When Brains Dream:
What Your Dreams Say about your Health

Dr. Christine Schaffner

DR. CHRISTINE
SCHAFFNER

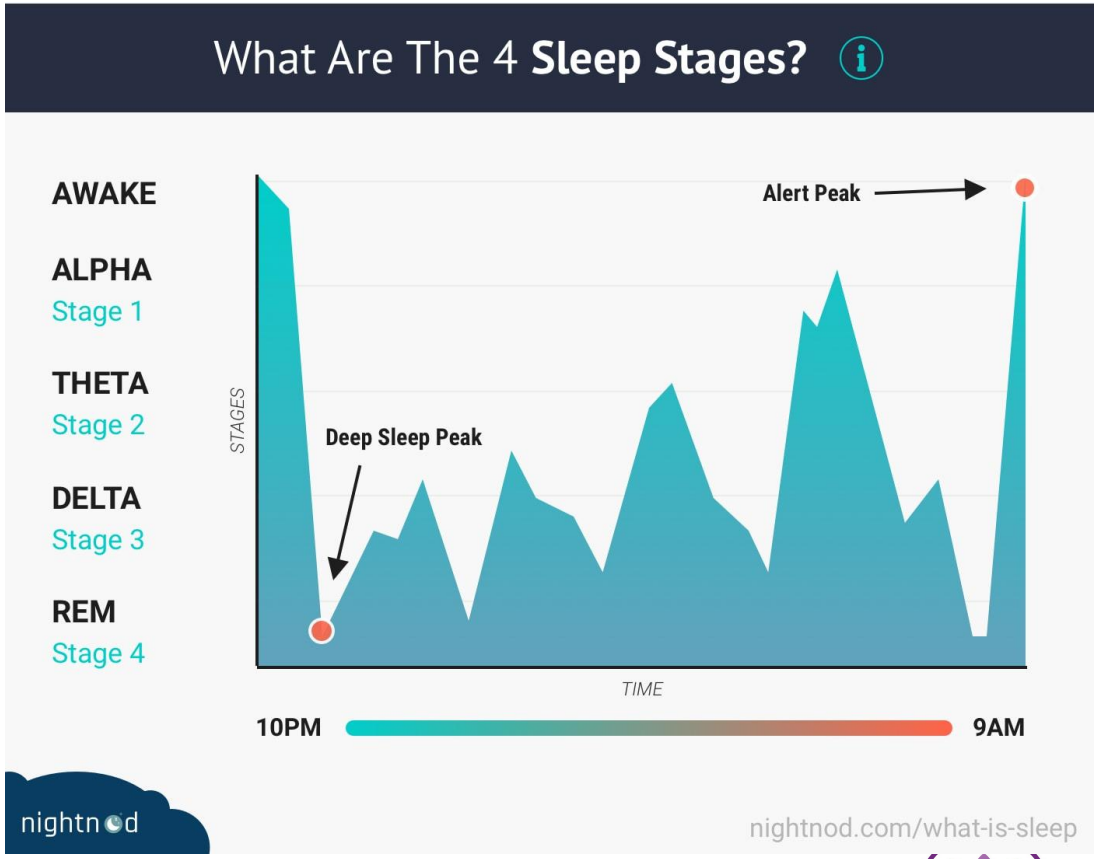
Overview

- Phases of Sleep
- When Do we Dream
- REM sleep
- Factors that affect REM
- Why We Dream
- Trauma and Dreams
- Somnium and REM

DR. CHRISTINE
SCHAFFNER

Phases of Sleep

- Non-Rapid Eye Movement (NREM)
  - N1-Light sleep
  - N2-The brain begins to produce bursts of rapid, rhythmic brain wave activity known as sleep spindles
  - N3-Deep or Delta Wave Sleep
- Rapid Eye Movement (REM)
  - During an 8-hour sleep period, the brain goes in and out of REM 4-5 times
  - Every 90 to 120 minutes, REM sleep and dreaming occur. These periods may last 5 to 30 minutes and typically become longer towards morning so that most REM sleep is experienced in the last one-third of the night
- It is important to realize that sleep does not progress through these stages in sequence.
  - Sleep begins in stage 1 and progresses into stages 2, and 3. After stage 3 sleep, stage 2 sleep is repeated before entering REM sleep.
  - Once REM sleep is over, the body usually returns to stage 2 sleep. Sleep cycles through these stages approximately four or five times throughout the night



https://nightnod.com/

DR. CHRISTINE SCHAFFNER

When Do We Dream?

