



Enhancing Vision and Brain Health: Understanding the Importance of Sleep

Presented by:

 **JOSEPH J. ALLEN, OD, FFAO, DIPL ABO**

Doctor Eye Health  

  The Doctor Eye Health Podcast



1

Disclosures

<p>6/6 - Independent contractor</p> <p>Alcon - Independent Contractor, Speaker</p> <p>Allergan - Advisory Board</p> <p>Amazon - Independent contractor</p> <p>ASPEX - Independent Contractor</p> <p>ASUS - Independent Contractor</p> <p>Avellino - Independent Contractor</p> <p>Axon Optics - Independent Contractor</p> <p>BMC - Advisory Board, Independent Contractor</p> <p>DryEyeRescue - Independent Contractor</p> <p>Engage Tech - Consultant, Stock Options</p> <p>EyeGo - Independent Contractor,</p> <p>EyeLove - Independent Contractor,</p> <p>FluoreSCENE Media - Independent Contractor</p> <p>GameAdvantage - Advisory Board, Independent Contractor</p> <p>Google - Royalties</p> <p>Glaukos - Independent Contractor</p> <p>MacuLogix - Independent Contractor</p> <p>MacuHealth - Independent Contractor</p>	<p>Meta - Royalties</p> <p>MYZE - Advisory Board, Independent Contractor, Shareholder</p> <p>Nanodropper - Independent Contractor, Shareholder</p> <p>OmegaQuant - Independent Contractor</p> <p>OmniActive - Consultant, Independent Contractor</p> <p>Performance Vision Technologies - Independent Contractor</p> <p>Randolph Engineering - Independent Contractor</p> <p>STAAR Surgical - Independent Contractor</p> <p>TCL - Independent Contractor</p> <p>Tarsus - Independent Contractor</p> <p>Tear Restore - Advisory Board, Independent Contractor, Previous Shareholder</p> <p>TheraTears - Independent Contractor</p> <p>ThinOptics - Independent Contractor</p> <p>Weave - Independent Contractor</p> <p>Zenni Optical - Independent Contractor</p>
---	--

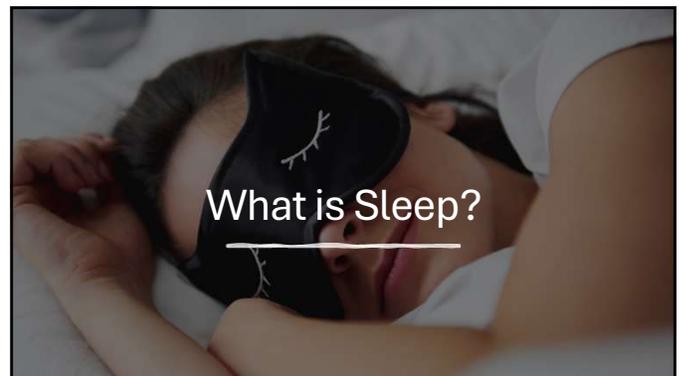
All Relevant Relationships Have Been Mitigated

2

Course Objectives

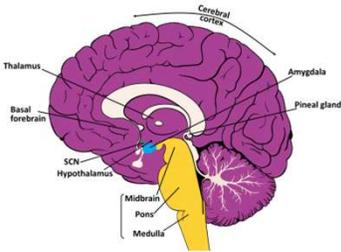
1. Understand the physiological connections between sleep, eye health, and brain function.
2. Identify common sleep disorders and their impact on ocular health and vision.
3. Discuss strategies to assess and educate patients on sleep hygiene for improved eye health outcomes.
4. Integrate knowledge of sleep science into optometric practice to enhance patient care and outcomes particularly in dry eye management

3



4

Brain Anatomy & Sleep



- **Hypothalamus** – Regulates sleep and wakefulness; SCN controls circadian rhythms based on light.
- **Brainstem** – Manages sleep-wake transitions; relaxes muscles during REM sleep.
- **Thalamus** – Blocks sensory input during sleep; active in REM to create dreams.
- **Pineal Gland** – Produces melatonin to regulate sleep cycles.
- **Basal Forebrain** – Promotes sleep; releases adenosine, which caffeine blocks.
- **Amygdala** – Processes emotions; highly active in REM sleep.

Image from: <https://www.ninds.nih.gov/health-information/public-education/brain-basics/brain-basics-understanding-sleep>

5

How do I know if I'm not getting enough sleep?

You might be sleep deficient if you often feel like you could doze off while:

- Sitting and reading or watching TV
- Sitting still in a public place, such as a movie theater, meeting, or classroom
- Riding in a car for an hour without stopping
- Sitting and talking to someone
- Sitting quietly after lunch
- Sitting in traffic for a few minutes



6

Symptoms of Sleep Dysfunction in Peds



-  **Overly Active**
-  **Attention Problems**
-  **Misbehavior**
-  **Mood disorders – Angry and impulsive, have mood swings, feel sad or depressed**
-  **Lack Motivation**

7

Stages of Sleep

Stage 1 (Non-REM) – Light sleep; heart rate, breathing, and brain waves slow; muscles relax with occasional twitches.

