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A Critical Review on *Aṣṭāṅga* Granules: Exploring its Neurocognitive Actions on Higher Mental Functions with Different Brain Regions for Improving Intelligence in School Going Childrens

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ABSTRACT

Low-average intelligence in school-going children adversely affects academic achievement, behaviour, and social functioning, highlighting the need for safe and effective cognitive,interventions. *Ayurveda* describes impaired intellect under conditions such as *Alpabuddhi*, *Mandabuddhi*, and *Jadatva*, and recommends *Medhya Rasayana* for enhancing cognition. *Aṣṭāṅga Granules*, a polyherbal formulation derived from the classical *Aṣṭāṅga Ghṛta*, contains several *Medhya* herbs traditionally indicated to improve *Dhi, Dhriti, Medha,* and *Smriti*. This review summarizes the *Ayurvedic* concepts, phytopharmacological evidence, and neurocognitive mechanisms of *Aṣṭāṅga* Granules in children with low-average intelligence. Available evidence suggests that the formulation may improve memory, attention, learning, and overall cognitive performance through antioxidant, neuroprotective, neurotransmitter-modulating, and neuroregenerative actions, supporting its potential as a complementary cognitive enhancer.

KEYWORDS: *Aṣṭāṅga Granules, Medhya Rasayana, Low-average IQ, Cognition.*

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INTRODUCTION

Intelligent quotient (IQ) is a key determinant of a child's learning capacity, academic performance, and adaptive functioning[1].Children with low-average IQ (approximately 75–86)[2]often exhibit subtle cognitive deficits, including poor comprehension, reduced memory retention, and impaired attention, which negatively impact scholastic achievement and social behavior. Children with below average cognitive abilities form a significant concern but less explored group, for whom the progressively increasing cognitive and social expectations at each stage of development can create considerable difficulties in the future. an *Ayurveda* perspective, such conditions can be correlated with impairment in *Medha* (intellect),

Smriti (memory), and *Dhi-Dhriti* (cognitive control functions). These are often associated with *Vata dosha* vitiation, inadequate nourishment of *Majja dhatu*, and dysfunction of *manovaha srotas*[3].

Ayurveda emphasizes *medhya rasayana* therapy for enhancing cognitive functions. *Ashtanga* granules is one such a unique preparation embeded with *medhya dravyas*. *Astanga ghrita* was formulated into *astanga* granules for easy administration and palatability among childrens. As it is in the form of granules it can

be easily administrated to children with milk to improve the compliance of drugs. These ingredients individually exhibit *medhya karma*, evidently, the formulation prepared out of these results in improving *Dhi, Dhriti, smriti* and *medha*, are traditionally indicated for improving intellect, memory, and overall cognitive performance[4]. These *dravyas* induvidually have special chemical constituents which acts on different areas of brain in improving overall intelligence of the child.

AIMS AND OBJECTIVES

- To review the role of ingredients of *Aṣṭāṅga* granules in improving higher mental functions acting on different brain areas.
- To evaluate the potential effects of constituent sof *astanga* granules in improving intelligence among school going childrens.

MATERIALS AND METHODS

A narrative review was conducted using classical Ayurveda texts and electronic databases including PubMed and MEDLINE.

Pharmacological Basis of *Aṣṭāṅga Granules*

According to *Ayurveda*, the therapeutic action of ***Aṣṭāṅga Granules*** is explained through their ***rasa, guna, virya, vipaka, prabhava,*** *and* ***doṣaghna*** qualities. Their combination of ***tikta, kaṭu,*** and ***madhura rasa***, together with ***laghu guna***, a balanced ***uṣṇa–sīta virya***, and ***madhura vipāka***, helps cleanse the body's channels, reduce ***āma***, nourish the nervous system, and support the balance of ***prāṇa vāta, sādhaka pitta,*** and ***tarpaka kapha*** which are responsible for enhancing *budhi, dhee, dhriti, smriti* and *medha*[5].Through these combined effects, the formulation may improve mental clarity, memory, and learning ability, which supports its use as a ***medhya rasāyana***.

