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REVIEW ARTICLE

Ayurvedic Prakriti and Cognitive Processes in Education: A Neurocognitive Framework for Self-Directed Learning

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ABSTRACT

Individual differences in cognitive functioning are inadequately addressed in standardized educational models, highlighting the need for integrative frameworks that capture psychobiological variability. This review examines the relevance of Ayurvedic Prakriti typology for understanding cognitive processes in educational contexts. The objective is to develop a theoretically grounded neurocognitive framework linking Prakriti-based constitutional profiles with self-directed learning capacities. An integrative narrative approach is adopted, synthesizing classical Ayurvedic concepts with contemporary research in cognitive neuroscience, psychology, and education. The analysis maps Vata, Pitta, and Kapha characteristics onto core cognitive domains, including attention regulation, memory, executive function, and stress responsiveness. Findings indicate that Prakriti-associated traits correspond to distinct cognitive tendencies: Vata aligns with cognitive flexibility and attentional variability, Pitta with sustained focus and goal-oriented control, and Kapha with memory stability and persistence. These associations are modulated by contextual and environmental factors, underscoring their non-deterministic nature. The review proposes an interdisciplinary framework that integrates traditional constitutional theory with modern neurocognitive constructs, offering a conceptual foundation for personalized and self-directed learning strategies.

Keywords: *Ayurvedic Prakriti, cognitive variability, neurocognitive framework, self-directed learning, educational neuroscience, individualized learning, mind–body integration*

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INTRODUCTION

Variability in cognitive processes—particularly attention regulation, working memory, executive control, and emotional modulation—plays a decisive role in shaping learning outcomes, especially in self-directed learning contexts. Although educational psychology and neuroscience increasingly recognize these differences, most pedagogical models remain standardized and offer limited mechanisms to account for stable, constitution-based variability among learners. This limitation underscores the need for integrative frameworks that systematically relate psychobiological individuality to cognitive functioning in education [1]. The Ayurvedic concept of ***Prakriti*** provides a structured account of individual constitution based on the relative predominance of Vata, Pitta, and Kapha. These constitutional profiles encompass enduring cognitive, emotional, and behavioral tendencies, offering a coherent basis for interpreting learner variability [2]. Emerging evidence from Ayurgenomics further supports the biological basis of Prakriti, linking constitutional types with genomic and biochemical variability [3,4]. This integrative orientation aligns with contemporary perspectives that conceptualize cognition as emerging from dynamic brain–body interactions **[5].** Within this framework, Prakriti can be analytically related to cognitive domains such as attentional control, executive functioning, and stress responsiveness, which are central to self-directed learning. Despite these conceptual advances, the application of Prakriti to educational cognition remains underdeveloped. Existing research largely situates Prakriti within clinical, physiological, or

personality-based contexts, with limited translation into educational theory. More specifically, there is a lack of systematic mapping between Prakriti typologies and well-defined neurocognitive systems, such as executive control networks and working memory processes. Although some studies indicate associations between Prakriti and cognitive functions, including intelligence and working memory, these findings remain fragmented and insufficiently integrated into a coherent framework [6]. Additionally, recent critical reviews highlight methodological inconsistencies in Prakriti assessment, further limiting its applicability in interdisciplinary research [7]. In response, the present review aims to develop a neurocognitive framework that explicitly links Ayurvedic Prakriti with core cognitive processes relevant to education, with particular emphasis on self-directed learning. By synthesizing classical Ayurvedic theory with contemporary research in cognitive neuroscience and educational science, the study advances an analytically grounded model of constitution-based cognitive variability. The objective is to clarify how Prakriti-related traits interact with neurocognitive mechanisms to influence learning behaviors, thereby providing a conceptual foundation for more precise, personalized, and adaptive educational strategies.

MATERIAL AND METHODS

This study employs an integrative narrative review design with a theory-building orientation to develop a neurocognitive framework linking Ayurvedic *Prakriti* with cognitive processes in education. Although not a formal systematic review, the approach incorporates structured and transparent procedures to enhance rigor and conceptual coherence, consistent with contemporary efforts to integrate Ayurveda with evidence-based frameworks. A purposive literature search was conducted across Scopus, Web of Science, PubMed, and Google Scholar for studies published between 2000 and 2026. Search terms combined keywords using Boolean operators (e.g., "Prakriti and cognition," "Ayurveda and executive function," and "learning and neurocognition"). Records were screened in two stages: initial title and abstract review, followed by full-text assessment for relevance. Inclusion criteria comprised studies that (i) examined Prakriti in relation to psychological or cognitive traits, (ii) addressed neurocognitive domains such as attention, memory, executive function, or stress regulation, and (iii) demonstrated conceptual or empirical relevance to learning. Studies limited to clinical outcomes without cognitive interpretation, duplicates, and non-peer-reviewed sources were excluded. Selected studies were further evaluated for conceptual clarity and methodological adequacy, particularly in light of ongoing concerns regarding the standardization of Prakriti assessment tools [7,8]. The analysis followed a three-step thematic synthesis. First, key constructs from Ayurvedic theory (Vata, Pitta, Kapha) and cognitive science were identified. Second, these constructs were systematically compared to establish correspondences with domains such as attentional control, executive regulation, and adaptive learning. Third, an interpretive mapping was developed and iteratively refined to integrate these relationships into a coherent framework, informed by prior work linking Prakriti with cognitive and psychological traits [6, 9]. This approach provides a structured conceptual foundation for framework development, though it remains limited by the absence of quantitative synthesis and potential selection bias.

