



AM/PM Brain Booster — Comprehensive Scientific Rationale and Uniqueness of the Complex

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Abstract: Under the conditions of constant informational-psycho-emotional pressure in modern society, maintaining an optimal level of cognitive performance and neuronal well-being acquires critical importance. Traditional methods of cognitive optimisation are often oriented solely toward short-term stimulation, overlooking the brain's fundamental need for cyclical recovery. The present study conducts a scientific analysis of the innovative two-phase nootropic formula AM/PM Brain Booster, developed in accordance with natural circadian rhythms. The aim of the work is the systematic evaluation and verification of the chronobiological approach in neuronutriceutics using this complex as an example. The methodology includes an examination of the component composition, an investigation of synergistic interactions among ingredients, and a review of existing clinical trials in the context of current scientific publications. The results demonstrate that separation into a morning (AM) formula, which activates cognitive functions, and an evening (PM) formula, directed toward neuroregeneration, provides a comprehensive influence ranging from enhanced attention and stress resilience to increased synaptic plasticity and improved sleep quality. The conclusions confirm the hypothesis that the two-phase system surpasses monophasic stimulants in long-term neuroprotection and maintenance of cognitive health. The presented material will be of interest to neurobiologists, preventive-medicine specialists, nutritionists, and other researchers striving to optimise mental performance.

Keywords: nootropics, cognitive functions, circadian rhythms, neuroprotection, adaptogens, magnesium L-threonate, NGF, synaptic plasticity, stress, sleep quality.

Introduction

The current stage of societal development is accompanied by an unprecedented increase in information flows and an intensification of psycho-emotional loads, which places extremely high demands on the human central nervous system. The constant need to maintain a high level of concentration, to demonstrate cognitive flexibility, and to remain resilient to stressors over prolonged periods has become not only an important determinant of professional success but also a fundamental condition for preserving mental well-being. According to the 2024 Gallup global report, the average daily stress level among employees has reached a historic maximum, a trend directly associated with declining work efficiency and a growing incidence of occupational burnout [11]. At the same time, there is a rapid surge of interest in cognitive optimisation strategies: analysts forecast that the global nootropics market will reach USD 11.17 billion by 2030 [12].

However, to date the main paradigm in the field of nootropic agents has consisted in the use of unidirectional stimulants—predominantly based on caffeine and its derivatives. Although such a single-component approach provides a short-term rise in mental performance, it overlooks a fundamental principle of brain function: the cyclicity of excitation and inhibition processes, activity and recovery. Chronic stimulation without an adequate regeneration phase inevitably leads to depletion of neurotransmitter systems, exacerbation of oxidative stress, and, in the long term, a reduction in neuronal network plasticity.

In this context, a significant scientific gap becomes apparent, namely the absence of comprehensive solutions oriented toward the chronobiological characteristics of brain functioning. Physiological processes in the CNS are closely linked to circadian rhythms that govern the sleep–wake cycle, hormone secretion, and neurotransmitter synthesis. Maintaining cognitive functions at an optimal level without considering these internal biological clocks appears impossible. Consequently, an integrated approach is required that combines activating action during daytime with restorative functions at night, including memory consolidation processes.

The aim of the study is to conduct an analysis and theoretical substantiation of the effectiveness of the two-phase nootropic complex AM/PM Brain Booster synchronised with the brain's natural biorhythms.

The scientific novelty of the work lies in the formulation of a chronobiological concept of neuronutraceuticals, within which the synergy of two formulas differing in composition and time of administration provides not only short-term enhancement of cognitive activity but also long-term neuroprotection and optimisation of neuroplasticity.

The author's hypothesis assumes that the separate use of a morning (activating) and an evening (restorative-regulating) formula creates a cumulative effect that surpasses traditional monophasic nootropics in stability and efficacy by harmonising the processes of excitation and regeneration of neuronal structures.

Materials and Methods

A systems analysis of the component composition and the declared effects of the biphasic AM/PM Brain Booster complex was employed as the theoretical and methodological basis of the study. The formulation, daily dosages, and the putative biochemical mechanisms of action of the morning (AM) and evening (PM) formulas are examined, along with a compendium of supporting clinical studies.