Stage 2 (Non-REM) – Light sleep before deep sleep; body temperature drops, eye movements stop, and brief bursts of brain activity occur.

Stage 3 (Non-REM) – Deep sleep; slowest heart rate, breathing, and delta brain waves; difficult to wake up.

Stage 4 Rapid Eye Movement (REM Sleep)

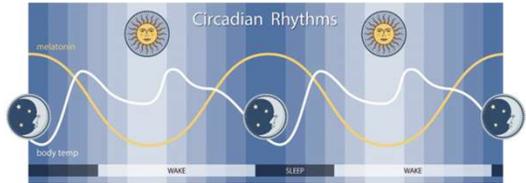


Image from: <https://www.ninds.nih.gov/health-information/public-education/brain-basics/brain-basics-understanding-sleep>

8

Rapid Eye Movement (REM)

REM Sleep Overview

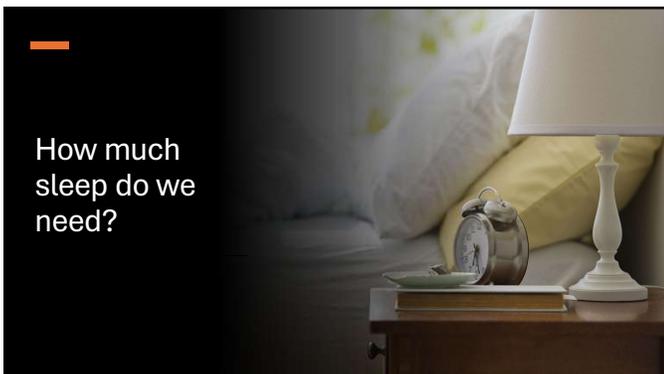
- Begins ~90 minutes after falling asleep.
- Rapid eye movement occurs behind closed lids.
- Brain waves resemble wakefulness.
- Breathing becomes fast and irregular; heart rate and blood pressure rise.
- Most dreaming happens in REM sleep.
- Temporary muscle paralysis prevents acting out dreams.
- REM sleep decreases with age.
- Memory consolidation involves both REM and non-REM sleep.



9

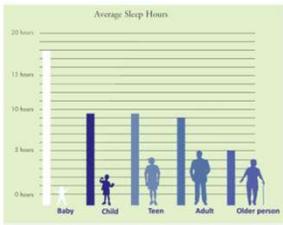


10



11

Sleep Needs per CDC



Age Group	Recommended Hours of Sleep Per Day
Babies & Infants	16-18 hours
6-12	9-12 hours
13-18	8-10 hours
18+	7-9 hours

Sleep needs change with age as shown on the chart above. Initially, babies sleep 16-18 hours a day. School-age children and teens need about 9.5 hours of sleep each night. Most adults require 7-9 hours of sleep at night.

12

Slide Contributed by Jacqueline Theis, OD, FAAO, FNAP

Retino-Pretectal-Parasympathetic – Trigeminovascular Pathway

- ipRGCs project directly to the olivary pretectal nucleus → superior salivatory nucleus → parasympathetic ocular vasodilation → Trigeminal stimulation

Alibali A, Dilli E. Photophobia: When light hurts, a review. *Curr Neurol Neurosci Rep.* 2018;18:62
Okamoto K, Thompson R, Tashiro A, Chang Z, Berreiter DA. Bright light produces Fos-positive neurons in caudal trigeminal brainstem. *Neuroscience.* 2009;160(4):858–64.

19

Slide Contributed by Jacqueline Theis, OD, FAAO, FNAP

Retino-Hypothalamic-Parasympathetic – Trigeminovascular Pathway

- ipRGCs project directly to the hypothalamus → superior salivatory nucleus → parasympathetic ocular vasodilation → Trigeminal stimulation

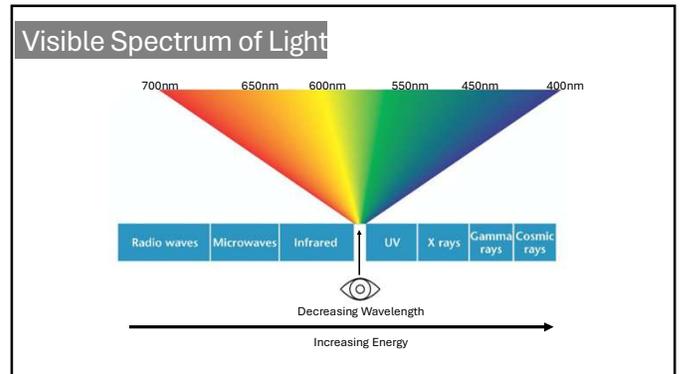
Alibali A, Dilli E. Photophobia: When light hurts, a review. *Curr Neurol Neurosci Rep.* 2018;18:62
Okamoto K, Thompson R, Tashiro A, Chang Z, Berreiter DA. Bright light produces Fos-positive neurons in caudal trigeminal brainstem. *Neuroscience.* 2009;160(4):858–64.

