, then takes a cold shower. He cites research pointing to exercise right after waking, 3 hours after or 11 hours after as good times for strength, but says that is fine-tuning.

4. Delay caffeine 90–120 minutes and cap it in the afternoon
Caffeine works by blocking adenosine. Letting residual adenosine clear before your first cup helps avoid the afternoon crash, which otherwise often leads to more caffeine that hurts sleep. Keep caffeine under 100 mg after 4 p.m., and ideally have the last dose by 2–3 p.m. Huberman notes some people, himself included, can drink a 200 mg double espresso at 5–6 p.m. and still fall asleep, but data show caffeine still degrades sleep quality.

5. Afternoon naps, NSDR and late sunlight protect the night
Naps are optional. If you take them, keep them under 90 minutes and not so late that they delay bedtime. Non-nappers can use 10–30 minutes of NSDR, yoga nidra or the Reveri self-hypnosis app instead. Hard exercise late in the day can delay your clock, while exercise in the first 0–4 hours after waking rarely shifts it. Viewing sunlight in the late afternoon, 5–30 minutes depending on clouds, makes the retina less sensitive to artificial light later that night.

6. From about 10 p.m. to 4 a.m., avoid bright light, especially from overhead
Light at night suppresses melatonin. The retinal cells that set the clock sit mostly in the lower half to two-thirds of the retina and so view the upper visual field, which makes overhead lights the worst offenders, especially fluorescent supermarket or gas-station lights. Use lamps set low in the room, dimmed lights, candlelight (about 3–10 lux) or moonlight, compared with 100–1,000 lux from desk and ceiling lights. Huberman has worn sunglasses into a late-night store.

7. Your body has to cool to fall asleep
Core temperature drops 1–3 degrees as you fall asleep. A hot bath, hot tub or sauna in the evening for no more than 20–30 minutes triggers a compensating drop afterward that makes falling asleep easier. Keep the bedroom cool, at least 3 degrees cooler than usual, and add blankets as needed.

8. Alcohol and THC help you fall asleep but degrade sleep architecture
Huberman, echoing Matt Walker, says alcohol and THC may help people fall or even stay asleep, but the sleep is less restorative. CBD and THC edibles appear to reduce anxiety for some people with anxiety-driven insomnia. He prefers supplements that he says do not disrupt sleep architecture.

9. Your temperature minimum lets you shift your clock
Your lowest body temperature occurs about 2 hours before your usual wake time, so around 5 a.m. if you wake at 7. Bright light, exercise or caffeine in the 2–4 hours before it delays your clock and makes you want to sleep and wake later. The same inputs in the hours after it advance your clock. This underpins Huberman's advice on jet lag and shift work.

10. Keep wake times consistent, within about an hour
Sleeping in more than about an hour past your usual wake time destabilizes the rhythm. After a late night, wake near your normal time and be strict about delaying caffeine. To shift to earlier hours, move bedtime and wake time 30–60 minutes earlier each night over about a week, using sunlight and exercise even when groggy.

EXAMPLES

1. Huberman's sleep stack doses
Magnesium threonate 145 mg, apigenin 50 mg and theanine 100–400 mg, taken 30–60 minutes before bed, ideally about 3 hours after eating. Try each alone. If magnesium upsets your gut, or theanine gives you disruptive vivid dreams, your right dose of it is zero.

2. Rotating add-ons
Every third or fourth night he adds 2 g of glycine and 100 mg of GABA. On other nights he adds 900 mg of myo-inositol, which he says helps him fall back asleep and reduces anxiety.

3. Why he avoids routine melatonin
Commercial doses are supraphysiological. Melatonin also interacts with testosterone, estrogen and the timing of puberty, so occasional use for jet lag is probably fine but chronic use, especially in kids, may be problematic.

4. Samer Hattar's 'cave' evenings
Huberman jokes that his friend Samer Hattar, who directs the chronobiology unit at the National Institute of Mental Health, lives in near-darkness at night to protect his rhythm.

5. Falling back asleep
When he wakes at night, Huberman uses as little light as possible. If sleep does not return, he plays the Reveri app's fall-back-asleep hypnosis and says it works '99 times out of 100.'

OTHER RELEVANT

1. Use mouth tape to treat or prevent mouth breathing
Mouth breathing, snoring and sleep apnea are serious health concerns. Huberman suggests medical tape over the mouth at night. Doing low-intensity cardio while breathing only through the nose can gradually widen the nasal airways.

2. Small adjustments for deeper, uninterrupted sleep
Eye masks and earplugs help. Raising the foot of the bed 3–5 degrees may aid lymphatic drainage, but people with acid reflux should raise the head end instead.

