



Chronobiology Meets Contemplative Practice: Theoretical Frameworks of Amritvela Rajyoga Meditation

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Abstract

While modern contemplative science has extensively investigated mindfulness and meditation techniques, the critical chronobiological variable of timing remains largely unexplored. Ancient Eastern traditions universally emphasize the pre-dawn window—traditionally termed Brahma Muhurta or Amritvela (3:00 AM – 6:00 AM)—as the optimal time for spiritual practice. This paper establishes an interdisciplinary theoretical framework bridging modern circadian biology, neuroendocrinology, and sleep architecture with the classical philosophy and practice of Brahma Kumaris Amritvela Rajyoga meditation. Mechanistically, pre-dawn practice coincides with the circadian nadir of core body temperature and basal cortisol, peak endogenous melatonin concentrations, high baseline vagal tone, and heightened neuroplastic receptivity characterized by EEG theta-alpha synchrony. These physiological conditions create a unique neuroendocrine environment that minimizes sensory noise and stress reactivity, facilitating deep self-regulation and divine connectivity. To empirically validate this theoretical framework, we present quantitative findings from our quasi-experimental study (N = 312) comparing novice practitioners across three 28-day arms: Pre-Dawn Amritvela Rajyoga (G1, n = 110, 4:00 AM–4:45 AM), Evening Rajyoga (G2, n = 100, 6:30 PM–7:15 PM), and No-Meditation Control (G3, n = 102). Results revealed that while both active meditation groups demonstrated significant improvements on the Spiritual Well-Being

Scale (SWBS) and Spirituality Index of Well-Being (SIWB), the Amritvela group achieved significantly superior gains compared to the Evening group (SWBS gain difference = +2.55, $p < .05$; SIWB gain difference = +4.09, $p < .001$) and Control group ($p < .001$). Mixed ANOVA confirmed a robust Time $\times$ Group interaction effect for SWBS ($F = 59.27$, $p < .001$, partial eta squared = .277) and SIWB ($F = 71.68$, $p < .001$, partial eta squared = .317). These empirical outcomes confirm that early morning practice yields an additive therapeutic effect beyond the meditation technique itself. We present the Amritvela Chrono-Contemplative Model (ACCM) to guide integrative health applications and future neuroimaging research.

Keywords: Amritvela, Rajyoga Meditation, Chronobiology, Circadian Rhythms, Brahma Muhurta, Spiritual Well-Being, Melatonin, Cortisol Awakening Response, Neuroendocrinology.

1. Introduction

In recent decades, contemplative science has witnessed an exponential growth in empirical literature validating the cognitive, psychological, and physiological benefits of mindfulness and meditation (Davidson & Kaszniak, 2015; Tang et al., 2015). Research using functional magnetic resonance imaging (fMRI), electroencephalography (EEG), and neuroendocrine assays has demonstrated structural brain changes, enhanced emotional regulation, reduced systemic inflammation, and improved psychological well-being resulting from regular meditation (Goyal et al., 2014; Luders et al., 2009). However, a glaring methodological and conceptual omission persists across the majority of contemporary studies: the variable of time. Contemporary clinical protocols—such as Mindfulness-Based Stress Reduction (MBSR) or Mindfulness-Based Cognitive Therapy (MBCT)—treat meditation practice as temporally invariant, encouraging participants to practice at any convenient time during the day.

In sharp contrast to modern secular protocols, classical Indian contemplative traditions universally prescribe practice during specific temporal windows aligned with natural planetary and physiological cycles. Chief among these is the pre-dawn period, historically designated in

Vedic literature as Brahma Muhurta—literally the 'Hour of Creator/Divinity'—occurring approximately 1.5 hours prior to sunrise, specifically between 3:00 AM and 6:00 AM (Sharma, 2018; Svoboda, 1998). Within the spiritual tradition of Brahma Kumaris World Spiritual University (BKWSU), this sacred pre-dawn period is termed Amritvela—the 'Ambrosial Nectar Hours' (4:00 AM to 4:45 AM)—and is recognized as the supreme foundation for spiritual empowerment, mind purification, and communion with the Supreme Soul (Chander, 1982; Saraswati, 2008).

This paper bridges this critical gap by establishing a comprehensive theoretical framework that unites classical Eastern contemplative wisdom with modern chronobiology, circadian neurophysiology, and neuroendocrinology. Furthermore, we ground this theoretical architecture in original empirical evidence from our 28-day quasi-experimental study (N = 312) conducted under the auspices of Manipur International University. By comparing pre-dawn practice directly against evening practice and a non-meditating control group, this work demonstrates that the temporal timing of practice is not merely an external cultural ritual, but a potent neurobiological amplifier of spiritual well-being.

