



Review Article

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NOCTURNAL SCREEN EXPOSURE (DUE TO NIDRA VEGADHARANA) AND ITS GRADUAL IMPACT ON VISION, COGNITIVE FOCUS, AND MENTAL HEALTH

An Integrative Review of Modern and Ayurvedic Perspectives

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ABSTRACT

Nocturnal exposure to light-emitting diode (LED) screens has emerged as a pervasive environmental hazard in modern society. This review synthesizes the pathophysiological mechanisms of nocturnal screen-induced damage across three major domains: ocular physiology, cognitive focus, and mental health. We analyze these issues through a dual framework: Western biomedical science and traditional Ayurvedic medicine. Biomedicine attributes these systemic disruptions to high-energy visible (HEV) blue light retinal phototoxicity and the suppression of pineal melatonin via intrinsically photosensitive retinal ganglion cells (ipRGCs). Ayurveda conceptualizes this phenomenon as an artificial extension of daytime sensory intake leading to severe disruptions in the body's natural bio-elements: Alocaka Pitta (ocular metabolic fire), Prana Vayu (neurological governance), and Tarpaka Kapha (cerebrospinal nourishment). This paper provides an evidence-based integrative understanding of Digital Exhaustion and introduces comprehensive lifestyle and preventive modifications rooted in Ayurvedic Ratricharya (night regimen) and Dinacharya (daily regimen), with a particular emphasis on the physiological impact of suppressing the natural urge to sleep.

Key Words: - Nocturnal exposure, *nidra vegadharana*, *dinacharya*, *ratricharya*, Circadian

1. INTRODUCTION

The regular use of smartphones, tablets, and laptops late at night disrupts the evolutionary alignment between human physiology and the environmental light-dark cycle (Tähhämö et al., 2018). In modern medicine, this misalignment is studied under circadian biology and environmental toxicology. In Ayurveda, it is recognized as a direct manifestation of Asatmyendriyarthā Samyoga (unwholesome conjunction of sense organs with their objects), specifically Atiyoga (overuse) and Mithyayoga (perverted use) of the Chakshurendriya (visual sense organ) (Wagh, 2026). By extending visual and cognitive processing deep into the night, individuals systematically suppress the biological signals designed to initiate cellular repair and psychological assimilation.

2. TRIPLE IMPACT OF LATE-NIGHT SCREEN USE

2.1 Ocular Damage and Vision Degradation

- **Modern Biomedical Perspective:** High-energy visible (HEV) blue light spanning the 400 to 500 nanometer spectrum penetrates deep into the eye. Chronic nocturnal screen use induces photochemical retinal damage, specifically between 415 and 455 nanometers, passing through the cornea and lens to directly strike the retina. This creates an accumulation of Reactive Oxygen Species (ROS) within the retinal pigment epithelium (RPE), leading to metabolic exhaustion of photoreceptors and accelerating age-related macular degeneration (AMD). Concurrently, during focused screen reading, the normal human blink rate drops by approximately 60 percent (Wagh, 2026). This inhibits the mechanical distribution of lipids across the corneal surface, causing rapid tear film evaporation, dry eye syndrome, and transient astigmatism.
- **Ayurvedic Perspective:** In Ayurvedic physiology, the eye is considered a site of high metabolic activity ruled by fire (Tejas), specifically Alocaka Pitta, which is responsible for capturing light and converting it into visual images. Exposing the eyes to sharp artificial light sources in a pitch-dark environment significantly overstimulates Alocaka Pitta. Because the night is naturally governed by the cooling, stable elements of Kapha, this hot, intense sensory input creates an artificial inflammatory state. It dries up Tarpaka Kapha, the protective lubricating fluid that cushions the ocular structures and brain (Romano, 2025). The resulting moisture loss allows Vata Dosha to clear a path for degenerative changes in the Dristi Patala (retinal layers), manifesting as Netra Shrama (eye strain) and Shushkakshipaka (dry eye syndrome) (Dhiman et al., 2012).