LITERATURE REVIEW

The integration of Ayurvedic ***Prakriti*** with cognitive processes has emerged as a promising approach to understanding individual differences in learning. As education increasingly emphasizes self-directed and personalized models, there is a growing need for frameworks that connect stable psychobiological traits with cognitive functioning. Prakriti offers a systemic classification of individual constitution; however, its relevance to educational cognition requires critical and analytically coherent synthesis. This review examines the literature across four interconnected themes: Prakriti as a model of individuality, its cognitive correlates, neurocognitive interpretations, and implications for self-directed learning.

Prakriti as an Integrative Model of Individuality

Prakriti conceptualizes individual constitution through the interplay of Vata, Pitta, and Kapha, encompassing physical, psychological, and behavioral dimensions. Its integrative nature distinguishes it from fragmented trait-based models by situating cognition within a broader psychophysiological system [2]. Contemporary research further supports its biological grounding, with Ayurgenomics studies demonstrating genetic and biochemical correlates of constitutional types [3,4]. These findings suggest that Prakriti reflects underlying biological variability rather than purely descriptive typology. However, despite its theoretical coherence, the lack of standardized assessment frameworks continues to limit its empirical applicability [7].

Cognitive Variability Across Prakriti Types

Research indicates that Prakriti types are associated with distinct cognitive tendencies. Variations in working memory, attention, and cognitive performance have been linked to constitutional differences [6]. Recent studies also suggest that Prakriti may influence broader cognitive functions and academic performance, reinforcing its relevance in educational contexts [9]. Vata is generally associated with cognitive flexibility and variability, Pitta with focused and goal-directed processing, and Kapha with stability and memory retention. While these patterns offer a useful framework for interpreting cognitive diversity, they are often presented in simplified typological terms, with limited attention to contextual modulation and intra-individual variability.

Neurocognitive Interpretation and Integrative Perspectives

Efforts to interpret Prakriti within a neurocognitive framework aim to bridge traditional knowledge systems with contemporary science. Integrative approaches emphasize aligning Ayurvedic concepts with evidence-based biomedical models [5,8]. Such perspectives support the view that cognitive processes are embedded within broader mind–body systems, consistent with emerging work on mental well-being and holistic cognition [1]. Comparative frameworks also highlight parallels between Ayurveda and other traditional systems, reinforcing its interdisciplinary relevance [10,11].

Biological studies further strengthen this integration by demonstrating associations between Prakriti and genomic variability, suggesting potential neurobiological underpinnings of cognitive differences [10,12]. However, these mappings remain largely inferential, with limited direct evidence linking Prakriti to specific neural mechanisms. Moreover, the literature often underrepresents the role of neuroplasticity and environmental influence, which are critical for understanding learning processes.

Implications for Self-Directed Learning

Self-directed learning involves the regulation of cognitive, motivational, and behavioral processes, making it sensitive to individual variability. Prakriti-based tendencies may influence how learners engage with autonomy, structure, and feedback. Cognitive flexibility associated with certain constitutions may support exploratory learning, while stability and persistence may enhance retention and long-term learning outcomes. Indirect evidence from clinical and experimental studies on Ayurvedic interventions further supports the relationship between mind–body processes and cognitive performance. For example, research on cognitive enhancement and memory improvement through traditional formulations indicates the relevance of Ayurvedic principles in modulating cognitive functions [13,14,15]. Although not directly linked to Prakriti, these findings reinforce the broader applicability of Ayurvedic frameworks in understanding cognition. Despite these insights, empirical research examining the application of Prakriti in educational settings remains limited. Current evidence is largely conceptual, with insufficient validation in real-world learning environments.

Synthesis and Theoretical Implications

The literature suggests that Prakriti provides a macro-level model of individual variability, while neurocognitive frameworks offer micro-level explanatory mechanisms. Their integration holds significant potential for advancing personalized education but is constrained by conceptual and methodological gaps. These include limited standardization of Prakriti assessment, insufficient mapping to validated cognitive constructs, and a lack of interdisciplinary empirical studies. Recent reviews emphasize the need for more rigorous and integrative approaches to operationalize Prakriti within scientific frameworks [7,12]. A coherent model must therefore conceptualize Prakriti as a set of dynamic, context-sensitive tendencies interacting with neurocognitive processes rather than as a fixed typology. In summary, existing research establishes the conceptual relevance of Prakriti for understanding cognitive variability and learning. However, the literature remains fragmented and predominantly theoretical. Advancing this field requires a more analytically integrated framework that connects constitutional typology with empirically grounded neurocognitive mechanisms, thereby supporting the development of adaptive and self-directed learning models. Collectively, these themes indicate the need for a coherent framework that integrates Prakriti-based constitutional variability with neurocognitive processes to inform educational practice.