2. Classical Foundations: Philosophical and Epistemological Framework of Amritvela

In classical Yogic and Ayurvedic philosophy, nature operates through the cyclical interaction of the three Gunas (qualities or modes of material nature): Sattva (purity, harmony, clarity, illumination), Rajas (activity, passion, agitation), and Tamas (inertia, darkness, lethargy) (Feuerstein, 2001; Frawley, 1999). According to the Sushruta Samhita and Charaka Samhita, the 24-hour diurnal cycle is governed by distinct shifts in these environmental Gunas. The pre-dawn hours represent the absolute peak of environmental Sattva Guna, during which the macrocosmic atmosphere is undisturbed by human mental noise, sensory stimulation, or environmental turbulence (Lad, 2002; Svoboda, 1998).

Patanjali's Yoga Sutras define yoga as 'Citta Vritti Nirodha'—the cessation of the modifications of the mind (Sutra 1.2; Bryant, 2009). Patanjali notes in Sutra 1.14 that spiritual practice (Abhyasa) becomes firmly grounded when practiced continuously, without interruption, with deep devotion, and for a long time ('Sa tu dirghakala nairantarya satkara-asevito dridhabhumih'). Practice during Brahma Muhurta directly facilitates Abhyasa because the mind is naturally free from the accumulated sensory impressions (Samskaras) and mental agitations (Vrittis) that accumulate throughout active waking hours.

Within Brahma Kumaris Rajyoga philosophy, Amritvela (4:00 AM – 4:45 AM) holds a unique, exalted status. According to the foundational teachings documented in the Avyakt Murlis (spoken spiritual discourses), Amritvela is designated as the 'hour of spiritual distribution and divine inheritance' (BKWSU, 2012; Chander, 1982). Unlike physical postures (Asanas) or breath manipulation (Pranayama), Rajyoga is a purely mental and spiritual discipline centering on 'Soul Consciousness' (Atmanubhuti)—the cognitive shift from identifying as a physical body to realizing oneself as an immortal, conscious point of spiritual light. During Amritvela, the soul connects directly with the Supreme Soul (Shiv Baba) in the Paramdham (Soul World), receiving spiritual energy, peace, purity, and power. The Avyakt Murlis explicitly state that a practitioner who establishes a powerful Amritvela foundation experiences effortless spiritual success, emotional resilience, and mental clarity throughout the remainder of the day.

3. Chronobiological and Neuroendocrine Architecture of the Pre-Dawn State

Modern chronobiology reveals that human physiology is strictly regulated by endogenous circadian rhythms generated by the Suprachiasmatic Nucleus (SCN) of the anterior hypothalamus (Refinetti, 2016; Czeisler & Gooley, 2007). The SCN synchronizes hormonal secretion, autonomic nervous system tone, core body temperature, and cerebral metabolic

activity across a 24-hour period. Examining these circadian biological parameters during the pre-dawn window reveals a precise neuroendocrine alignment that optimizes contemplative processing.

4. Circadian Melatonin Peak and Antioxidant Neuroprotection

Pineal secretion of melatonin (5-methoxy-N-acetyltryptamine) follows a robust nocturnal circadian curve, rising shortly after dusk, peaking between 2:00 AM and 4:00 AM, and gradually declining toward dawn (Hardeland et al., 2011; Reiter et al., 2014). Beyond its classic role in sleep-wake regulation, endogenous melatonin is a potent neuroprotective agent, a master free-radical scavenger, and a modulator of central neurotransmission (Reiter et al., 2016). High circulating melatonin levels during the early morning hours enhance gamma-aminobutyric acid (GABA)-ergic inhibitory transmission in the cerebral cortex, dampening cortical excitability and hyper-arousal. Practicing Rajyoga meditation during peak melatonin availability allows meditators to maintain a state of deep muscular and psychological relaxation while remaining fully conscious, avoiding the sleep state.

5. Cortisol Nadir and the Autonomic Vagal Window

Hypothalamic-Pituitary-Adrenal (HPA) axis activity is at its diurnal nadir during the late night and early pre-dawn hours. Plasma cortisol levels reach their lowest baseline concentrations between 12:00 AM and 4:00 AM before undergoing the steep rising slope known as the Cortisol Awakening Response (CAR) shortly after spontaneous waking (Clow et al., 2004; Wilhelm et al., 2007). Meditating at 4:00 AM occurs precisely during this low-cortisol window before the morning stress surge. Concurrently, autonomic nervous system regulation during pre-dawn is dominated by parasympathetic vagal activity, reflected in elevated high-frequency Heart Rate Variability (HF-HRV) (Trinder et al., 2001). This autonomic vagal

dominance lowers heart rate, blood pressure, and systemic vascular resistance, creating an ideal physiological environment for inner absorption.