3. Shift workers: hold a rotation for about 2 weeks
Rotating between nights and days every few days is very hard on brain and body, so stay on one shift as long as possible. If you have to be up in the middle of the night, for example to feed a baby or study before dawn, dim red light lets you see without disrupting the healthy cortisol rhythm, though it is less practical for full-time night shifts.

4. Do the basics before buying supplements
Morning and afternoon light, caffeine timing, cool and dark evenings, and no alcohol come first. Supplements are for nights the basics are not enough, and many people will not need them.

Using Light (Sunlight, Blue Light & Red Light) to Optimize Health

Date: 2022-04-18 · Duration: 2:23:43
URL: https://www.youtube.com/watch?v=UF0nqolsNZc

KEYPOINTS

1. Light shapes the body through two routes: eyes and skin
Huberman explains that wavelength determines what light does. Short wavelengths such as UVB and blue strongly drive melanopsin-containing retinal ganglion cells. Long wavelengths such as red and near-infrared penetrate deeper into skin and reach cellular structures like mitochondria. Nature rarely relies on a single mechanism, so many effects of light, including on hormones, pain and mood, run through both the eyes and the skin.

2. Melatonin translates day length into a body-wide signal
Light hitting the eyes signals the pineal gland, deep in the brain, to stop releasing melatonin. Long summer days therefore mean a shorter nightly melatonin signal, and winter a longer one. Endogenous melatonin has regulatory effects: it promotes bone-building osteoblasts, suppresses gonad maturation (one reason high childhood levels delay puberty), affects placental development, and regulates sleepiness. It also has protective effects as an antioxidant and immune activator. Huberman stresses that the benefit comes from its daily and seasonal rise and fall, not from simply having more.

3. Protect your nighttime melatonin
Bright overhead light in the middle of the night drives melatonin to near zero almost immediately. If you get up, use the minimum light needed to move safely, ideally dim amber or red light, which barely affects the melanopsin cells unless very bright. Shift workers should keep their sleep period dark too. Huberman is cautious about melatonin supplements, saying most doses are supraphysiological and flatten the natural seasonal rhythm. Anyone pregnant should talk to their doctor before taking it.

4. Sun on the skin raised sex hormones in a 2021 study
Huberman reviews a 2021 Cell Reports paper, "Skin exposure to UVB light induces a skin-brain-gonad axis and sexual behavior." In mice, UVB raised testosterone and estrogen, increased mating and gonad size, and improved follicle maturation. In humans, after a few days of covering up to set a baseline, UVB exposure raised estradiol, progesterone and testosterone in both sexes and increased romantic passion, sometimes after just one or two sessions. Measured across a year, testosterone was lowest in winter and highest from June to September. Testosterone rose more in men from countries with low UV exposure, which parallels darker skin needing more sun for vitamin D3.

5. Bright light reduces pain through the eyes and skin
UVB on the skin increases beta-endorphin release. A recent Neuron paper found that light captured by melanopsin cells in the eye signals the ventral lateral geniculate and intergeniculate leaflet, which drive the periaqueductal gray to release endogenous opioids. This helps explain why people tolerate physical and emotional pain better on long, bright days.

6. UVB to the eyes primes immune defenses
Sufficient UVB to the eyes activates a sympathetic nervous system pathway that makes the spleen deploy immune cells and molecules. Huberman argues that fewer summer colds reflect better defenses as well as warmer weather. Wound healing is faster with more UVB, and a PNAS study showed that light on melanopsin cells helps drive stem-cell turnover in skin, hair and nails, which grow faster on longer days.

7. The right light at the wrong time worsens mood
Citing Samer Hattar of the National Institute of Mental Health, Huberman recommends getting as much light in your eyes and on your skin early and throughout the day as is safely possible. But a melanopsin pathway to the perihabenular nucleus bypasses the body clock, and activating it at night reduces dopamine and can promote low mood. He advises avoiding artificial bright or UV-rich light from roughly 10 p.m. to 4 a.m., and from 8 p.m. if you're prone to depression.

8. Even dim light during sleep affects the heart and metabolism
In a study he describes, healthy adults slept a full night in either under 3 lux or about 100 lux of overhead light. Melatonin was unaffected in both groups. But the 100-lux sleepers had higher nighttime heart rate, lower heart rate variability and greater insulin resistance the next morning. He suggests a free light-meter phone app to gauge your bedroom's brightness.

9. Red light reaches mitochondria
Red and near-infrared light can enter cells and boost mitochondrial ATP production while lowering reactive oxygen species, which build up with age. That's the mechanism behind evidence-backed low-level light therapy for acne, scarring, wound healing and pigmentation, which is usually applied to targeted patches of skin. Huberman notes there are few data on whole-body red light and that most infrared saunas don't get hot enough to produce sauna's established effects.