Sl. NO	Dravyas	Rasa	Guna	Virya	Vipaka	Doshagna
1	Vacha	Katu Tikta	Ruks Laghu	Ushna	Katu	Kaphavatahara
2	Bakuchi	Kashaya Tikta	Laghu	Sheeta	Katu	Pittakaphara
3	Vidhara	Kashaya Tiktaka	Sara	Ushna	Katu	Kaphavatahara
4	Shankapushpi	Katu Tikta	Sara	Ushna	Katu	Pittahara
5	Shatavari	Madhura Tikta	Sheeta Guru	Sheeta	Madhura	Vatapitaahara
6	Mandukaparini	Tikta Kashaya Madura	Laghu	Sheeta	Madhura	Vatapittahara
7	Brahmi	Kashaya Tikta	Sara Laghu	Sheeta	Madhura	Sarvdoshara
8	Guduchi	Katu Tikta	Laghu	Ushna	Madhura	Tridoshara

Table No 1; Showing g*una karma* of *Astanga* Granules;

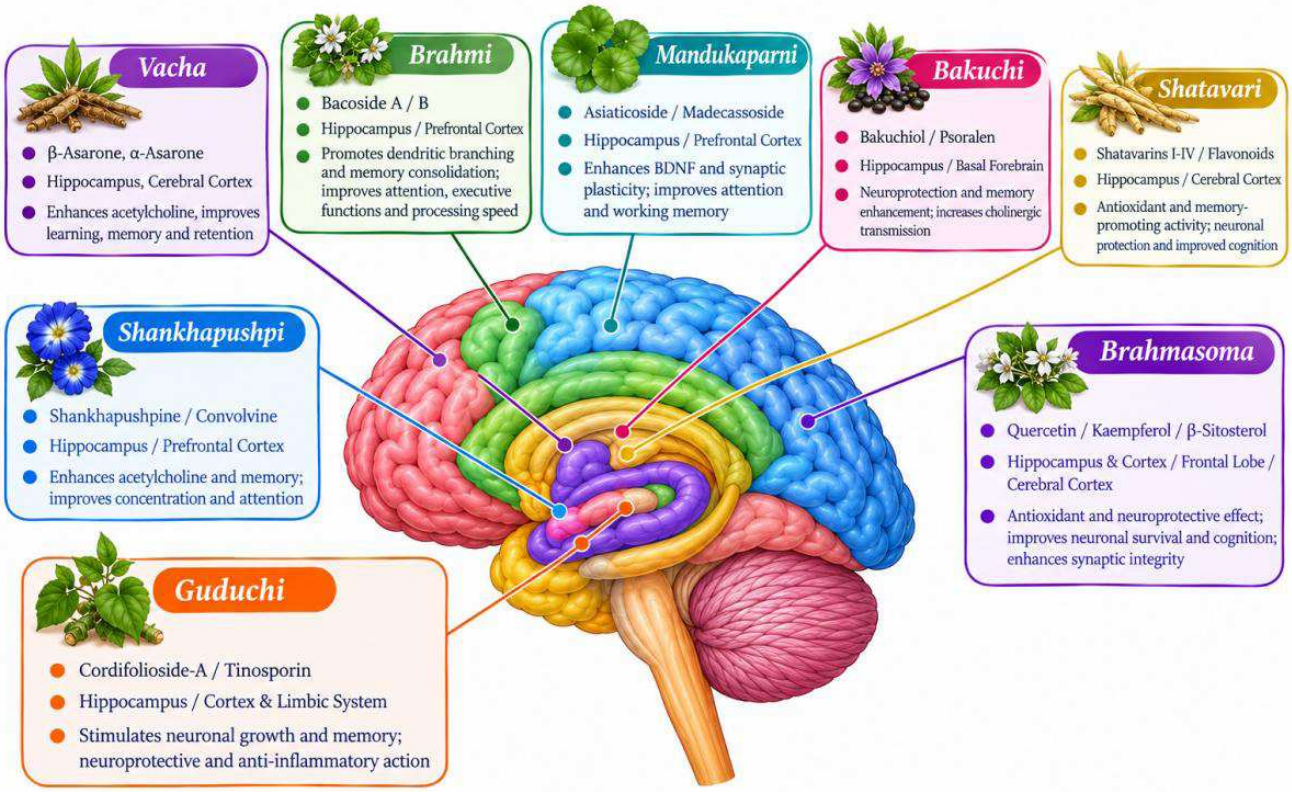


Figure1: Image showing major constituents acting on different brain areas

Table No 2: Showing major constituents acting on different brain areas

Drug	Major Constituent	Brain Area Predominantly Influenced	Effect on Buddhi
Vacha	β-Asarone, α-Asarone	Hippocampus, Cerebral Cortex	Enhances acetylcholine, improves learning, memory and retention
Brahmi	Bacoside A	Hippocampus	Promotes dendritic branching and memory consolidation
Brahmi	Bacoside B	Prefrontal Cortex	Improves attention, executive functions and processing speed
Mandukaparni	Asiaticoside	Hippocampus	Enhances BDNF and synaptic plasticity
	Madecassoside	Prefrontal Cortex	Improves attention and working memory
Bakuchi	Bakuchiol	Hippocampus	Neuroprotection and memory enhancement
	Psoralen	Basal Forebrain	Increases cholinergic transmission
Shatavari	Shatavarins I–IV	Hippocampus	Antioxidant and memory-promoting activity
	Flavonoids	Cerebral Cortex	Neuronal protection and improved cognition
Shankhapushpi	Shankhapushpine	Hippocampus	Enhances acetylcholine and memory
	Convolvine	Prefrontal Cortex	Improves concentration and attention
Brahmasoma	Quercetin	Hippocampus and Cortex	Antioxidant and neuroprotective effect
	Kaempferol	Frontal Lobe	Improves neuronal survival and cognition
	β-Sitosterol	Cerebral Cortex	Enhances synaptic integrity
Guduchi	Cordifolioside-A	Hippocampus	Stimulates neuronal growth and memory
	Tinosporin	Cortex and Limbic System	Neuroprotective and anti-inflammatory action

Mechanism of action of *astanga* granules on different brain areas;

Intelligence is a complex cognitive function that depends on the coordinated activity of multiple brain regions, particularly the **hippocampus, prefrontal cortex, cerebral cortex, basal forebrain, frontal lobe, and limbic system** [6]. These regions regulates learning, memory, attention, executive function, reasoning, language, and emotional processing. The phytoconstituents present in *aṣṭāṅga* Granules exert complementary actions on these brain areas through antioxidant, neuroprotective, neurotransmitter-modulating, and synaptic plasticity-enhancing mechanisms.