20

The Evolution of the Lighting Industry

- Fire ~ 500,000 years ago
- Wax candle ~700 BC
- Incandescent light sources ~1801
 - Generates light through heat
 - Similar to spectrum from the sun
 - High energy consumption
 - Emits energy towards high-wavelength
- Fluorescent light sources ~1940
 - Generates light through excitation of individual atoms
- Lower energy consumption
 - Compact fluorescent lamps (CFLs)
 - Light emitting diodes (LEDs)

21



22

Slide Contributed by Jacqueline Theis, OD, FAAO, FNAP

Transmission Characteristics of the Eye

Dillon J. The photophysics and photobiology of the eye. *J Photochem Photobiol B.* 1991;10(102):23–40.

23

Slide Contributed by Jacqueline Theis, OD, FAAO, FNAP

Ocular Health and Retinal exposure to light

- Some wavelengths are more effective at causing harm than others
 - Blue light is phototoxic to the retina
- International Commission on Non-ionising Radiation Protection (ICNIRP)
 - Blue light hazard exposure limit
 - Guidelines represent levels below which adverse health effects are unlikely
- Compared CFL, LEDs computer screens, tablet computers, laptops and smartphones to assess worst case exposure conditions for someone staring at a screen for extended periods of time → no cause for concern for public health
- Percentage of transmission of blue light from corneal surface to retina is age-related
 - Transmission is higher for children than adults

O'Hagan JB, Khazova M, Price LLA. Low-energy light bulbs, computers, tablets and the blue light hazard. *Eye.* 2016;30:230-233
International Commission on Illumination (CIE). A Computerized Approach to Transmission and Absorption Characteristics of the Human Eye. CIE 203:2012 incl. Erratum 1: Vienna, Austria, 2012

24

Slide Contributed by Jacqueline Theis, OD, FAAO, FNAF

Circadian Rhythm

- Suprachiasmatic nuclei (SCN) of the hypothalamus = circadian pacemaker
 - Humans adjust the physiology (gene expression, body temperature, heart rate, melatonin production) by anticipating daily environmental changes.
- Input pathway
 - Light-dark cycle – necessary and sufficient condition for circadian synchronization
 - Intrinsically photosensitive retinal ganglion cells (ipRGCs) contain melanopsin, which is directly excited by blue light ... and rod/cone inputs
 - Retinohypothalamic tract → SCN
 - Feeding cycles
 - Scheduled exercise
 - Social activities
- Output pathways
 - Rhythmic change in parasympathetic/sympathetic balance
 - Pineal release of melatonin during darkness

25

Slide Contributed by Jacqueline Theis, OD, FAAO, FNAF

Blue Light and Circadian Rhythm/Alertness



- Light suppresses melatonin in humans – strongest response from short-wavelength light 446-477nm
- Blue monochromatic light shown to be more effective than longer-wavelength light for enhancing alertness

West KE, Jablonski MR, Warfield B. Blue light from light-emitting diodes elicits a dose-dependent suppression of melatonin in humans. *J Appl Physiol*. 110:619-626. 2011

26

What about blue-light filters?



27

Slide Contributed by Jacqueline Theis, OD, FAAO, FNAF

Blue Light Blockers



- “Blue-Blockers” or “Blue-Attenuating” filters are not well-defined or standardized (cut off filter vs notch filter)
- Important properties of a filter
 - Luminous transmittance (%)
 - Melanopsin transmittance (%)
 - Color Shift
 - Color Gamut

Splitschan M, Lazar R, Cajochen C. Visual and non-visual properties of filters manipulating short-wavelength light. *Oph & Physiol Optics*. 39:2019:459-468

28

Slide Contributed by Jacqueline Theis, OD, FAAO, FNAF

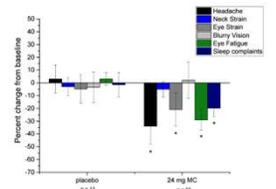
Blue Light Blockers vs. Computer (Night-Mode) Modifications

- Compared the radiation produced by smartphones that reaches the eye when using night-mode functions vs blue light reducing lenses
- To determine impact they had on visual and nonvisual (circadian) parameters to compute a melatonin suppression value (MSV)
 - Night-mode functions reduced MSV by up to 93%
 - Warmest mode produced the least suppression
 - Blue light reducing spectacles reduced melatonin suppression by 33%
 - Coated lenses more efficient than tinted lenses

Teran, E., Yee-Rendon, C. M., Ortega-Salazar, J., De Gracia, P., Garcia-Romo, E., & Woods, R. L. (2020). Evaluation of Two Strategies for Alleviating the Impact on the Circadian Cycle of Smartphone Screens. *Optometry and vision science: official publication of the American Academy of Optometry*, 97(3), 207–217. <https://doi.org/10.1097/OPX.0000000000001485>