EXAMPLES

1. Glen Jeffery's red light vision studies
In two human studies from Glen Jeffery's lab at University College London, people aged about 28 to 72 viewed 670 nm red light, with 790 nm near-infrared also used, from about a foot away for 2 to 3 minutes each morning, over periods ranging from two to twelve weeks. Only those 40 and older improved, with about a 22% gain on the tritan test of short-wavelength cone function and reduced drusen (fatty deposits in the eye). Huberman says rods and cones are the body's most metabolically active cells.

2. The UVB protocol used in the hormone study
Subjects spent about 20 to 30 minutes outdoors around midday, two or three times a week, in short sleeves or shorts with no hat or sunglasses, going about normal activities, for 10 to 12 sessions over about a month. Huberman suggests the same pattern for chronic pain where it's safe.

3. Huberman's own light setup

He gets outside early and several times a day, keeps a roughly 930 to 1,000 lux LED drawing panel on his desk year-round, and looks at it more on overcast days. He says it's a much cheaper option than a typical SAD lamp.

4. 40 Hz flicker for the brain

Li-Huei Tsai's MIT group found that light flickering at 40 Hz entrains gamma oscillations across the brain, reducing amyloid plaques and phosphorylated tau and supporting synapses. These studies are now in clinical trials for Alzheimer's. Huberman considers home protocols premature and warns that flicker can trigger seizures in people prone to epilepsy.

OTHER RELEVANT

1. Make daytime exposure count

Cloudy daylight still delivers far more light than indoor sources. Glasses and contacts are fine, but windows and windshields filter UVB. Don't wear blue blockers outdoors or during the day. Never look at any light that is painful to view. People with retinitis pigmentosa, macular degeneration, glaucoma or a high skin cancer risk should consult their ophthalmologist or dermatologist first.

2. Using red light safely

For eyes, use a dim, non-flashing source at a distance that doesn't make you squint. Many commercial panels are too bright for close viewing and come with eye shields. Check with an eye doctor before starting. For late-night work, a study on shift workers found dim red light promoted alertness without suppressing melatonin or raising cortisol. The study compared it with 460 nm blue light and dim white light.

3. Systemic exposure beats spot treatment

Huberman argues light therapies that illuminate broad areas of skin, combined with appropriate light to the eyes, are likely more potent than a small local device. He warns never to shine high-intensity skin devices into the eyes.

Understand and Use Dreams to Learn and Forget

Date: 2021-02-01 · Duration: 1:17:49
URL: https://www.youtube.com/watch?v=FFwA0QFmpQ4

KEYPOINTS

1. Sleep runs in ~90-minute ultradian cycles whose makeup shifts across the night

Early cycles are dominated by shallow and slow-wave (non-REM) sleep with little REM; each later cycle contains progressively more REM. Huberman stresses this holds even if sleep is broken by a bathroom trip: the more total sleep you get, the more REM you accumulate toward morning. The two stages handle different kinds of learning, which is the backbone of the whole episode.

2. Slow-wave sleep has a distinct chemical signature: near-zero acetylcholine, some norepinephrine, lots of serotonin

Acetylcholine, normally the focus neuromodulator (from brainstem and nucleus basalis sources), plummets almost to zero, so the brain shows big sweeping waves rather than focused activity. A little norepinephrine remains, linked to movement circuitry, and serotonin is high. You are not paralyzed in this stage, which is why sleepwalking typically happens here.

3. Motor-skill learning and learning of fine details consolidate mainly in early-night slow-wave sleep

Studies that selectively deprived people of slow-wave sleep, by waking them when EEG showed it or by chemically biasing sleep away from it, found poor motor learning and poor performance on tests of detailed rules, such as spelling of difficult words. Because this stage is front-loaded, even a short night still captures much of it.

4. REM sleep removes serotonin and, crucially, epinephrine, while the body is paralyzed and the mind hallucinates

REM, discovered in the 1950s in a Chicago sleep lab, involves erratic eye movements driven by pons-thalamus-cortex waves, atonia (full paralysis) and vivid hallucinatory dreams. Norepinephrine/epinephrine, the chemical signature of fear and anxiety, is essentially absent, one of the few times in life it sits near zero. That lets you replay emotionally loaded events without the fear response.

5. REM acts as nightly self-therapy by uncoupling emotion from experience

Huberman frames REM as where emotional load is attached to the right experiences and stripped from the wrong ones. It also eliminates irrelevant 'meanings', the links between experiences. Too much connectivity resembles a child melting down because the ice cream shop is closed; adult emotional stability largely comes from pruning connections, and REM continues that work.

6. Losing REM makes people irritable and prone to catastrophizing

Selective REM-deprivation studies show emotionality gets 'unhinged': small things feel big and the future looks daunting. Huberman's own pattern is to fall asleep at 10:30–11 pm, wake at 3–4 am, then use non-sleep deep rest (NSDR) to fall back asleep until about 7 am to capture REM. On mornings he can't go back to sleep, he notices the irritability.