1. ***Vacha*-Brain areas: Hippocampus and Cerebral Cortex-**β-Asarone is one of the most extensively studied compounds of *vacha*. Experimental studies demonstrate that it increases **acetylcholine availability**, enhances **brain-derived neurotrophic factor (BDNF)** expression, reduces oxidative stress, and promotes hippocampal neurogenesis[7]. The hippocampus is the principal center for learning and memory formation; therefore, improved neuronal survival and synaptic plasticity directly enhance memory acquisition and retention. In the cerebral cortex, β-asarone improves neuronal communication and processing speed, supporting better reasoning and information integration. These effects contribute to improvements in IQ domains related to memory, comprehension, and learning.

2. ***Brahmi* -Brain area: Hippocampus and Prefrontal Cortex-**Bacoside A enhances dendritic arborization and stimulates synapse formation within hippocampal neurons, leading to stronger long-term potentiation, the cellular basis of learning and memory. It also protects neurons from oxidative injury. Bacoside B acts predominantly on the prefrontal cortex by improving cholinergic transmission[8] and neuronal signaling involved in attention, executive functions, decision-making, and working memory. Together, these mechanisms improve information processing speed, concentration, and intellectual performance.

3. ***Mandukaparni*-Brain area: Hippocampus and Prefrontal Cortex**-Asiaticoside in the *mandukaparini* increases the expression of BDNF, stimulates neurogenesis, and enhances synaptic plasticity in the hippocampus[9]. These changes facilitate better learning and long-term memory formation. Madecassoside exhibits potent antioxidant and anti-inflammatory effects within the prefrontal cortex, preserving neuronal integrity and improving attention, working

memory, and cognitive flexibility. These functions are essential for academic performance and higher intelligence.

4. ***Bakuchi* -Brain area: Hippocampus and Basal Forebrain-**Bakuchiol possesses significant antioxidant and anti-inflammatory properties that protect hippocampal neurons from oxidative damage and apoptosis. This preservation of neuronal integrity supports memory and learning[10].Psoralen influences the cholinergic neurons of the basal forebrain, the major source of acetylcholine to the cerebral cortex[11]. Enhanced cholinergic transmission improves attention, learning efficiency, and memory retrieval, all of which contribute to cognitive performance.

5. ***Shatavari* -Brain area: Hippocampus and Cerebral Cortex-**Shatavarins exhibit antioxidant and neuroprotective effects by reducing oxidative stress and preventing neuronal degeneration in the hippocampus. They support memory consolidation and learning[12].The flavonoids and ethanol extracts of *Shatavari* improve cerebral cortical function by reducing neuroinflammation and enhancing neuronal survival, does retention transfer latency, ↓ escape latency, ↓ AChE activity thereby improving cognition, information processing, and adaptive learning[13].