- 2/3 of sleep includes dreaming, yet the average person recalls only 4-6 dreams a month
- Dreaming can happen at any stage of sleep
- Dreams are more prolific and intense during REM
- Non-REM dreams tend to involve more coherent content that involves thoughts or memories grounded to a specific time and place
  - N1 dreams are a simple thought or picture, very short
  - N2 dream content is recent and episodic, ex what you ate for dinner
- REM dreams tend to be more vivid, fantastical, and/or bizarre even though they may involve elements of waking life

https://www.sleepfoundation.org/dreams

DR. CHRISTINE SCHAFFNER

REM Sleep

- REM-Rapid Eye Movement, the stage of sleep when most dreaming occurs
- Occurs every 90 minutes during sleep, the length of REM increases each cycle, up to 30 minutes
- Muscles are paralyzed, heart rate and blood pressure increases, breathing becomes faster and more irregular
  - “When the mind leaves the body the body goes wild, the body needs a break from the mind” Naiman
- The EEG of brain during REM looks just like the brain is awake. However, there is no muscle tone or ability to control muscles. REM is triggered in the brainstem.
- REM sleep is associated with a brain-wide increase in cerebral blood volume, increasing cerebrospinal fluid (CFS) influx and glymphatic system activity

DR. CHRISTINE SCHAFFNER

Benefits of REM

- REM is vital for learning, memory, mood
- Also essential for emotional recalibration, creativity, and problem solving
- The formation of associative networks and the integration of unassociated information for creative problem solving

DR. CHRISTINE SCHAFFNER

REM Deprivation

- Physically, REM sleep loss is associated with:
  - Increased inflammatory responses
  - Increased risk for obesity (rise in Leptin)
  - Memory and cognitive impairment
  - Patients with sleep apnea, which may be associated with a complete loss of REM sleep, are at increased risk for cardiovascular disease, diabetes, obesity, and depression.
  - Unresolved trauma
- Loss of REM may lead to diminished efficacy of all the neurological and psychological processes that are based on REM sleep (learning, memory, creativity, brain detoxification etc.)

DR. CHRISTINE SCHAFFNER

Causes of Reduction in REM

- The following substances are known to suppress REM sleep:
  - Caffeine
  - Alcohol
  - Marijuana
  - Opioid (narcotic) pain medications
  - Benzodiazepine medications
  - Antidepressant medications
  - Lithium
- Reduction of REM activity may also occur with insufficient amount of sleep, chronic illnesses, exposure to EMF
- Consequence of social and occupational demands, insufficient sleep syndrome is defined as a "voluntary chronic pattern of shortened sleep"

DR. CHRISTINE SCHAFFNER

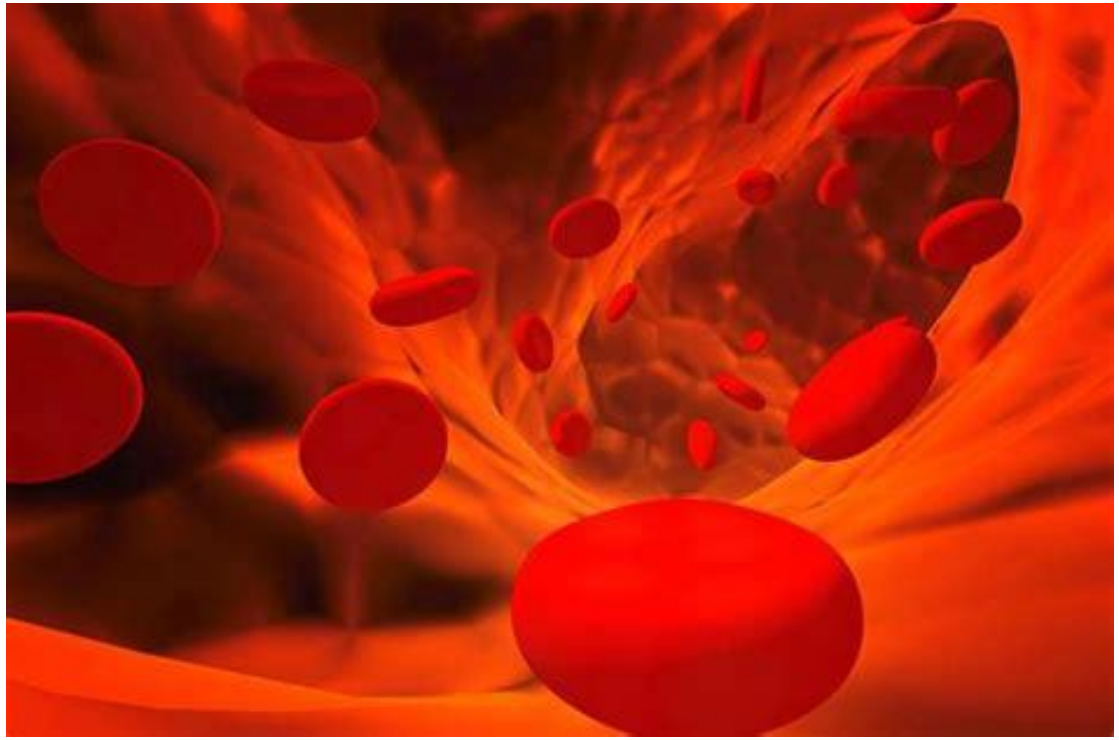
Mold/Mycotoxins and Dreams

- Clinically patients with mold exposure/mycotoxins often have insomnia as well as nightmares
- Mycotoxins can affect the neurological system via multiple mechanisms, including the production of pro-inflammatory cytokines, **the suppression of GABA-producing neurons**, cytotoxicity, and/or inhibiting cell division