7. Strong nightmares likely occur in slow-wave sleep, not REM

Since epinephrine is absent in REM, intense fear there is unlikely, so frightening being-chased dreams probably arise in slow-wave sleep, though he allows for exceptions. Waking in a panic is better explained as REM content spilling into waking just as adrenaline becomes available again. He flags this research as not fully settled.

8. REM atonia can intrude into waking life as sleep paralysis

Some people wake fully conscious but unable to move, sometimes while hallucinating; it usually breaks within seconds but can feel far longer because dreams distort time. Huberman notes a theory that many 'alien abduction' reports (paralysis, faces, floating) map closely onto this sleep-into-waking intrusion.

9. EMDR and ketamine therapy share core features with REM

EMDR (lateral eye movements while recounting trauma) suppresses the amygdala. Ketamine, a dissociative anesthetic related to PCP, blocks the NMDA receptor, which gates long-term potentiation after intense experiences, so emotion cannot be wired onto the memory. REM achieves something similar chemically by withholding epinephrine. All three reduce the emotional charge of a memory rather than erasing it.

10. Sleep consistency may matter as much as, or more than, total sleep for learning

A study by Harvard undergraduate Emily Hoagland in Robert Stickgold's lab found exam-style learning tracked night-to-night regularity more than total duration: 6, 6, 5, 6 hours beat 6, 10, 7, 4. As Huberman recalls it, each hour of variation was tied to roughly a 17% performance drop. He finds this a relief, since a steady 6–6.5 hours may beat chasing 8–9 erratically.

EXAMPLES

1. Francine Shapiro's walk behind Stanford

The Palo Alto psychologist noticed a troubling memory felt less intense while walking, then brought only the side-to-side eye movements into the clinic: 30–60 seconds of eye movements, then recounting the event. EMDR is one of the few behavioral trauma treatments approved by the American Psychological Association; it works best for single-event trauma like a car crash rather than an entire childhood or divorce, and should be done with a certified clinician.

2. Why lateral eye movements work

Huberman initially thought EMDR was 'crazy'. He rejects the explanations that it mimics REM eye movements or synchronizes brain hemispheres. Instead, at least five high-quality papers in roughly five years, in journals like Neuron and Nature, show horizontal (not vertical) eye movements suppress the amygdala. Those are the eye movements generated naturally when you walk, run or cycle forward.

3. The chicken soup and explosion thought experiment

If an explosion went off while he ate soup at his kitchen table, NMDA-gated plasticity would couple the table and soup to fear, raising heart rate and sweating at every later meal. Some emergency rooms stock ketamine to infuse soon after trauma so the emotion still occurs but isn't wired in. He flags the ethics and warns recreational ketamine is dangerous and can be lethal.

4. Matt Wilson's spatial replay findings

Work initiated at MIT showed neurons that fired while rodents navigated a space replay the same firing pattern during REM; similar replay appears in non-human primates and humans. Huberman links it to solidifying important new places, like a city, a building or social interactions, over the following days.

5. Sarah McKay on menopause

His colleague in Australia, who studies menopause and the brain, says many emotional effects of menopause aren't directly hormonal. Temperature-regulation changes disrupt sleep, which in turn impairs the circuits that regulate emotion.

OTHER RELEVANT

1. Don't panic before a performance after a short night

Slow-wave sleep and physical recovery are front-loaded, so if you have already trained the skill, waking after 3–4 hours before a competition shouldn't wreck performance. A full night remains better.

2. Levers that shift sleep architecture

Resistance exercise (not aerobic) increases the proportion of slow-wave sleep, apparently without disrupting other stages, though it need not be close to bedtime. Tryptophan or 5-HTP gave Huberman deep sleep and then an early wake-up; he says serotonin supplements can disrupt REM/slow-wave timing. A few studies suggest arginine may raise slow-wave sleep, but it has cardiac and other effects to check. Alcohol and THC speed sleep onset but disrupt depth and the normal stage sequence.

3. Full bladder: avoid it, unless you want dream recall

A bladder-to-brainstem circuit wakes you; drinking lots of fluid fractures REM, which disrupts sleep but increases dream recall in lab studies. He doesn't recommend it, and also advises against going to bed dehydrated.

4. Tools for lucid dreaming and dream journaling

About 20% of people lucid dream, and some who do it nightly find sleep less restorative. To induce it, look at a cue (e.g., a drawn red apple) before sleep for several days. To reduce it, wake at the end of a 90-minute cycle (6 or 7.5 hours rather than 7). For journaling, note sleep and wake times and any recall; dreams centered on others' intentions (theory of mind) are more likely REM dreams.