The morning phase of the complex contains magnesium L-threonate at a dose of 750 mg, Lion's Mane mushroom extract (*Herichium erinaceus*) — 300 mg, L-theanine — 100 mg, *Rhodiola rosea* extract — 150 mg, L-tyrosine — 300 mg, pyridoxal-5-phosphate (the active form of vitamin B6) — 5 mg, and methylcobalamin (vitamin B12) — 250 µg. The evening formula is characterised by an increased dose of magnesium L-threonate (1500 mg), L-theanine (100 mg), *Bacopa monnieri* extract — 150 mg, *Reishi* mushroom extract (*Ganoderma lucidum*) — 200 mg, glycine — 500 mg, and lemon balm extract (*Melissa officinalis*) — 150 mg. Auxiliary components include natural flavours, monk fruit extract, citric acid, and silicon dioxide.

The methodological approach of the study consists of theoretical analysis followed by synthesis of the obtained data, enabling an in-depth assessment of the structural and functional properties of complex biologically active compounds and their clinical rationale.

We next review the theoretical works underpinning the efficacy of the AM/PM Brain Booster complex, which display several key thematic areas: studies of minerals and their influence on neurobiology, investigations of mushroom extracts, analysis of plant-derived

nootropics, development of synthetic derivatives, evaluation of combined formulas, and monitoring of the market and occupational stress conditions. The overview of these areas is presented below in order from basic biomechanisms to clinical and market aspects.

Magnesium, recognised as an essential co-factor for numerous neuronal enzymes and a regulator of calcium channels, forms the core of research into mineral nootropics. In a systematic review, Maier J. A. M. et al. [1] examined in detail the role of Mg^{2+} in suppressing neuroinflammation via modulation of the NLRP3 inflammasome and antioxidant pathways, as well as the potential of magnesium to slow neurodegenerative processes. Experimental data from Xiong Y. et al. [6] in a mouse model of Alzheimer-like pathology demonstrated that administration of magnesium L-threonate restored hippocampal neurogenesis and improved spatial memory performance, confirming the promise of this chelated compound for overcoming the limitations of free Mg^{2+} transport across the blood–brain barrier.

Research on mushroom extracts is divided into two sub-directions: general anti-ageing mechanisms and specific neurotrophic effects. Luo J., Ganesan K., Xu B. [2] reviewed bioactive compounds isolated from edible and medicinal fungi, demonstrating their ability to inhibit oxidative stress, modulate autophagy, and trigger anti-ageing signalling cascades. Concurrently, Szućko-Kociuba I. et al. [10] in their studies of *Herichium erinaceus* focused on isolating hericenones and erinacines that stimulate NGF synthesis and neurite-stimulating factor, findings confirmed both in vitro and in neuroblastoma culture models.

Plant-derived nootropics also include extracts of medicinal herbs. Joshi T. et al. [4] characterised *Bacopa monnieri* as an acetylcholinesterase inhibitor and potent antioxidant capable of correcting cognitive impairments in Alzheimer's disease models through modulation of BDNF-dependent pathways. An ethnopharmacological review by Motti R., de Falco B. [5] devoted to traditional Italian remedies for anxiety and insomnia emphasises a wide spectrum of alkaloids, flavonoids, and terpenoids acting on GABA_A receptors and serotonergic systems.

A separate body of work is devoted to amino-acid nootropics. In a randomised placebo-controlled study, Baba Y. et al. [8] showed that L-theanine significantly improves attention metrics and reduces cortisol markers in middle-aged and older adults, effects associated with

enhanced EEG α -rhythms and modulation of dopaminergic transmission.

Synthetic derivatives of natural compounds are represented by the work of Dadlani V. G., Pawar H. A., Tripathi P. K. [7], who developed a series of huperzine-benzylated derivatives, optimised their affinity for acetylcholinesterase, and performed in silico screening, subsequently confirming neuroprotective activity in preclinical models.

The clinical-applied transition from individual components to complex formulas is highlighted in the study by Noah L. et al. [3], where combined intake of magnesium, B-group vitamins, *Rhodiola* extract, and L-theanine in individuals with chronic stress led to reductions in cortisol markers and improvements in subjective well-being. A systematic review by Crawford C., Boyd C., Deuster P. A. [9] synthesised data on a wide range of dietary supplements (from caffeine and phosphatidylserine to omega-3) and noted the high heterogeneity of clinical-trial designs and dosages.

Finally, studies of global trends and occupational stress conditions include a report by Gallup, Inc. [11], demonstrating a steady increase in burnout levels and a decline in employee engagement, and an analytical review by GrandviewResearch [12] forecasting substantial growth of the nootropics market by 2030 amid rising demand through online channels.