DR. CHRISTINE SCHAFFNER

Pyroluria and Dreams

- Pyroluria-individuals cannot clear kryptopyrroles (by-product metabolites of hemoglobin) and bind to zinc, biotin, B6 causing deficiency
- Nutritional deficiency can lead to GABA deficiency (among many other things)
- Poor dream recall is a common symptom of Pyroluria
- DHA Labs- https://www.dhalab.com/



DR. CHRISTINE SCHAFFNER

Infections and Sleep

- This review discusses the evidence on the ***bidirectional effects of the immune response against viral, bacterial, and parasitic infections on sleep patterns and how the lack of sleep affects the immune response against such agents***.

The Bidirectional Relationship between Sleep and Immunity against Infections

Elizabeth G. Ibarra-Coronado,[1] Ana Ma. Pantaleón-Martínez,[1] Javier Velazquéz-Moctezuma,[2] Oscar Prospéro-García,[3] Mónica Méndez-Díaz,[3] Mayra Pérez-Tapia,[4,5] Lenin Pavón,[6] and Jorge Morales-Montor[1]

[1]*Departamento de Inmunología, Instituto de Investigaciones Biomédicas, Universidad Nacional Autónoma de México, AP 70228, 04510 México, DF, Mexico*
[2]*Area de Neurociencias, Departmento de Biología de la Reproduccion, CBS, Universidad Autonoma Metropolitana-Iztapalapa, Avenida San Rafael Atlixco No. 186, Col Vicentina, Iztapalapa, 09340 Mexico City, DF, Mexico*
[3]*Grupo de Neurociencias, Laboratorio de Canabinoides, Departamento de Fisiología, Facultad de Medicina, Universidad Nacional Autónoma de México, México, DF, Mexico*
[4]*Departamento de Inmunología, Escuela Nacional de Ciencias Biológicas, IPN Prolongación de Carpio y Plan de Ayala s/n, Col. Sto. Tomás, 11340 México, DF, Mexico*
[5]*Unidad de Desarrollo e Investigación en Bioprocesos (UDIBI), Escuela Nacional de Ciencias Biológicas, IPN Prolongación de Carpio y Plan de Ayala s/n, Col. Sto. Tomás, 11340 México, DF, Mexico*
[6]*Laboratorio de Psicoinmunología, Dirección de Investigaciones en Neurociencias, Instituto Nacional de Psiquiatría Ramón de la Fuente, 14370 México, DF, Mexico*

Correspondence should be addressed to Jorge Morales-Montor; jmontor66@biomedicas.unam.mx

Received 3 October 2014; Accepted 24 December 2014

Academic Editor: Muhammad Atif Zahoor

Sleep is considered an important modulator of the immune response. Thus, a lack of sleep can weaken immunity, increasing organism susceptibility to infection. For instance, shorter sleep durations are associated with a rise in suffering from the common cold. The function of sleep in altering immune responses must be determined to understand how sleep deprivation increases the susceptibility to viral, bacterial, and parasitic infections. There are several explanations for greater susceptibility to infections after reduced sleep, such as impaired mitogenic proliferation of lymphocytes, decreased HLA-DR expression, the upregulation of CD14+, and variations in CD4+ and CD8+ T lymphocytes, which have been observed during partial sleep deprivation. Also, steroid hormones, in addition to regulating sexual behavior, influence sleep. Thus, we hypothesize that sleep and the immune-endocrine system have a bidirectional relationship in governing various physiological processes, including immunity to infections. This review discusses the evidence on the bidirectional effects of the immune response against viral, bacterial, and parasitic infections on sleep patterns and how the lack of sleep affects the immune response against such agents. Because sleep is essential in the maintenance of homeostasis, these situations must be adapted to elicit changes in sleep patterns and other physiological parameters during the immune response to infections to which the organism is continuously exposed.