29

Enhancing our natural blue light blockers



Slide Contributed by Jacqueline Theis, OD, FAAO, FNAF

Article: **Macular Carotenoid Supplementation Improves Visual Performance, Sleep Quality, and Adverse Physical Symptoms in Those with High Screen Time Exposure**
 James M. Strangham ^{1*}, Nicole T. Strangham ² and Kevin J. O'Brien ³
¹ Nutritional Neuroscience Laboratory, Department of Psychology, University of Georgia, Athens, GA, 30602, USA
² Interdisciplinary Neuroscience Program, Biomedical and Health Sciences Institute, University of Georgia, Athens, GA, 30602, USA, nstrangham@gmail.com
³ Vision Science Laboratory, Department of Psychology, University of Georgia, Athens, GA, 30602, USA, O'Brien@psych.uga.edu
 * Correspondence: jm.strangham@gmail.com, Tel.: +1-210-204-4189
 Academic Editor: Bettina Aldrich
 Received: 19 June 2017; Accepted: 28 June 2017; Published: 29 June 2017

30

Slide Contributed by Jacqueline Theis, OD, FAAO, FNAP

TBI and Blue Light

> Neurobiol Dis. 2020 Feb;134:104679. doi: 10.1016/j.nbd.2019.104679. Epub 2019 Nov 18.

A randomized, double-blind, placebo-controlled trial of blue wavelength light exposure on sleep and recovery of brain structure, function, and cognition following mild traumatic brain injury

William D S Kilgore ¹, John R Vanuk ², Bradley R Shane ², Maren Weber ², Sahil Bajaj ²

Affiliations + expand

> J Head Trauma Rehabil. Sep/Oct 2020;35(5):E405-E421. doi: 10.1097/HTR.0000000000000576

Daily Morning Blue Light Therapy Improves Daytime Sleepiness, Sleep Quality, and Quality of Life Following a Mild Traumatic Brain Injury

Adam C Raikes ¹, Natalie S Dalley, Bradley R Shane, Brittany Forbeck, Anna Alkozei, William D S Kilgore

Affiliations + expand

PMID: 32472836 DOI: 10.1097/HTR.0000000000000579

31

Slide Contributed by Jacqueline Theis, OD, FAAO, FNAP

TBI and Blue Light Recommendations

- Blue blockers to use at night time (after dinner) to help regulate sleep
- Turn brightness down on computer and increase it daily to help with retinal light re-adaptation
- FL41 tint only if have blue-light triggered migraines (computer/fluorescent lights/sunlight)
- Supplementation with Lutein, Zeaxanthin, Omega 3s and discussion about diet and proper electronics use

32



33

Tired Patient:
"I didn't sleep last night.
Will this affect my exam?"

34

Sleep On Eyesight

> Acta Ophthalmol. 2015 May;93(3):284-6. doi: 10.1111/aoa.12536. Epub 2014 Oct 12.

Contrast sensitivity and the effect of 60-hour sleep deprivation

Vilhelm F Koefoed ¹, Jørg Almus, Kristian S GouÅ, Gunnar Høivang, Berit E Moen

> Phys Ther. 2013 Sep;93(9):1185-96. doi: 10.2522/ptj.20120144. Epub 2012 Nov 15.

Sleep deprivation has no effect on dynamic visual acuity in military service members who are healthy

Matthew R Scherer ¹, Pedro J Chen, Kristin J Heaton

No effect on

- Contrast Sensitivity
- Dynamic Visual Acuity

35

Binocular Vision and Sleep

36

ELSEVIER Clinical Neurophysiology Volume 111, Issue 10, 1 October 2000, Pages 1775-1778

4643

Distinct pattern of oculomotor impairment associated with acute sleep loss and circadian misalignment

Leland S. Stone^a, Steven L. Trause^a, Patrick F. Cavanagh^a, Nathan H. Koka^a and Erin E. Flynn-Krueger^a

^aDepartment of Neurobiology, University of California, San Diego, San Diego, CA, USA

Oculomotor impairment after 1 night of total sleep deprivation: a dissociation between measures of speed and accuracy

Luigi De Gennaro^{a, b}, Michele Ferrara^a, Luca Urbani^b, Maria Bertini^a

37

ELSEVIER Clinical Neurophysiology Volume 114, Issue 4, April 2003, Pages 723-736

Oculomotor impairment during chronic partial sleep deprivation ☆

M Russo^{a, b}, M Thomas, D Thorne, H Sing, D Redmond, L Rowland, D Johnson, S Hall, J Krichmar, T Balkin

Show more

38

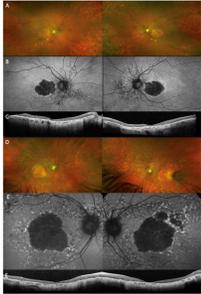
Sleep and Age-Related Macular Degeneration (AMD)

Front Aging Neurosci. 2023 Aug 22;15:1247413. doi: 10.3389/fnagi.2023.1247413

Sleep duration and age-related macular degeneration: a cross-sectional and Mendelian randomization study