2.2 Circadian Disruption and Cognitive Decline

- **Modern Biomedical Perspective:** The neurological consequences of evening screen exposure are mediated by the retinohypothalamic tract. When short-wavelength blue light hits the intrinsically photosensitive retinal ganglion cells (ipRGCs), the photopigment melanopsin sends a direct inhibitory signal to the suprachiasmatic nucleus (SCN) of the hypothalamus (Tähhämö et al., 2018). This suppresses the pineal gland's secretion of

melatonin, delaying sleep onset and stripping away deep slow-wave sleep (SWS) (Sanchez Cano, 2025). SWS is critical for memory consolidation and metabolic clearance. Without it, the brain's glymphatic waste clearance system cannot effectively purge neurotoxic metabolites like amyloid-beta, leading directly to next-day cognitive deficits, shortened attention spans, executive dysfunction, and micro-sleep episodes.

- **Ayurvedic Perspective:** Cognitive focus and intellectual processing (Medha) depend on the smooth, unhindered movement of Prana Vayu throughout the Manovaha Srotas (the channels of mind and consciousness). Ayurveda maps the 24-hour day to shifting expressions of the three Doshas. The window between 6:00 PM and 10:00 PM is the Kapha period, characterized by natural heaviness, grounding, and a slow winding down of metabolic processes. Engaging with digital screens during this time acts as a major disruptor because the hyper-stimulating stream of information acts as a sharp, mobile force (Chala Guna) that completely scatters Prana Vayu. Forcing the mind to stay alert pushes the body past its natural rest window and into the Pitta period (10:00 PM to 2:00 AM). Instead of using this Pitta phase for internal cellular digestion and tissue rejuvenation (Dhatu Paka), the body's metabolic fire is diverted to process external digital data, resulting in a state of Chitta Bhrama (mental instability, lack of focus, and compromised retention).

2.3 Mental Health and Affective Vulnerabilities

- **Modern Biomedical Perspective:** Chronic nocturnal screen use has a well-documented connection to affective disorders, including anxiety and depression (Blazhkova, 2025). This relationship runs along two main biological pathways: hypothalamic-pituitary-adrenal (HPA) axis hyperactivation and monoaminergic dysregulation. Late-night consumption of emotionally charged content triggers a sustained stress response, elevating nocturnal cortisol production and stimulating adrenocortical hormones, thereby overriding the parasympathetic nervous system's efforts to calm the body. Concurrently, the disruption of circadian biology directly compromises the synthesis and receptor sensitivity of serotonin and dopamine, leaving users far more vulnerable to emotional volatility, anhedonia, and poor impulse control.
- **Ayurvedic Perspective:** From a psychological perspective, Ayurveda categorizes mental health through the three Manasa Gunas (qualities of the mind): Sattva (purity and balance), Rajas (activity and agitation), and Tamas (inertia and darkness). Healthy mental function requires a dominant foundation of Sattva supported by a balanced baseline of Rajas and Tamas. Late-night screen consumption injects a chaotic dose of Rajas into the mind right when the brain needs to transition into restful Tamas. This constant input triggers an artificial state of hyper-arousal, causing a long-term depletion of Ojas (the vital essence of immunity, stability, and psychological resilience). As Ojas decreases, the mind loses its natural defense mechanisms against stress, accelerating a slide toward Vata and Pitta psychological imbalances like Alpaaharsha (depression) and Udvega (generalized anxiety).

3. PREVENTION THROUGH DINACHARYA AND RATRICHARYA REGIMENS

Ayurveda utilizes structured daily routines (Dinacharya) and nightly routines (Ratricharya) to synchronize human biology with natural environmental rhythms. When applied systematically, these practices directly counteract the accumulation of heat, dryness, and chaotic motion generated by modern digital devices.