DR. CHRISTINE SCHAFFNER

EMF affects REM

- This study concluded that exposure to electromagnetic radiation in awake animals can alter their subsequent sleep structure
- REM sleep was more sensitive to radio frequency radiation than slow wave sleep

ORIGINAL ARTICLE

Non-thermal continuous and modulated electromagnetic radiation fields effects on sleep EEG of rats ☆,

Haitham S. Mohammed [a], Heba M. Fahmy [a], Nasr M. Radwan [b], Anwar A. Elsayed [a]

Show more

+ Add to Mendeley Share Cite

https://doi.org/10.1016/j.jare.2012.05.005

Abstract

In the present study, the alteration in the sleep EEG in rats due to chronic exposure to low-level non-thermal electromagnetic radiation was investigated. Two types of radiation fields were used; 900 MHz *unmodulated* wave and 900 MHz *modulated* at 8 and 16 Hz waves. Animals has exposed to radiation fields for 1 month (1 h/day). EEG power spectral analyses of exposed and control animals during slow wave sleep (SWS) and rapid eye movement sleep (REM sleep) revealed that the REM sleep is more susceptible to modulated radiofrequency radiation fields (RFR) than the SWS. The latency of REM sleep increased due to radiation exposure indicating a change in the ultradian rhythm of normal sleep cycles. The cumulative and irreversible effect of radiation exposure was proposed and the interaction of the extremely low frequency radiation with the similar EEG frequencies was suggested.

DR. CHRISTINE SCHAFFNER

Immune Activation can Affect Sleep

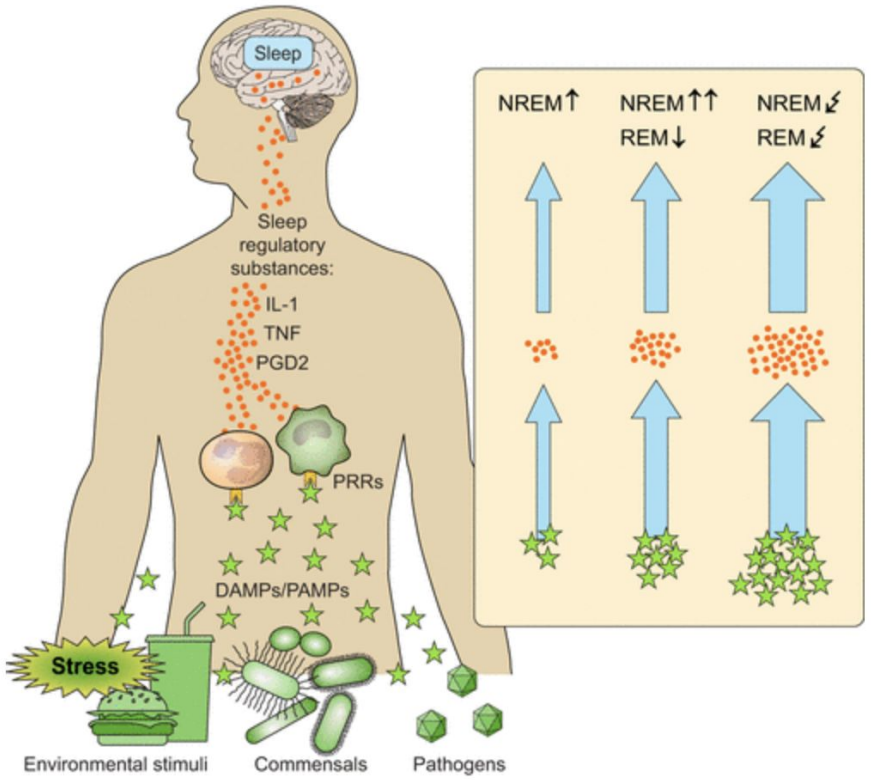


FIGURE 4.

Conceptual model of sleep changes in response to immune activation and underlying mechanisms. Environmental stimuli (e.g., food intake, stress), commensal bacteria, and infectious pathogens (here illustrated as viruses) are recognized by the immune system as damage- and pathogen-associated molecular patterns (DAMPs and PAMPs, green stars), which activate pattern recognition receptors (PRRs, orange polygon) on innate leukocytes. This PRR activation induces an inflammatory response with the production of sleep regulatory substances, such as interleukin (IL)-1 and tumor necrosis factor (TNF) (both represented by orange dots), which reach the brain and promote non-rapid-eye-movement (NREM) sleep (left arrow). In higher doses (e.g., during an infection; middle arrow), these sleep regulatory substances may also suppress rapid-eye-movement (REM) sleep. Prostaglandin (PG) D_2 is shown as a potential further mediator of sleep changes in response to immune activation. These sleep responses to immune activation are assumed to be adaptive. Subtle immune activation may be involved in homeostatic NREM sleep regulation that in turn could serve to restore immune homeostasis. More pronounced immune activation during an infection can induce a sleep response that in turn may support host defense and immunological memory formation. However, an extreme immune activation (e.g., during severe infection; right arrow) seems to disrupt both NREM and REM sleep, often accompanied by sleep fragmentation, feelings of nonrestorative sleep, and daytime fatigue. Notably, most of our knowledge is based on animal research, and confirmation in humans is still needed.