Shirshen Lei¹, Zhouyuan Liu², Haihui Li^{3*}

- Cross-sectional study, bidirectional two-sample Mendelian randomization (MR)
- 5,481 participants aged ≥40 years
 - short sleep duration (SSD) (<7 h per night)
 - normal (7–8 h per night)
 - excessive/long sleep duration (LSD) (≥9 h per night)
- SSD increases the risk of early AMD
- Advanced AMD could increase the risk of SSD



39

Sleep on Glaucoma

- may be a risk factor for or a consequence of glaucoma
- Poor sleep history associated with glaucoma risk
- Snoring, daytime sleepiness, insomnia, and short/long duration, individually or jointly
 - all associated with the risk of glaucoma.
- Loss of retinal ganglion cells includes ipRGCs.
 - May influence sleep quality in those with glaucoma



Qiu M, Ramulu PY, Boland MV. Association Between Sleep Parameters and Glaucoma in the United States Population: National Health and Nutrition Examination Survey. J Glaucoma. 2019 Feb;28(2):97-104.

40

Obstructive Sleep Apnea

- Recurrent obstruction of the upper airway during sleep
 - resulting in periodic hypoxemia
 - disturbances in sleep continuity
 - increased respiratory exertion
- activation of the sympathetic nervous system, oxidative stress, and the emergence of systemic inflammatory response



Lévy P, et al. Nat Rev Dis Primers. 2015 Jun 25;1:15015.
Scarabosio A, et al. Diagnostics (Basel). 2024 Aug 21;14(16):1828.

41

Obstructive Sleep Apnea

- Affects nearly **20–25% of the US adult population**
- **40% higher likelihood of developing glaucoma** compared to normal individuals

Lévy P, et al. Obstructive sleep apnoea syndrome. Nat Rev Dis Primers. 2015 Jun 25;1:15015.
Scarabosio A, et al. The Overlooked Floppy Eyelid Syndrome: From Diagnosis to Medical and Surgical Management. Diagnostics (Basel). 2024 Aug 21;14(16):1828.

42

Floppy Eyelid Syndrome



Photo: De Gregorio A, Therapeutic Advances in Ophthalmology.

- 25% of patients with OSA have FES
- Risk for OSA and Glaucoma
 - keratoconus
- Ocular surface disease
 - Giant papillary conjunctivitis
 - Bacterial/viral conjunctivitis
 - Exposure keratitis
 - Dry eye disease

Kadyan A, Asghar J, Dowson L, Sandramouli S. Ocular findings in sleep apnoea patients using continuous positive airway pressure. Eye (Lond). 2010 May;24(5):843-50
De Gregorio A, Cerini A, Scala A, Lambiase A, Pedrotti E, Morselli S. Floppy eyelid, an under-diagnosed syndrome: a review of demographics, pathogenesis, and treatment. Therapeutic Advances in Ophthalmology. 2021;13.

43

CPAP (continuous positive airway pressure) machine

Treatment options for exposure/dryness

- Lubricating ointments
- Eye masks/moisture seals
- Eyelid tape (SleepTite/SleepRite)



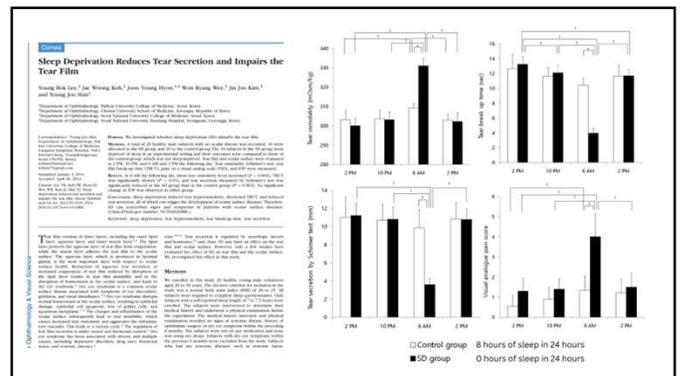
44

Sleep on Dry Eye

- Dry eye disease (DED) is associated with poor sleep quality and higher risk of sleep disorders.
- Bidirectionality
 - Symptoms of dry eye (inflammation, irritation, nocturnal lagophthalmos) can disrupt sleep.
 - Sleep disturbances may also contribute to tear film instability and worsening dry eye symptoms.



45



46

Association between sleep quality and dry eye disease: a literature review and meta-analysis

Yuxuan Gu¹, Kai Cao², Ao Li³, Jingyi Wang³, Yihan Guo³, Yiran Hao³, Lei Tian³, Ying Jie⁴

Meta-analysis reviewed 21 studies with n=419,218

- Poor Sleep Quality: significantly worse in dry eye patients
 - Increased Daytime Sleepiness
 - More Extreme Sleep Durations:
- Short sleep (<5 hours/night): **3.76*** more likely
- Excessive sleep (>9 hours/night): **5.53*** more likely
- Dry eye patients have **2.2*** higher risk of sleep disorders



47

Sleep on Dry Eye

Reduced Sleep Time & Quality	<ul style="list-style-type: none"> • Decreased TBUT, Schirmer's, goblet cell density • Increased osmolarity, lacrimal gland hypertrophy, corneal epithelial damage • Altered Meibomian Gland secretions
Ocular Discomfort:	Nocturnal lagophthalmos & poor lid seal leads to dryness, irritation.
Pain & Inflammation:	Eye discomfort makes falling/staying asleep harder. <ul style="list-style-type: none"> • Eye movement against inside of lids?
Mental Health Link	Dry eye patients have higher rates of stress, anxiety, and depression, affecting sleep.