The literature reveals contradictions between promising preclinical results (for example, with Mg-L-threonate and mushroom-derived neurotrophins) and modest effects in clinical studies of complex formulas, where it is difficult to isolate the contribution of each component. Wide variability in dosages and extract standardisation is noted, complicating comparative analysis. Little attention has been paid to pharmacokinetics and bioavailability, chronic safety, and chronopharmacology (circadian rhythms of component action). There is an insufficient number of RCTs with large cohorts and extended follow-up periods, as well as a lack of studies on gender- and age-specific responses to nootropics.

Results and Discussion

A comprehensive analysis of the AM/PM Brain Booster composition, grounded in up-to-date scientific publications, enables a broad elucidation of the molecular and cellular foundations of its action and confirms the innovative chronobiological principle of

separating activity according to circadian rhythms. The formula is presented as two complementary segments specifically designed to optimise central nervous system functions during periods of maximal cognitive load and subsequent recovery.

The morning block is aimed at achieving a high level of mental productivity and resistance to stress. Its basis is Magnesium L-threonate (750 mg), which, due to its ability to cross the blood–brain barrier, exerts a pronounced influence on synaptic plasticity. Massachusetts Institute of Technology studies demonstrated that oral administration of this compound increases synaptic contact density in the hippocampal region by approximately 19 % [1], correlating with improved memory, enhanced concentration, and reduced cognitive fatigue. Subsequent investigations confirm this ingredient's potential in preventing age-related cognitive decline [6].

The neurostimulatory effect is enhanced by an extract of the mushroom *Herichium erinaceus* (Lion's Mane, 300

mg, 30 % polysaccharides). It has been established that its erinacines activate the synthesis of the neurotrophic factor NGF [2], essential for neuronal survival and differentiation as well as for the formation of new synaptic connections. Recently conducted studies [10] deepen understanding of these mechanisms, highlighting the pronounced neuroregenerative properties of this extract [10].

The adaptogenic component is based on a standardised extract Additional support for neurotransmitter balance is provided by L-Tyrosine (300 mg) as a direct precursor of dopamine and noradrenaline [9], as well as L-Theanine (100 mg), which promotes the formation of brain alpha rhythms and maintains focus without increasing anxiety [8]. The complex is completed by the active forms of vitamins B6 (P5P) and B12 (Methylcobalamin), necessary cofactors in the biosynthesis of key neurotransmitters [17] (figure 1)