https://journals.physiology.org/doi/full/10.1152/physrev.00010.2018

DR. CHRISTINE SCHAFFNER

Sleep and Immunity

- Sleep improves T cell function
- T cells help to fight intracellular infections (virus infected cells, cancer cells)
- Stress hormones (adrenaline noradrenaline, prostaglandins) inhibit integrins, and adhesion molecule
- These hormones are low during sleep and integrins are stronger
- Stickiness of integrins allows T cells to attach and kill infected cells

Brief Definitive Report | February 12 2019

$G\alpha_s$-coupled receptor signaling and sleep regulate integrin activation of human antigen-specific T cells

Stoyan Dimitrov , Tanja Lange , Cécile Gouttefangeas , Anja T.R. Jensen , Michael Szczepanski , Jannik Lehnnolz , Surjo Soekadar , Hans-Georg Rammensee , Jan Born , Luciana Besedovsky

+ Author and Article Information

Check for updates

J Exp Med (2019) 216 (3): 517–526. | https://doi.org/10.1084/jem.20181169 | **Article history**

Standard View | PDF | Share | Tools

Efficient T cell responses require the firm adhesion of T cells to their targets, e.g., virus-infected cells, which depends on T cell receptor (TCR)–mediated activation of β_2-integrins. $G\alpha_s$-coupled receptor agonists are known to have immunosuppressive effects, but their impact on TCR-mediated integrin activation is unknown. Using multimers of peptide major histocompatibility complex molecules (pMHC) and of ICAM-1—the ligand of β_2-integrins—we show that the $G\alpha_s$-coupled receptor agonists isoproterenol, epinephrine, norepinephrine, prostaglandin (PG) E_2, PGD_2, and adenosine strongly inhibit integrin activation on human CMV- and EBV-specific $CD8^+$ T cells in a dose-dependent manner. In contrast, sleep, a natural condition of low levels of $G\alpha_s$-coupled receptor agonists, up-regulates integrin activation compared with nocturnal wakefulness, a mechanism possibly underlying some of the immune-supportive effects of sleep. The findings are also relevant for several pathologies associated with increased levels of $G\alpha_s$-coupled receptor agonists (e.g., tumor growth, malaria, hypoxia, stress, and sleep disturbances).

DR. CHRISTINE SCHAFFNER

The Dreaming Brain

- During REM sleep:
  - Brain activity increases in large portions of the limbic system which mediates emotional expression
  - Activity decreases in dorsolateral prefrontal cortex which plays a role in executive functioning, logical reasoning, and impulse control
  - Motor cortex activation produces the sensation of movement within our dreams
  - The patterns of brain activity that represent images in our dreams are created by reactivating the patterns originally produced when we saw similar images in our waking life
- This activity can explain how we form images, movements, and emotions as well as the often bizarre nature of our dreams

Why We Dream

- “I think of dreaming as overnight therapy,” Walker says. “It provides a nocturnal soothing balm that takes the short edges off of our emotional experiences so we feel better the next day.” Matthew Walker, PhD
- Problem Solving
- Evolutionary Function
- Regulate Emotions
- Contribute to Memory
- Creativity

DR. CHRISTINE SCHAFFNER

NEXTUP-Stickgold and Zadra

- NEXTUP —Network Exploration to Understand Possibilities
- New model of dream function that explains why a human brain must dream to carry out critical components of its sleep-dependent memory evolution function
- Dreaming is a form of sleep-dependent memory processing that extracts new knowledge from existing memories through the discovery and strengthening of previously unexplored associations
- Dreaming allows the sleeping brain to enter an altered state of consciousness in which it can construct imagined narratives and respond emotionally to them

NEXTUP

- The dreaming brain cannot access and incorporate complete episodic memories (i.e., memories of actual events in our lives), so the associative exploration of dreams is limited to semantic and nondeclarative memories (i.e., memories related to general world knowledge and those acquired and used unconsciously, respectively). ***In other words, while imagining and planning during wakefulness is normally based on recalled events, narrative construction during dreaming is based on semantic associations of these events, giving dreams their metaphorical quality and allowing for a more expansive investigation of associative links***
- During REM-***serotonin and norepinephrine are shut off*** (similar to LSD induced states) and acetylcholine peaks in regions such as the hippocampus, these shifts bias memory networks toward the activation of normally weak associations, perhaps explaining the bizarreness of many dreams, especially during REM sleep.
- REM sleep is accompanied by a ***general activation of the limbic system***, presumably explaining the enhanced emotionality seen in REM dreams, while also biasing the brain toward creating emotional responses to imagined dream narratives
- Finally, unlike problem solving during wakefulness that relies on imagining and planning, dreaming stops short of offering definitive solutions to our current concerns. ***Instead, our dreams serve to explore the solution space, helping us to discover new possibilities. It is up to other processes, both in wakefulness and sleep, to draw conclusions and delineate our plans. Dreaming takes what has been and shows us what might be.***