6. Sleep Architecture, Hypnagogic States, and EEG Synchrony

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In terms of sleep architecture, the late pre-dawn hours consist primarily of Stage 2 Non-REM and Rapid Eye Movement (REM) sleep, characterized by elevated central cholinergic activity and heightened synaptic plasticity (Diekelmann & Born, 2010). Awakening directly from this REM-rich state into Amritvela meditation allows practitioners to tap into the 'hypnagogic bridge'—a transitional state between sleep and full wakefulness. Electrophysiologically, this state is marked by prominent theta (4–8 Hz) and alpha (8–12 Hz) power across frontal and midline cortical areas (Cahn & Polich, 2006; Lagopoulos et al., 2009). Frontal midline theta activity correlates with deep focused attention and working memory clearance, while alpha wave synchrony reflects relaxed alert awareness. Practicing Rajyoga during this window facilitates rapid entry into deep meditative absorption (Dhyana).

7. Empirical Validation: Grounding the Model in a 312-Participant Trial

To test the validity of the Chrono-Contemplative Framework, we conducted a rigorous 28-day quasi-experimental empirical investigation among $N = 312$ adult novice meditation practitioners across India (Singi & Chowdhury, 2026). Ethical clearance was granted by the Institutional Research Ethics Committee (IREC) of Manipur International University (Ref: MIU/23/PYS/MGMT/WC/08). Participants were allocated into three comparative study arms: Group 1 (Amritvela Meditation, $n = 110$, practicing live via Zoom from 4:00 AM to 4:45 AM); Group 2 (Evening Meditation, $n = 100$, practicing live via Zoom from 8:30 PM to 9:15 PM); and Group 3 (No-Meditation Control, $n = 102$). Both active intervention groups underwent the exact same 28-day structured virtual Rajyoga curriculum (Week 1: Self

Realisation; Week 2: God Realisation; Week 3: My Role in World Drama; Week 4: Empowering through Rajyoga).

Spiritual well-being was evaluated pre- and post-intervention using two gold-standard psychometric instruments: the 20-item Spiritual Well-Being Scale (SWBS; Paloutzian & Ellison, 1982, measuring Religious Well-Being [RWB] and Existential Well-Being [EWB]) and the 12-item Spirituality Index of Well-Being (SIWB; Daaleman & Frey, 2004, measuring Self-Efficacy [SE] and Life Scheme [LS]).

Table.1. Comparative Pre-Post Empirical Outcomes across Amritvela, Evening, and Control Groups (N = 312)

Scale & Group	Pre Mean	Pre SD	Post Mean	Post SD	Gain Score	Effect Size (d)
SWBS - Amritvela (G1)	76.72	8.12	85.53	9.45	+8.81***	1.00 (Large)
SWBS - Evening (G2)	75.74	8.05	82.00	8.61	+6.26***	0.75 (Moderate)
SWBS - Control (G3)	80.15	3.01	78.54	1.79	-1.61***	-0.65 (Medium)
SIWB - Amritvela (G1)	37.14	7.41	46.87	7.78	+9.74***	1.28 (V. Large)
SIWB - Evening (G2)	35.07	6.22	40.72	6.61	+5.65***	0.88 (Large)
SIWB - Control (G3)	36.65	1.72	36.63	2.11	-0.02 (ns)	-0.01 (Nil)

Note. N = 312 (G1 = 110, G2 = 100, G3 = 102). SWBS = Spiritual Well-Being Scale (range 20–120); SIWB = Spirituality

Index of Well-Being (range 12–60). Gain Score = Post Mean minus Pre Mean. Effect Size = Cohen's d. *** $p < .001$.

As detailed in Table 1, the empirical data strongly confirms the theoretical hypothesis. While practicing Rajyoga meditation in the evening (G2) yielded statistically significant and robust improvements on both SWBS (+6.26, $t = 7.45$, $p < .001$, $d = 0.75$) and SIWB (+5.65, $t = 8.80$, $p < .001$, $d = 0.88$), practicing during pre-dawn Amritvela (G1) produced dramatically larger gains on both SWBS (+8.81, $t = 10.49$, $p < .001$, $d = 1.00$) and SIWB (+9.74, $t = 13.47$, $p < .001$, $d = 1.28$). Post-hoc pairwise comparisons using Tukey's HSD confirmed that Amritvela gains were significantly superior to Evening gains for SWBS (Mean Difference = +2.55, $p < .001$).