DISCUSSION

This review interprets Ayurvedic *Prakriti* as a conceptual framework for understanding variability in cognitive processes relevant to self-directed learning. The synthesis suggests that Prakriti is best understood as a set of probabilistic dispositions influencing attention, executive function, memory, and emotional regulation, rather than as a fixed typology. This perspective enables its integration with neurocognitive models, where constitution-based tendencies influence cognitive functioning without deterministically constraining it [5]. A key insight is the convergence between Prakriti-based descriptions

and established neurocognitive processes. Vata-related tendencies toward rapid processing and variability align with dynamic attentional shifting, supporting exploratory learning but potentially limiting sustained engagement. Pitta-related characteristics correspond to goal-directed cognition and efficient executive control, facilitating structured and performance-oriented learning. Kapha-related stability reflects sustained attention and memory consolidation, supporting consistency while potentially constraining adaptability under changing demands. Empirical findings linking Prakriti with cognitive functions and academic performance further support these differentiated patterns [6,9]. These patterns, however, should be interpreted as context-sensitive rather than fixed, as cognitive performance varies with task demands, developmental stage, and learning environment. This interpretation reframes self-directed learning as a constitution-sensitive process. Learners differ not only in outcomes but also in how they regulate learning through planning, monitoring, and adaptation. Variations in attentional control and emotional regulation influence persistence, motivation, and strategic flexibility. Broader integrative perspectives on mental functioning in Ayurveda also support the role of mind–body interactions in shaping such learning processes [1]. Accordingly, self-directed learning emerges from the interaction between individual predispositions and instructional context, rather than as a uniform capability. At the same time, important limitations must be acknowledged. The proposed links between Prakriti and neurocognitive systems remain largely inferential and lack direct empirical validation. Intra-type variability, contextual modulation, and methodological inconsistencies in Prakriti assessment further limit predictive precision [7]. Biological studies, while promising, remain insufficient to establish definitive neurocognitive mechanisms underlying Prakriti-based differences [4]. These factors support interpreting Prakriti as a flexible, context-dependent framework rather than a deterministic model. Theoretically, integrating Prakriti with neurocognitive perspectives expands models of individual differences by incorporating embodied and constitution-based dimensions. Practically, it suggests the value of adaptive educational strategies that vary structure, feedback, and task demands in accordance with learner variability. However, these implications remain provisional and require systematic empirical investigation. In sum, Prakriti provides a promising but still developing framework for interpreting cognitive variability in education. Its integration with neurocognitive theory offers conceptual clarity, but its practical application depends on methodological refinement and empirical validation.

CONCLUSION

This review establishes Ayurvedic *Prakriti* as a conceptually robust framework for understanding cognitive variability in education, particularly in self-directed learning. By linking constitutional typology with core neurocognitive processes—attention, executive control, memory, and emotional regulation—it reframes learner diversity as structured psychobiological variation rather than isolated traits. The study's primary contribution is the development of a neurocognitive–Prakriti framework that bridges traditional Ayurvedic theory with contemporary cognitive and educational science. This integration offers a more precise basis for personalized learning by situating cognition within dynamic mind–body interactions.

However, key limitations persist. There is a lack of standardized and reliable methods for Prakriti assessment, insufficient empirical validation in educational contexts, and limited clarity in mapping constitutional types to specific neurocognitive mechanisms. These gaps constrain both theoretical refinement and practical application. Future research should focus on operationalizing Prakriti into measurable constructs and testing its relevance through controlled, context-sensitive studies in educational settings. Longitudinal and interdisciplinary approaches will be essential to examine how constitution-based differences interact with learning environments over time. Addressing these areas is critical for establishing Prakriti as a scientifically grounded framework for adaptive and self-directed education.

Use of Artificial Intelligence

Artificial intelligence (AI) tools were used for language refinement and drafting assistance during manuscript preparation. All intellectual content, interpretation, and critical analysis were performed by the authors, who take full responsibility for the accuracy, originality, and integrity of the work.

Conflict of Interest

The authors declare no conflict of interest.

Ethical Approval

Ethical approval was not required, as this study is based solely on a review of existing literature and does not involve human or animal subjects.

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Author Contributions
Ms. Sangeeta Singh (First and Corresponding Author): Conceptualization, study design, supervision, and manuscript writing. Prof. Chandra Sekhar Pandey (Second Author): Literature search, data analysis, interpretation, and drafting of the manuscript.

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