Dream Deprivation

- Dr. Rubin Naiman, a sleep and dream expert at the Arizona Center for Integrative Medicine at the University of Arizona, believes that many of our modern ailments are due to dream deprivation rather than sleep deprivation and suggests that a "silent epidemic of REM sleep deprivation" is contributing to our growing health-care concerns.
  - *Dreams, he thinks, are the most potent antidepressant known to man.*
  - *"Dreaming is a second gut, It sifts through all of the experiences we consume during the day."*
- At the beginning of the night, deeper non-REM sleep is prioritized; only later in the night and into the morning does REM sleep increase in duration.
- It is in these later REM sleep hours that dreaming most vivid and elaborate
- Sleep deprivation often particularly intrudes on late REM/dreaming sleep
- https://www.psychologytoday.com/us/blog/dream-factory/201708/dream-deprived-modern-epidemic

DR. CHRISTINE SCHAFFNER

“Our devaluation of REM/dreaming underpins our denial of its loss ... We typically approach and investigate the dream from a biased, wake-centric perspective ... we presume that waking consciousness is the norm and view dreaming as a secondary, subservient state of consciousness ... [yet] REM/dreaming is a deconstructive force that challenges our consensual view of reality ... ***Dream eyes transcend waking egoic perspectives, opening us to greater social and spiritual consciousness and revealing a numinous world behind the world***.” Naiman

DR. CHRISTINE SCHAFFNER

REM and Noradrenaline (Norepinephrine)

- The part of the brain that secretes norepinephrine during wakefulness and non-REM sleep takes a break during REM sleep.
  - “Norepinephrine is associated with stress, and it affects the degree to which the amygdala — the fear center of the brain — is sensitive to stimuli,” says Itamar Lerner, co-author of the new paper and a postdoctoral sleep researcher at Rutgers University.
- One theory, known as the REM calibration hypothesis, holds that norepinephrine builds up during the day and can be reset to normal levels during REM sleep.
  - “When that happens, we believe that the amygdala may become less sensitive to stimuli, and less likely to overreact to something that really shouldn’t be fearful,” says Lerner.
- **“Concentrations of a key stress-related chemical called noradrenaline are completely shut off within your brain when you enter this dreaming sleep. In fact, REM sleep is the only time during the 24-hour period when your brain is completely devoid of this anxiety-triggering molecule” Dr. Matthew Walker, Why We Sleep**

Trauma and Dreams

- REM sleep-brain is devoid of norepinephrine
  - MRIs have shown key emotional and memory related structure of the brain are all reactivated during REM
    - Amygdala
    - Emotion related regions of the cortex
    - Hippocampus
- Dreaming state of REM allows us to heal emotional wounds
  - Reduction in reactivity of amygdala
  - Rearrangement of rational prefrontal cortex that helps lessen emotional reactions
- Cartwright per Walker:
  - REM sleep with specific dreaming about emotional themes and sentiments of the waking trauma
  - Content specific dreaming was able to accomplish clinical remission and emotional closure to move forward

PTSD and Dreams

- REM sleep is disrupted in patients suffering from PTSD
- PTSD-brain has not detoxed the emotion from the trauma memory
- PTSD patients have higher levels of noradrenaline not allowing the the brain to enter REM, nightmares are more common in PTSD
- Lowering noradrenaline allows brain to enter REM sleep resulting in reduction of nightmares and improved sleep
  - Dr. Murray Raskind, UW in Seattle, found in 2000, while working with Vets that the Prazosin (an alpha 1-adrenergic antagonist- which blocks noradrenaline) he prescribed for blood pressure resulted in fewer nightmares and improvement in sleep and daytime functions

DR. CHRISTINE SCHAFFNER

GABA puts the brakes on Noradrenaline

- GABA is Gamma-aminobutyric acid, a neurotransmitter and the cornerstone of the inhibitory (calming) system in the body; controlling the action of epinephrine, norepinephrine, and dopamine
- By inhibiting neural activity, GABA facilitates:
  - Sleep
  - Reduces mental and physical stress
  - Lowers anxiety
  - Creates a calmness of mood
- **One study showed that GABA levels are reduced by 30 percent in adults with chronic primary insomnia**
- Low GABA is associated with:
  - Insomnia and disrupted sleep patterns
  - Anxiety
  - Chronic stress
  - Depression.
  - Difficulty concentrating and memory problems
  - Muscle pain and headaches
  - Low GABA activity is also associated with substance use disorders
- GABA altering substances are often used for relaxation, pain relief, stress and anxiety reduction, lowering blood pressure, and improving sleep