6. ***Shankhapushpi*-Brain area:** Hippocampus and Prefrontal Cortex-Shankhapushpine increases acetylcholine concentration in the hippocampus, thereby strengthening memory encoding and consolidation. Convolvine modulates neurotransmission within the prefrontal cortex[14], improving sustained attention, concentration, and executive control. These actions enhance problem-solving ability and academic performance.

7. ***Brahmasoma*-Brain area: Hippocampus, Frontal Lobe and Cerebral Cortex**-Quercetin is a potent antioxidant that crosses the blood-brain barrier and protects hippocampal neurons against oxidative injury while promoting synaptic plasticity. Kaempferol improves neuronal survival and reduces neuroinflammation within the frontal lobe, supporting executive function, planning, and reasoning[15]. β-Sitosterol enhances membrane stability and synaptic integrity in cortical neurons, facilitating efficient neuronal communication required for higher cognitive functions[16].

8. ***Guduchi* -Brain area: Hippocampus, Cerebral Cortex and Limbic System**-Cordifolioside-A stimulates neuronal regeneration and enhances synaptic connections within the hippocampus, promoting learning and memory[17]. Tinosporin exhibits anti-inflammatory and antioxidant effects throughout the cortex and limbic system, protecting neurons from chronic oxidative damage while improving emotional regulation and cognitive performance[18].

Since emotional stability strongly influences learning and attention, *guduchi* indirectly supports better intellectual functioning.

Discussion

In ayurveda, cognitive function is not attributed to a single organ or doshas, but is considered the outcome of the coordinated action of ***prāṇa vāta, sādhaka pitta*,** and ***tarpaka kapha*[19],** supported by proper nourishment of ***majjā dhātu*** and the healthy functioning of ***manovaha srotas***. Any imbalance in these factors can affect higher mental functions such as attention, learning, memory, comprehension, and decision-making. Therefore, children with low-average intelligence may be understood as having a functional disturbance of these neuropsychological components rather than an obvious structural abnormality.

Among these, ***prāṇa vāta*** situated in *mastiska* (brain) circulate through *kanta* (larynx-trachea) and *uras* (lungs and heart). It commands the *buddhi* (intellectual), *hridaya* (heart), *chitta* and *indriya* and is responsible for *buddhi, hridaya, indriya* and chitta *dharana*[19].it has a key role in regulating attention, perception, concentration, and the transmission of sensory information. The central nervous control (*prano atra murdhaga)*[20] of respiration is a complex process that involves the coordinated efforts of multiple brain region nerves and neurotransmitters. It is closely governs to ***dhi*** (comprehension), ***dhriti, mati*** (intellect and decision-making), and ***smṛti*** (memory).*Acharya vaghbata* opines that *udana vata* also has its role in *smritikriya*[21] as its acts more on frontal cortex according to studies thus stimulating one of the brain area related to intelligence. *Sādhaka pitta* enables an individual to accomplish desired goals (*abhipretārtha-manoratha-sādhana)*[22] and plays an indispensable role in maintaining courage, confidence, enthusiasm, intelligence, memory, and emotional stability. *Buddhirvaisesika ālocaka pitta* represents the cognitive aspect of vision and is situated in the region of śṛṅgāṭaka. It performs higher intellectual functions such as interpretation, memory, discrimination, and recall of visual information[23].

Sādhaka pitta governs intellect, discrimination, emotional balance, and cognitive processing, thereby strengthening ***medha, smriti,dhi*** and ***dhṛti*** (retention and mental perseverance).

Fortitude *(dhruti)* is one of the functions attributed *to kapha. jnana* and *buddhi* are under the control of *kapha*.[24] among the 5types of *kapha, tarpaka kapha* has the major role. It nourishes the sensory organs. ***Tarpaka kapha*** provides nourishment and stability to the nervous system, supporting ***smṛti, dhṛti,*** and the proper nourishment of ***majjā dhātu,*** which forms the structural basis for healthy cognitive function[25].