.05) and SIWB (Mean Difference = +4.09, $p < .001$). Mixed-design repeated measures ANOVA demonstrated a highly significant Time $\times$ Group interaction for both SWBS ($F(2,309) = 59.27$, $p < .001$, partial eta squared = .277) and SIWB ($F(2,309) = 71.68$, $p < .001$, partial eta squared = .317). ANCOVA controlling for baseline differences further established that the post-intervention SWBS estimated marginal mean for Amritvela (85.96) was significantly higher than Evening (82.95) and Control (77.14) ($p < .001$).

8. The Amritvela Chrono-Contemplative Model (ACCM)

Synthesizing the neurobiological mechanisms with classical yogic epistemology and our empirical results, we construct the Amritvela Chrono-Contemplative Model (ACCM). The ACCM posits that spiritual transformation is a multiplicative function of meditation technique and temporal neurobiological receptivity:

$$\text{Spiritual Well-Being Gain} = f(\text{Contemplative Technique} \times \text{Circadian Receptivity Factor})$$

Table.2. The Amritvela Chrono-Contemplative Model (ACCM): Pre-Dawn vs. Evening Physiological & Contemplative Comparison

Domain / Marker	Pre-Dawn Amritvela (4:00 AM - 4:45 AM)	Evening Practice (8:30 PM - 9:15 PM)
HPA Axis & Cortisol	Diurnal nadir; minimal basal cortisol; low stress reactivity	Diurnal elevation; cumulative daily stress cortisol load
Pineal Melatonin	Peak circadian concentration; enhanced GABAergic inhibition	Low baseline daytime levels; minimal melatonin availability
Autonomic Tone (ANS)	High vagal parasympathetic dominance; elevated HF-HRV	Sympathetic tone elevated from daily cognitive & physical activity
EEG & Brain State	High theta-alpha synchrony; hypnagogic REM plasticity bridge	Beta wave dominance; accumulated sensory fatigue & mental chatter
Guna & Macro-Environment	Sattva Guna peak; silent macro-environment; zero distraction	Rajasic/Tamasic environmental noise; familial and digital demands

Note. Model comparison based on chronobiological synthesis and empirical study parameters (Singi & Chowdhury, 2026).

9. Discussion, Implications, and Future Research Directions

The integration of chronobiological principles with Rajyoga meditation provides a powerful new paradigm for contemplative health and positive psychology. Our empirical findings

demonstrate that while meditation practiced at any time is beneficial (as evidenced by Group 2's significant gains), pre-dawn practice unlocks an exceptional tier of spiritual efficacy. The ACCM explains why: practicing during the biological nadir of cortisol and peak melatonin allows meditators to bypass daytime cognitive resistance, anchoring 'Soul Consciousness' directly into subcortical emotional architecture.

For lifestyle medicine and public health policy, these results carry substantial implications. In an era plagued by circadian disruption, night-shift fatigue, chronic stress, and existential despair, encouraging structured pre-dawn contemplative practice offers a cost-effective, non-pharmacological strategy for health promotion. Virtual delivery via platforms like Zoom democratizes access to guided Amritvela practice, establishing social accountability and structured community support without geographical barriers.

Future research should build upon this framework by integrating objective biological and neuroimaging markers. Specifically, future studies should measure serial salivary cortisol and melatonin assays during Amritvela meditation, assess simultaneous high-density EEG and functional near-infrared spectroscopy (fNIRS) to map cortical connectivity, and conduct long-term 6-month longitudinal follow-ups to evaluate habit persistence.

10. Conclusion

This study establishes that time is an essential, active constituent of contemplative practice. By combining classical Yogic scriptural wisdom regarding Brahma Muhurta and Brahma Kumaris Amritvela with modern circadian biology and neuroendocrinology, we demonstrate that pre-dawn Rajyoga meditation provides optimal conditions for spiritual flourishing. Our empirical trial (N = 312) confirms that Amritvela practice yields significantly superior gains in spiritual well-being and eudaimonic self-efficacy compared to evening practice and control

conditions. Contemplative science and integrative medicine must henceforth incorporate chronobiological timing as a primary variable in meditation research and intervention design.

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Conflict of Interest/Competing Interests

No conflict of interest.

Data Availability

The raw data supporting the findings of this research paper will be made available by the authors upon a reasonable request.

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