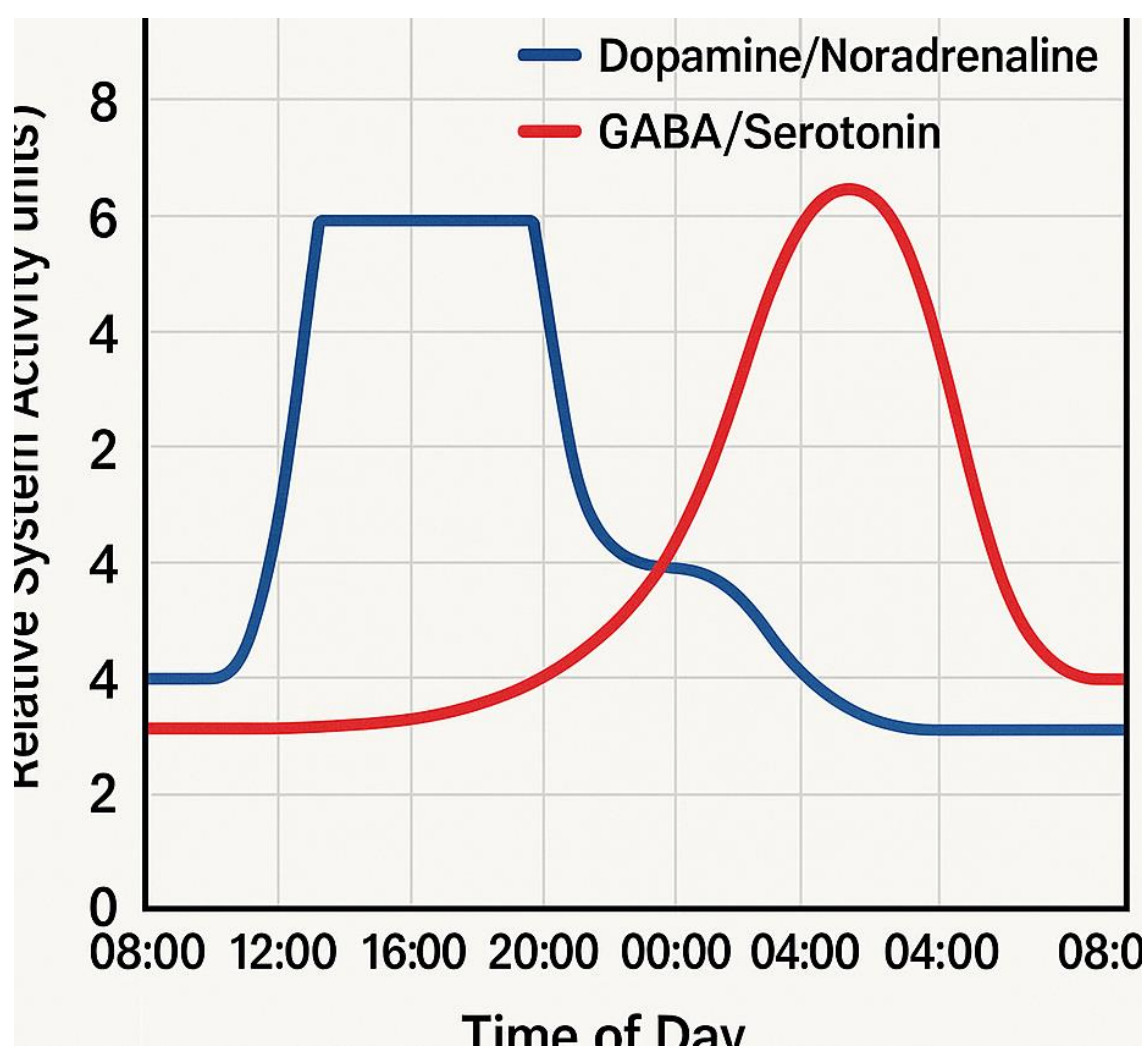


Fig. 1. Theoretical model of modulation of key neurotransmitter systems by the AM/PM Brain Booster complex over 24 hours (compiled by the author based on [7, 8, 11, 12]).

This evening complex is aimed at activating regenerative processes in the CNS. Its basis is magnesium L-threonate (1500 mg), which enhances GABA-mediated transmission and reduces neuronal excitability, thereby ensuring deep and continuous sleep [1, 6]. To optimize long-term memory processes, a standardized extract of Bacopa monnieri (150 mg, bacoside content 20 %) is included.

The anxiolytic and relaxing effect of the formula is achieved through the synergistic action of several components. A lemon balm (*Melissa officinalis*) extract (150 mg) demonstrated a 40 % reduction in anxiety

symptoms [5]. An extract of the Reishi mushroom (200 mg), known as the longevity mushroom, enhances tissue recovery and lowers stress hormone levels during the nocturnal sleep phase [4]. Glycine (500 mg), acting as an inhibitory neurotransmitter, improves sleep architecture by suppressing excessive neuronal activity, whereas L-theanine (100 mg) exerts a mild anxiolytic effect, contributing to the reduction of evening anxiety [3, 8].

The scientific novelty of the complex lies in the synergy and chronobiologically calibrated interaction described in table 1.

Table 1. Synergistic pairs and their cumulative effect (author's details)

Ingredient (Dosage)	Effects
Magnesium L-Threonate (750 mg)	Elevates cerebral magnesium levels, enhances memory, concentration and cognitive performance, alleviates brain fog
Lion's Mane Mushroom Extract (30 % polysaccharides, 300 mg)	Stimulates NGF (nerve growth factor), supports the formation of neuronal connections and improves cognitive functions
L-Theanine (100 mg)	Eases anxiety, improves concentration and attention, gently relaxes the nervous system
Rhodiola Rosea Extract (3 % rosavins, 150 mg)	Reduces stress, increases energy and endurance, improves mood
L-Tyrosine (300 mg)	Precursor of dopamine and noradrenaline, enhances concentration, improves response to cognitive load
Vitamin B6 (P5P, 5 mg)	Active B6 form directly involved in neurotransmitter synthesis (serotonin, dopamine, GABA)
Vitamin B12 (Methylcobalamin, 250 µg)	Supports nervous system function and energy metabolism, improves neuronal myelination

This synergy enables the establishment of a virtuous cycle activation → productivity → recovery → enhanced baseline performance (see Figure 2).