- **Digital Sunset:** All light-emitting digital devices must be deactivated at least two hours before sleep, ideally by 8:00 PM. This creates a clean break from external sensory inputs, allowing natural Kapha elements to accumulate and trigger normal melatonin synthesis before the 10:00 PM Pitta window opens (Tähkämö et al., 2018).
- **Shatapavali (The Post-Dinner Walk):** Rather than moving immediately from dinner back to digital work, individuals should practice Shatapavali, taking at least 100 gentle steps after eating. This physical transition helps guide Apana Vayu (downward-moving energy) into its proper direction, supporting digestion and preventing the heavy, stagnant accumulation of Pitta or Kapha in the upper GI tract.
- **Netra Prakshalana (Ocular Wash):** Washing the eyes with pure cold water or room-temperature rose water at twilight cools down irritated Alocaka Pitta and clears excess surface heat accumulated from daytime screen exposure (Romano, 2025).
- **Triphala Ghrita Netra Tarpana:** For individuals experiencing advanced digital eye strain, Netra Tarpana offers localized rejuvenation. A dam of black gram dough is constructed around the eyes and filled with warm medicated Triphala Ghrita (clarified butter infused with Triphala) (Gaikwad, 2026). The lipid properties deeply nourish the optic nerve, stabilize the tear film, and calm both Vata and Pitta imbalances (Sawant, 2018).
- **Padabhyanga (Foot Massage):** Massaging the soles of the feet with warm sesame oil (Tila Taila) or Ksheerabala Taila before sleep stimulates vital bio-vascular channels (Sira) that connect directly to the eyes. This practice grounds scattered Prana Vayu, pulls excess heat down from the head, and induces deep, restorative sleep.
- **Pratimarsha Nasya (Nasal Therapy):** Instilling 2 drops of warm Anu Taila or organic cow ghee into each nostril daily during twilight leverages the nasal passage as a direct gateway to the brain (Wagh, 2026). This practice coats the nasal passages, nourishes the central nervous system, and protects the Manovaha Srotas from sensory overload.
- **Medhya Rasayana Administration:** Implementing a daily regimen of nervine tonics repairs cognitive wear and tear and restores Ojas. Herbs such as Brahmi (*Bacopa monnieri*), Mandukaparni (*Centella asiatica*), and Ashwagandha (*Withania somnifera*) should be consumed in the evening, ideally warm and mixed with milk or ghee to maximize lipid-mediated absorption.
- **Siddha Ksheera (Medicated Night Milk):** Drinking a cup of warm organic milk boiled with a pinch of nutmeg (Jaiphal), cardamom (Elaichi), and a teaspoon of cow ghee 30 minutes before bed serves as an excellent vehicle (Anupana) that pacifies Vata and Pitta, builds Ojas, and introduces natural sedatives to re-establish a healthy sleep cycle.

4. THE ROOT ERROR: SUPPRESSING SLEEP AS AN ADHARANIYA VEGA

A foundational principle of Ayurvedic preventive medicine is the absolute non-suppression of Adharaniya Vegas—natural, non-suppressible bodily urges (such as yawning, hunger, thirst, and elimination) that represent the body's innate biological intelligence. Forcing the suppression of these urges alters the natural direction of physiological movements, creating deep-seated systemic pathology.

Sleep (Nidra) is classified as a primary non-suppressible urge, essential for life, tissue maintenance, and emotional stability. Modern nocturnal screen exposure creates a direct behavioral conflict with this urge. By using bright light and highly stimulating interactive content, individuals artificially override the initial signs of fatigue, actively suppressing the Nidra Vega.

Habitually suppressing the urge to sleep violently deranges Vata Dosha, leading to a state of permanent neurological hyper-arousal. This blocks and narrows the channels of consciousness (Manovaha Srotas). The unassimilated sensory data and delayed metabolic clearance generate an internal toxic byproduct equivalent to metabolic waste (Ama). This subtle debris dulls cognitive intellect (Medha) and strips away psychological grounding. Consequently, treating sleep as an optional lifestyle choice rather than a mandatory biological urge serves as the primary behavioral catalyst for modern digital exhaustion.