The ingredients of ***aṣṭāṅga*** **granules** appear to act synergistically on these functional domains, thereby enhancing the cognitive faculties—***dhi, dhṛti, smṛti, medha*** and ***mati***, thus improving the buddhi. ***Vacha*** **(acorus calamus)** primarily stimulates ***prāṇa vāta***. Its active constituent, β-asarone, enhances cholinergic neurotransmission and neuronal communication, improving attention, learning, comprehension, and memory. These actions mainly contribute to better ***dhi, mati***, and ***smṛti***. ***Brahmi*** **(bacopa monnieri)** acts predominantly on ***sādhaka pitta*** while also nourishing ***tarpaka kapha***. Bacosides promote synaptic plasticity, hippocampal neurogenesis, and bdnf expression, leading to improvements in learning, memory consolidation, sustained attention, and mental stability. Thus, *brahmi* supports ***dhi***, ***smṛti***, and ***dhṛti***. ***Maṇḍūkaparṇī*** **(centella asiatica)** nourishes ***majjā dhātu*** and supports both ***tarpaka kapha*** and ***sādhaka pitta***. Asiaticoside promotes neuronal repair, neurogenesis, and hippocampal plasticity while reducing oxidative stress. These effects improve memory, concentration, and cognitive flexibility, thereby enhancing ***smṛti, dhṛti,*** and ***mati***. ***Śaṅkhapuṣpī*** **(convolvulus pluricaulis)** influences both ***prāṇa vāta*** and ***sādhaka pitta***. By improving cholinergic function and reducing anxiety, it enhances comprehension, attention, and memory while promoting emotional stability. As a result, it contributes to ***dhi, dhṛti***, and ***smṛti***. ***Guḍūcī*** **(tinospora cordifolia)** acts as a potent ***rasāyana,*** nourishing ***majjā dhātu*** while supporting ***sādhaka pitta*** and ***tarpaka kapha***. Its antioxidant and neuroprotective properties help preserve neuronal integrity, reduce oxidative stress, and improve long-term cognitive performance, particularly ***smṛti*** and ***dhṛti***. Similarly, ***śatāvarī*** **(asparagus racemosus)** and ***vidārī*** **(pueraria tuberosa)** provide nourishment to ***majjā dhātu*** and ***tarpaka kapha***. Their adaptogenic and rejuvenating properties support neuronal health, improve mental resilience, and strengthen memory retention, thereby enhancing ***dhṛti*** and ***smṛti***. ***Bakucī*** **(psoralea corylifolia)**, through its antioxidant and neuroprotective actions, supports ***sādhaka pitta,*** helping maintain efficient neuronal function and indirectly improving ***dhi*** and ***mati***.

The combined action of these herbs provides a comprehensive approach to cognitive enhancement. Herbs such as ***vacha*** and ***śaṅkhapuṣpī*** predominantly improve ***prāṇa vāta***, resulting in better attention, perception, and intellectual processing. ***Brahmi*** and ***śaṅkhapuṣpī*** strengthens ***sādhaka pitta,*** thereby enhancing learning, discrimination, and executive function. Meanwhile, ***maṇḍūkaparṇī, guḍūcī, śatāvarī,*** and ***vidārī*** nourish ***tarpaka kapha*** and ***majjā dhātu***, providing structural support to the nervous system and facilitating memory consolidation and sustained cognitive performance. Together, these actions improve ***dhi*** (learning and understanding), ***dhṛti*** (retention and mental stability), ***smṛti*** (memory), and ***mati*** (reasoning and decision-making).

Modern scientific evidence complements these classical concepts. Phytoconstituents such as **β-asarone, bacosides, asiaticoside, shankhapushpine, cordifolioside-a, quercetin,** and **kaempferol** have been shown to enhance cholinergic neurotransmission, increase bdnf expression, promote synaptic plasticity, reduce neuroinflammation, and protect neurons from oxidative stress. These effects are particularly evident in the hippocampus and prefrontal cortex, brain regions responsible for learning, memory, attention, and executive function. Thus, the modern pharmacological actions closely parallel the *ayurvedic* concepts of balancing ***prāṇa vāta***, optimizing ***sādhaka pitta,*** nourishing ***tarpaka kapha***, and strengthening ***majjā dhātu***. Overall, the synergistic action of the eight ***medhya rasāyana*** herbs in ***aṣṭāṅga*** **granules** provides a holistic approach to improving cognitive function. By simultaneously restoring functional balance and supporting neuronal health, the formulation may enhance intelligence, learning ability, memory, attention, and academic performance in children with low-average intelligence.

Conclusion

Nature has gifted us countless healing herbs, many of which are still waiting to be fully understood. Ayurveda has recognised their value for centuries. Aṣṭāṅga granules, with its medhya rasāyana herbs, may help support learning, attention, memory, and understanding in children. More than just improving an intelligence score, the real aim is to nurture each child's unique abilities and help them reach their potential. By bringing together Ayurvedic wisdom and modern science, we can explore these natural treasures further and help children learn, grow, and flourish.

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