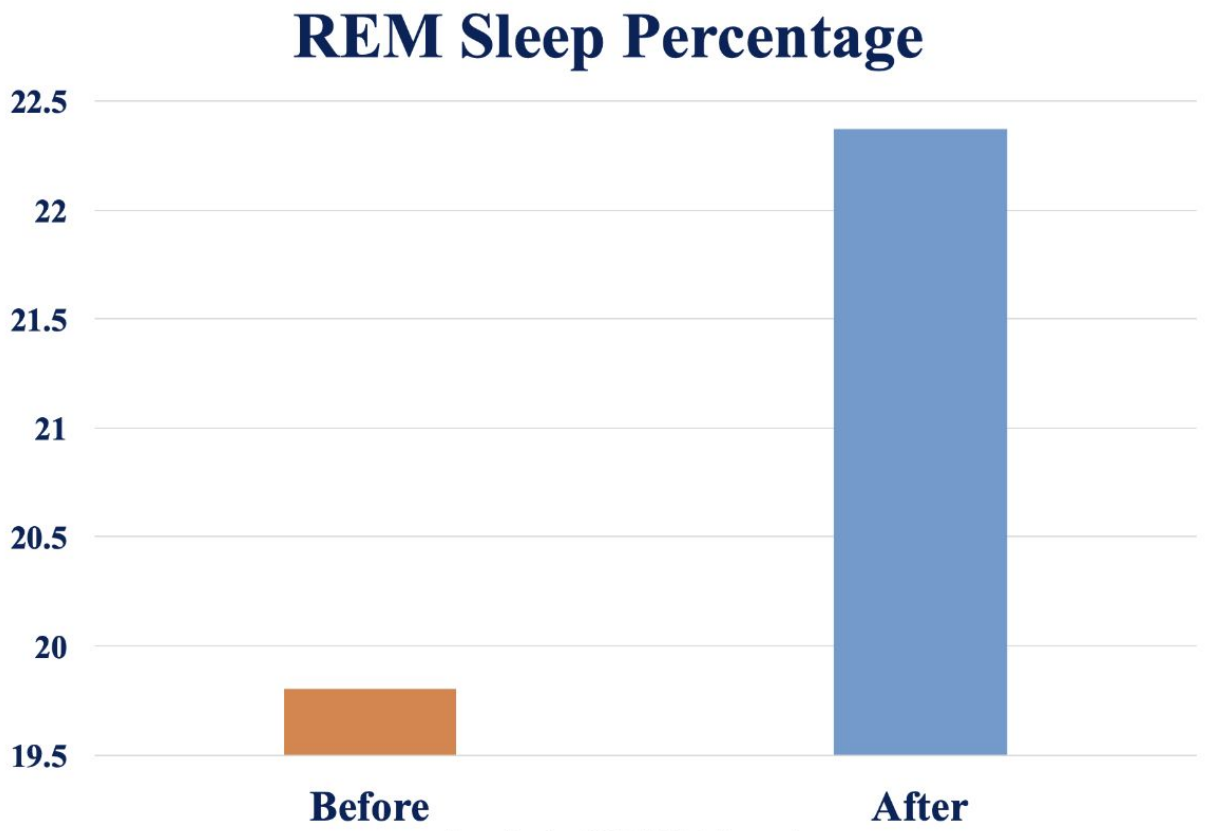
DR. CHRISTINE SCHAFFNER

The Importance of Delivery Method of GABA

- GABA is poorly absorbed - and its brain bioavailability is also poor - when administered orally
- We created a transdermal supramolecular complex of GABA in combination of chondroitin sulfate for optimal absorption
- Microbial (nonanimal- derived) chondroitin sulfate is a molecule that has inherent anti-inflammatory, immune-modulatory activities and allows GABA to cross blood-brain barrier

DR. CHRISTINE SCHAFFNER

REM Improvements with Somnium



DR. CHRISTINE SCHAFFNER

Benefits of Somnium

Sleep benefits:

- Helps you fall asleep
- Helps you stay asleep
- **Helps you to remove blocks to REM dream sleep**
- Helps with overall sleep quality

Brain benefits:

- Allows you to move into deep sleep for glymphatic system to be turned on
- Allows for high performance uptake of GABA significant role in hypothalamic-pituitary function
- Memory AND Motor-Skill/Human Performance enhancement
- **GABA signaling is essential for major brain functions such as learning, memory, creativity (through REM sleep), control of anxiety and mood, response to stress**

Trauma and Emotional Support:

- **Delivery method of GABA allows for noradrenaline to be lowered allowing for REM dream sleep which is required to process trauma**
- REM is required to process every day life
- Reduces risk for neuropsychiatric conditions
- Enhances meditation