48

Visual Disturbances?

- Sleep disturbances (e.g. insomnia) affect ~50% of individuals with anxiety.
- Insufficient sleep can instigate or further exacerbate anxiety
- Patients may tend to hyper fixate or have anxiety over visual disturbances (floaters, photopsia, scotoma, etc.)



Chellappa SL, Aeschbach D. Sleep and anxiety: From mechanisms to interventions. *Sleep Med Rev.* 2022 Feb;61:101583. Epub 2021 Dec 8.
 Gouliopoulos N, Oikonomou D, Karygianni F, Rouvas A, Kymppouropoulos S, Moschos MM. The association of symptomatic vitreous floaters with depression and anxiety. *Int Ophthalmol.* 2024 May 7;44(1):218.

49

Eyelid Myokymia

- Fatigue**
 - Poor Sleep / Lack of Sleep
- Stress**
- Stimulant use**
 - Caffeine
 - Sugar

50

Health Benefits of Sleep

- **Cardiovascular** - Heals and repairs your heart and blood vessels.
- **Endocrine/Metabolic** - Helps support a healthy balance of the hormones that make you feel hungry (ghrelin) or full (leptin) and how you react to insulin
 - When you don't get enough sleep, your level of ghrelin goes up and your level of leptin goes down. This makes you feel hungrier than when you're well-rested.
 - Sleep deficiency results in a higher-than-normal blood sugar level, which may raise your risk of diabetes.
 - Sleep also plays a role in puberty and fertility.
- **Musculoskeletal** - Supports healthy growth and development
 - Deep sleep triggers the body to release the hormone that promotes normal growth in children and teens.
 - This hormone also boosts muscle mass and helps repair cells and tissues in children, teens, and adults
- **Immune** - Affects your body's ability to fight germs and sickness
- **Neurologic** - helps with glymphatic process in the brain
- Decreases **your risk of health problems**, including heart disease, high blood pressure, obesity, and stroke.

51

Slide Contributed by Jacqueline Theis, OD, FAAO, FNAP

Impact of inadequate sleep and neurologic disorders/cognitive decline

- Increased risk of neurodegenerative disease
 - Alzheimer's disease
 - Parkinson's disease
 - Dementia
 - Stroke and other cerebrovascular disease
- Impaired cognitive function
 - Memory and learning
 - Focus and Decision Making
 - Emotional Regulation
- Increase seizures in patients with epilepsy
- Impact ability to recover from brain injury

52

Slide Contributed by Jacqueline Theis, OD, FAAO, FNAP

Role of Sleep in AD

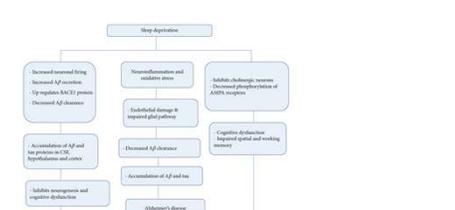


Figure 2: Sleep deprivation-induced alteration in various pathways leading to AD pathogenesis. SD increases neuronal firing, upregulates BACE1 protein, and augments neuroinflammation and oxidative stress. Alterations in these pathways impact clearance of the toxic metabolites and leading to the accumulation of Aβ and tau protein. SD has a negative impact on the glymphatic system and the inhibition to cognitive dysfunction and impaired memory in AD patients.

Bishir et al. Biomed Research International. 2020

53

Slide Contributed by Jacqueline Theis, OD, FAAO, FNAP



Figure 3: Sleep is a vital phenomenon and an indicator of overall health. Normal sleep is very essential for memory and brain health since various neural circuits in the brain are involved in sleep. Sleep deprivation has evolved as a major threat in modern society. SD impairs LTP and molecules associated with memory and leads to cognitive dysfunction. SD also impairs the clearance of toxic metabolites produced in the brain and contributes to the pathophysiology of neurodegenerative disorders like AD, PD, and cerebral stroke. SD also causes an imbalance in the immune system and aggravates the pathophysiology of MS and glioma. It can be concluded that SD adversely affects various proteins, genes, and molecular cascades in neurodegenerative disorders.

Bishir et al. Biomed Research International. 2020

54

Slide Contributed by Jacqueline Theis, OD, FAO, FNAP

Epworth Sleepiness Scale

Epworth Sleepiness Scale¹

How likely are you to nod off or fall asleep in the following situations, in contrast to feeling just tired? This refers to your usual way of life in recent times. Even if you haven't done some of these things recently, try to work out how they would have affected you. It's important that you answer each question as best you can. Use the following scale to choose the most appropriate number for each situation.