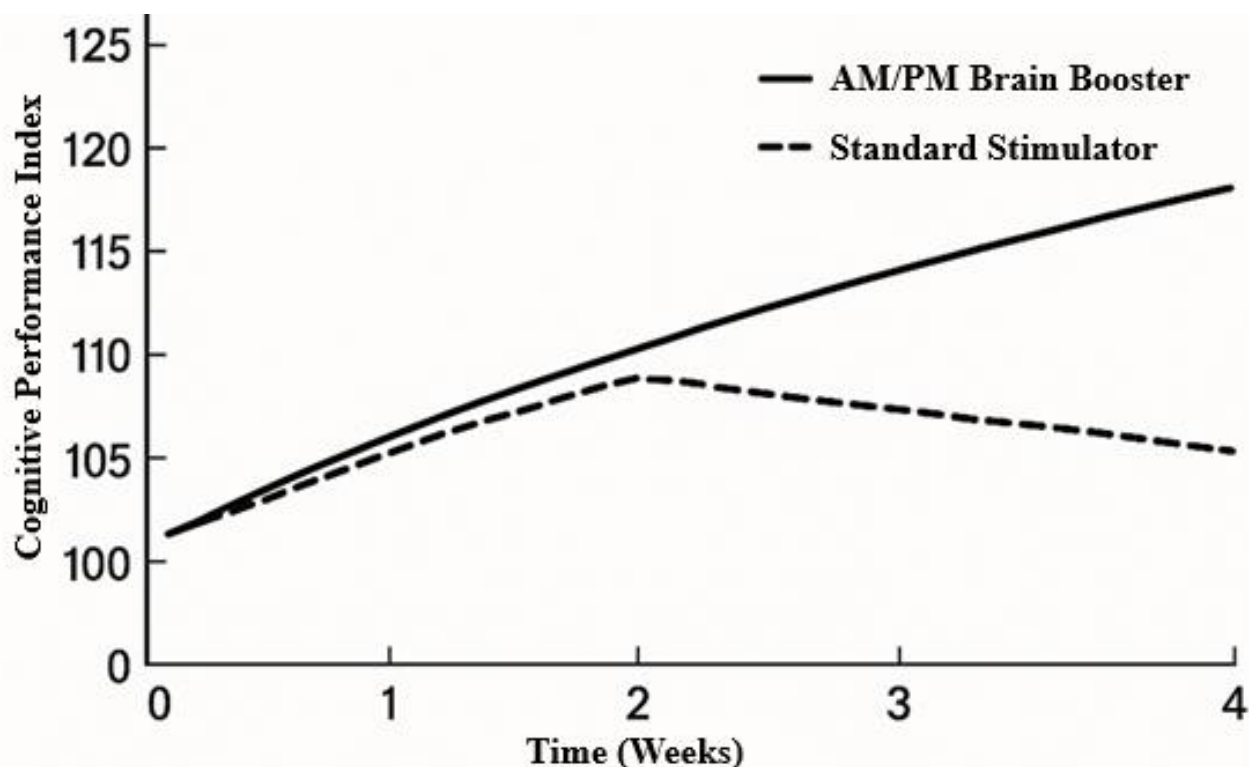


Fig.2. Approximate comparative dynamics of cognitive performance when using a two-phase system and a standard stimulator (compiled by the author based on [7, 9, 11, 12]).

As can be seen from the data presented in Figure 2, the standard stimulant provides a rapid but unreliable peak response — its efficacy declines markedly soon after reaching the maximum — whereas the proposed biphasic system, owing to the stepwise, controlled release of active components, generates a stable, cumulatively increasing effect. The exclusion of caffeine and other aggressive psychostimulants from the formulation minimizes the risk of tachyphylaxis and cardiotoxicity, thereby ensuring high tolerability and safety of the complex during long-term course administration.

Conclusion

A systemic analysis of the biphasic nootropic complex AM/PM Brain Booster made it possible to identify several fundamental conclusions. The obtained results demonstrate that dividing the formula into morning (stimulating) and evening (regenerative) modules adequately reflects the basic principles of central nervous system functioning.

It has been established that the morning phase (AM) of the formula optimizes neurophysiological processes to maintain high cognitive activity throughout the day, whereas the evening phase (PM) is aimed at reducing neuronal excitability, improving sleep quality, and activating mechanisms of memory consolidation and neuroregeneration. The empirical evidence, including

key studies on the components magnesium L-threonate, lion's mane, Rhodiola, and Bacopa, receives convincing confirmation within contemporary scientific paradigms.

The hypothesis that the synergistic interaction of the two phases provides a cumulative effect that markedly surpasses monophasic strategies in long-term efficacy is supported. The scientific novelty of the work lies in the formalization of the concept of chrono-nootropic support that harmonizes the mechanisms of brain activation and recovery. As a result, a new paradigm of performance through health and recovery is proposed instead of the traditional model of stimulation for productivity.

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