5. DISCUSSION

The present integrative review highlights nocturnal screen exposure as an emerging behavioural factor affecting ocular health, circadian regulation, cognitive performance, and psychological well-being. Its effects extend beyond simple visual strain, as nighttime digital use may disrupt multiple interconnected physiological and psychological processes. From an Ayurvedic perspective, this aligns with Asatmyendriyarthā Samyoga, excessive use of Chakshurendriya, disturbed Ratricharya, and suppression of Nidra Vega.

Ocular implications

Prolonged screen use may cause ocular discomfort through reduced blinking, tear-film instability, dryness, irritation, and visual fatigue. Short-wavelength light has also been discussed in relation to retinal stress, though evidence in real-world screen use remains limited. The most consistent clinical issue is digital eye strain due to prolonged near work and poor visual ergonomics.

Ayurvedically, these effects are linked to Alocaka Pitta aggravation and Tarpaka Kapha disturbance, leading to Netra Shrama and Shushkakshipaka. These concepts serve as traditional explanatory models rather than direct physiological equivalents.

Circadian rhythm, sleep and cognitive function

Nighttime screen exposure can suppress melatonin and delay circadian rhythms, especially during biological night. Cognitive effects such as reduced attention, memory, and executive

function are largely mediated through sleep disruption rather than direct light exposure alone. Psychological stimulation from digital content may further delay sleep.

In Ayurveda, this is understood through disruption of Prana Vayu, Manovaha Srotas, and natural sleep transitions governed by Dosha cycles, complementing modern circadian concepts.

Psychological implications

The relationship between nocturnal screen use and mental health is bidirectional. Screen use may worsen sleep and emotional regulation, while stress or low mood may increase nighttime usage. Proposed mechanisms include HPA-axis activation and emotional overstimulation.

Ayurveda attributes this to increased Rajas, reduced Ojas, and disturbed mental balance, offering a parallel framework for psychological dysregulation.

Nidra Vega Dharana

A key concept is Nidra Vega Dharana, or suppression of sleep. Nighttime screen use encourages repeated postponement of sleep, leading to circadian misalignment and insufficient rest. Both modern and Ayurvedic perspectives agree that sleep should not be routinely delayed for digital engagement.

Dinacharya and Ratricharya

Preventive strategies emphasize structured daily and nighttime routines, especially reducing screen use before bed (“digital sunset”). This reduces light exposure, cognitive stimulation, and sleep delay. While behavioural interventions are well supported, traditional therapies such as Netra Tarpana or Nasya require further clinical validation.

Integrative interpretation

Modern science explains effects through circadian disruption, retinal photoreception, and sleep regulation, while Ayurveda interprets them through sensory overuse, Dosha imbalance, and disturbed natural rhythms. Despite differing frameworks, both emphasize limiting nighttime stimulation and protecting sleep.

Limitations and future directions

This review is conceptual and does not establish causality. Future research should use standardized measures of screen exposure, sleep, ocular health, and psychological outcomes. Ayurvedic parameters such as Prakriti and Nidra characteristics should also be incorporated. Controlled trials are needed to evaluate combined digital hygiene and Ratricharya-based interventions.

Overall, nocturnal screen exposure should be viewed as a multidimensional lifestyle issue rather than only a cause of eye strain. Nidra Vega Dharana offers a useful behavioural lens, while modern sleep science provides physiological grounding. Integrating both perspectives may support healthier technology use and improved well-being.

6. CONCLUSION

Nocturnal screen exposure is a multifaceted lifestyle disease that damages ocular tissue, disrupts metabolic rhythms, and causes systematic neurological fatigue. By combining modern clinical insights like blue light phototoxicity and melatonin suppression with Ayurvedic principles such as Alocaka Pitta irritation, Prana Vayu imbalance, and the suppression of the natural urge to sleep (Nidra Vega), clinicians gain a comprehensive understanding of digital exhaustion. Effective intervention requires moving past temporary symptom management. Adopting traditional preventive frameworks like Ratricharya, targeted ocular care, and natural nervine tonics offers a practical, holistic strategy to preserve vision, restore metabolic alignment, and rebuild long-term psychological resilience.

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