	Would never nod off	Slight chance of nodding off	Moderate chance of nodding off	High chance of nodding off
	0	1	2	3
Sitting and reading				
Watching TV				
Sitting, inactive, in a public place (e.g., in a meeting, theater, or during events)				
As a passenger in a car for an hour or more without stopping for a break				
Lying down to rest when circumstances permit				
Sitting and talking to someone				
Sitting quietly after a meal without alcohol				
In a car, while stopped for a few minutes in traffic or at a light				

Add up your points to get your total score. A score of 10 or greater raises concern; you may need to get more sleep, improve your sleep practices, or seek medical attention to determine why you are sleepy.

© 1990-1997 MW Johns. Used under license

55



How do you order or refer for a sleep study?

56

How to communicate with patients

57

Sleep Aids? Common Sleep Medications

Drug Category	Medication	Typical Dosages
Nonbenzodiazepine benzodiazepine receptor agonist	zaleplon (Sonata)	5-20 mg
	zolpidem tartrate (Ambien)	5-10 mg
	zolpidem tartrate extended-release (Ambien CR)	6.25-12.5 mg
Benzodiazepine	eszopiclone (Lunesta)	1-3 mg
	clonazepam (Klonopin)	0.25-2 mg
Melatonin receptor agonist	lorazepam (Ativan)	0.5-4 mg; dose >2 mg rare
	temazepam (Restoril)	7.5-30 mg
	ramelteon (Rozerem)	8 mg
Antihistamine	diphenhydramine (Benadryl)	25-100 mg
	hydroxyzine (Vistaril, Atarax)	10-100 mg
Tricyclic antidepressant	doxepin (Silenor)	3-6 mg
	amitriptyline (Elavil)	10-25 mg
	nortriptyline (Pamelor)	10-50 mg
Second-generation antidepressant	trazodone (Dysparel)	25-100 mg
	mirtazapine (Remeron)	7.5-45 mg
Antipsychotic	quetiapine (Seroquel)	25-100 mg
Chloral derivative	chloral hydrate	500-1,000 mg

PDQ Supportive and Palliative Care Editorial Board: Sleep Disorders (PDQ®): Health Professional Version, 2024 Jul 17. In: PDQ Cancer Information Summaries [Internet]. Bethesda (MD): National Cancer Institute (US); 2002-. [Table]. Table 3. Medications Commonly Used to Promote Sleep.

58

Sleep Aids? OTC Options

- Diphenhydramine (Benadryl).
- Doxylamine (Unisom).
- Valerian root
- Cannabidiol (CBD)
- Magnesium
- Melatonin
- Chamomile tea
- Mugwort

59

Can Sleep Medications Affect the Eyes?

Medication	Ocular Side Effects
Temazepam	Blurred Vision
Zolpidem	Halos Around lights
Doxylamine	Dry Eye
Trazodone	Angle Closure
Antipsychotics *chlorpromazine, paroxetine)	Corneal Edema
Antidepressants (Fluoxetine, alprazolam, paroxetine)	

60

Optimizing Sleep?

Sleep hygiene education (AKA tips for better sleep)

- Found to be most effective

Other options (associated with improved sleep quality)

- Light Therapy Interventions
- Reduced light exposure at night
- Supplementation
- Mindfulness



Bigloe SC, den Hollander S, van Rensberg DJ, Hendricks S, Kerkhoffs G, Goutteborge V. Sleep interventions in elite sport - a systematic review. S Afr J Sports Med. 2025 Feb 15;37(1):v371a18811.

61

Slide Contributed by Jacqueline Theis, OD, FFAO, FNAAP



Concussion Care Centre
OF VIRGINIA, LTD.



VIRGINIA NEURO-OPTOMETRY

Sleep Hygiene Checklist

Listed below is a list of strategies to help you improve your sleep. Try adding one strategy every day. It will take you about 2 weeks to work through this list. Overtime you will see improvement in your sleep.

- Set a time to go to bed – before 11 pm.
- Quiet the house by turning off electronics and light sources that emit blue light two hours before bedtime
 - This includes phones, tablets, computers, smart bulbs/TVs
 - If you **MUST** use a device in the evening, put in on "night mode" and consider getting blue blocking glasses for evening wear only.
- Do not wear blue blockers constantly throughout the day as it may disrupt your sleep-wake cycle
- Reduce your fluid intake about 2 hours before your bedtime to limit middle of the night bathroom runs.
- Reduce alcoholic beverages in the late evening
- Darken and cool the bedroom (65°-69°)
- No bed buddies – remove kids and pets from your bed until you are feeling better. You can have a mat setup on the floor for them instead of having them in bed.
- Place a notepad and pen next to your bed to help "park your ideas" for the day.
- Relax, meditate, or read a book before bed
- Avoid checking email and messages before bed.
- When you get into bed, stay in bed for at least 20-30 minutes to allow your body time to fall asleep. If you wake up and cannot fall asleep, you can get out of bed and do a quiet activity (no electronics) and then try again to get back into bed.
- Eliminate naps. If you need to nap, limit them to no more than 20 minutes.
- Avoid caffeine in the late afternoons and evenings (after 3pm).
- Exercise during the day
- Get outside in the mornings for a light walk of 15-30minutes