DR. CHRISTINE SCHAFFNER

Somnium

- Apply to temples and behind the top of the ear before bedtime
- 3-month supply
- SLEEP20 for 20% off

https://ipothecarystore.com/products/somnium-nighttime-gaba-cream

DR. CHRISTINE SCHAFFNER

Bonuses

DR. CHRISTINE SCHAFFNER

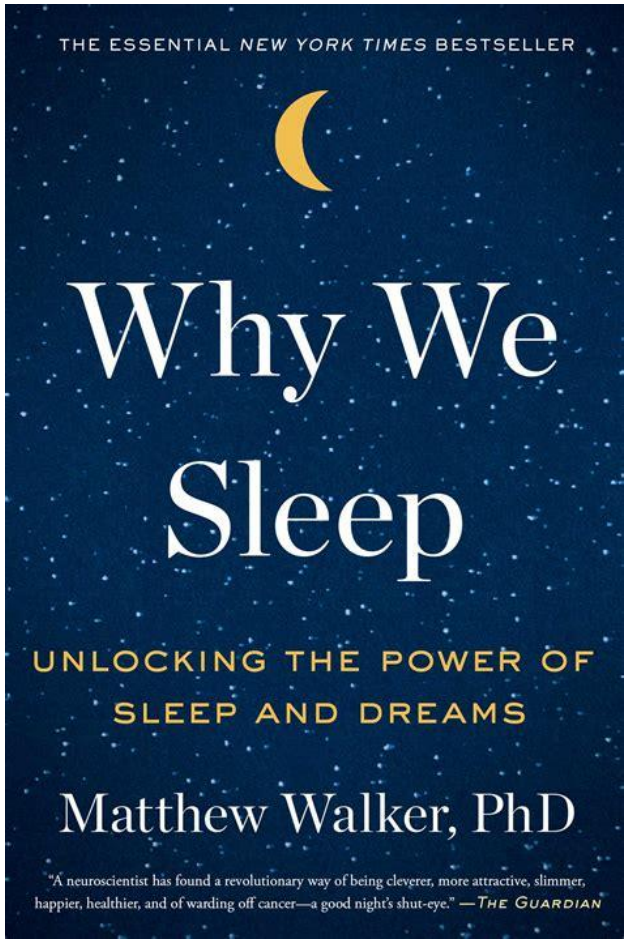
Dream Incubation Technique

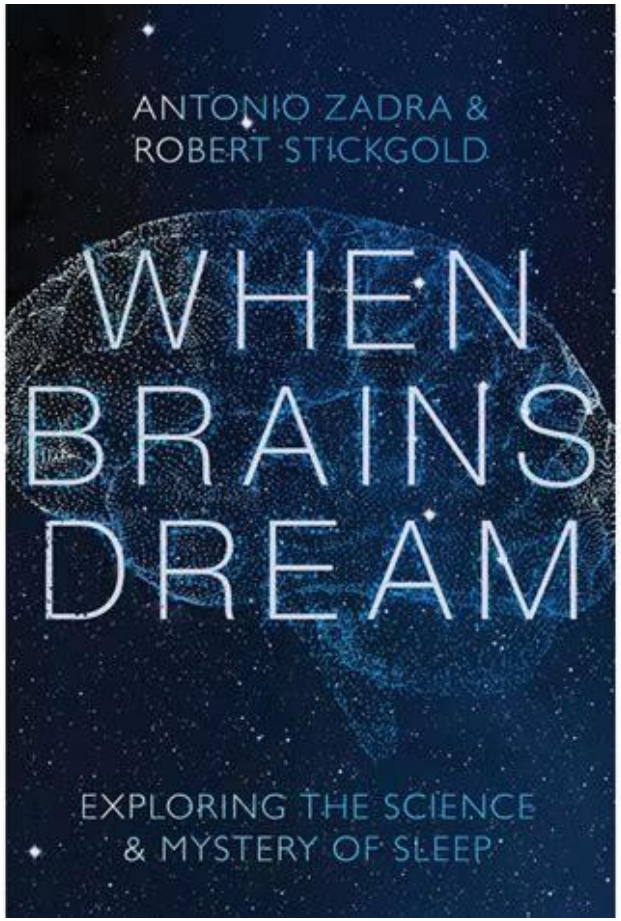
- Choose a night when you are not overly tired or under the influence os any substances that may negatively affect sleep, such as alcohol.
- Take a few minutes to think about the topic or problem you want to target in your dream. You may want to ask a question, like “How do I feel about this issue?”
- Summarize the problem in a short phrase, question or sentence. Find the version that feel right, then write down the incubation phrase and keep it by your bed.
- When ready to go to sleep, tell yourself that you will dream about the problem. Have a pen and paper (or recorder/ Smartphone) near the bed.
- Repeat the incubation phrase to yourself as you fall asleep. If the mind wanders, just bring the attention back to your phrase.
- Sleep!
- Upon awakening, either in the middle of the night or in the morning, lie quietly in bed with your eyes closed. Give yourself a few minutes to remember as much of the dream as possible. Then open your eyes and record everything you remembered, even if it is only a fragment.
- Examine how your recalled dreams may relate to your incubation phrase.
- As with most thing, practice helps. It might take several nights to get to a solution or a creative insight.

When Brains Dream by Antonio Zadra & Robert Stickgold

DR. CHRISTINE SCHAFFNER

Resources





DR. CHRISTINE SCHAFFNER