62

Establishing a Sleep Routine

- Setting consistent sleep and wake times
- Creating a conducive sleep environment
 - The role of bedtime rituals in signaling sleep



63

Optimizing the Sleep Environment



- Temperature control in the bedroom
- Importance of comfortable bedding and pillows
- Minimizing noise and light disruptions

64

Managing Stimulants and Substances

- Effects of caffeine and nicotine on sleep quality
- Limiting alcohol intake before bedtime
 - The impact of heavy meals and fluid intake close to bedtime




65

Technology and Sleep

- Effects of screens on sleep (phones, tablets, computers)
- Establishing a digital curfew
 - Using blue light filters and night mode settings



66

Physical Activity and Sleep

- Benefits of regular exercise on sleep quality
- Timing of exercise relative to bedtime
- Types of exercises that promote better sleep



Alnawwar MA, Alraddadi MI, Algethmi RA, Salem GA, Salem MA, Alharbi AA. The Effect of Physical Activity on Sleep Quality and Sleep Disorder: A Systematic Review. *Cureus*. 2023 Aug 16;15(8):e43595.

67

Nutrition and Sleep



- Foods that promote sleep
- Foods and drinks to avoid close to bedtime
- The role of balanced nutrition in overall sleep health

St-Onge MP, Mikic A, Pietrolungo CE. Effects of Diet on Sleep Quality. *Adv Nutr*. 2016 Sep 15;7(5):938-49.

68



Ingredients

- Stevia extract
- Melatonin
- Chamomile extract
- Valerian root extract
- Turmeric
- Taurine
- Omega-3 (DHA from algae)
- Vitamin A & C
- Calcium
- Potassium
- Malic acid
- Sodium Chloride
- Citric Acid

69

Melatonin & AMD Risk?

Multicenter Study | JAMA Ophthalmol. 2024 Jul 1;142(7):648-654.
doi: 10.1001/jamaophthalmol.2024.1822.

Melatonin and Risk of Age-Related Macular Degeneration

Hejin Jeong¹, Jacqueline K. Shala^{1,2}, Jonathan C. Markle², Katherine E. Talcott², Rishi P. Singh^{2,3}

Retrospective study on over 120k patients over the age of 50

- Significant decreased risk of development and progression of AMD

2005 study followed 55 patients given 3mg melatonin QHS for 6 months

- Reported stability in visual acuity and improved AMD retinal morphological changes

70

What about Lutein/Zeaxanthin (L/Zi)?

- Natural blue light filter
- 2018 Study using 20mg/4mg L/Zi vs placebo for 6 months
 - Significant increase in MPOD, serum L/Zi (p<0.05)
 - Trend was observed for melatonin (p<0.1) in the L/Zi treatment group compared with the placebo group.
 - Significant effect on
 - sleep disturbance
 - daytime dysfunction
 - quality of sleep
 - medication requirement for sleep.



Culver MF, Bowman J, Juturu V. Lutein and Zeaxanthin Isomers Effect on Sleep Quality: A Randomized Placebo-Controlled Trial. *Biomedical Volume 9 Issue 2*, 9/21/2018.

71

Stress Management and Relaxation Technique

- Stress reduction strategies before bedtime
- Incorporating relaxation techniques (e.g., meditation, deep breathing)
- Progressive muscle relaxation and guided imagery



72

Developing Personalized Sleep Hygiene Plans



- Assessing individual sleep habits and challenges
- Creating personalized strategies for improving sleep hygiene
- Setting realistic goals and tracking progress

73

Tips for Better Sleep

- Set a schedule—go to bed and wake up at the same time each day.
- Exercise for at least 30 minutes most days of the week, but not within a few hours of bedtime.
- Avoid caffeine and nicotine late in the day and alcoholic drinks before bed.
- Relax before bed—try a warm bath, reading, or another relaxing routine.
- Create a room for sleep—avoid bright lights and loud sounds, keep the room at a comfortable temperature, and don't watch TV or use a smartphone or computer in your bedroom.
- Don't lie in bed awake. If you can't get to sleep, do something else, like reading or listening to calming music, until you feel tired.
- Set a schedule—go to bed and wake up at the same time each day.
- Exercise for at least 30 minutes most days of the week, but not within a few hours of bedtime.
- Avoid caffeine and nicotine late in the day and alcoholic drinks before bed.
- Relax before bed—try a warm bath, reading, or another relaxing routine.
- Create a room for sleep—avoid bright lights and loud sounds, keep the room at a comfortable temperature, and don't watch TV or use a smartphone or computer in your bedroom.
- Don't lie in bed awake. If you can't get to sleep, do something else, like reading or listening to calming music, until you feel tired.

74

Thank You!!




www.DoctorEyeHealth.com
m
Hello@DoctorEyeHealth.com



75